AN EXCELLENT FATHER

(JANE AUSTEN)

Introduction: - An 'Excellent father' is an excerpt from a famous novel by Jane Austen 'Pride and Prejudice'. The important characters of this passage are Mr. and Mrs. Bennet, Jane, Elizabeth and Mr. Bingley.

Mr. Bennet: - A gentleman, who lives with his wife and five daughters at Longbourne House. Mr.Bennet seldom shows anger; he prefers to laugh at people's weaknesses.

Mrs. Bennet: - His wife; a foolish, quick tempered woman. Her chief aim in life is to find rich Husbands for her daughters.

Jane: - The eldest of the Bennet daughters and also the prettiest.

Elizabeth: - The second of the Bennet daughter. She is shrewder than Jane and is always ready to speak her mind.

Kitty: - The fourth of the Bennet daughters.

Charles Bingley: - A rich handsome, eligible and single gentleman.

Summary

This prose extract has been taken from Jane Austen's famous novel "Pride and Prejudice" which after considerable revision appeared as "Pride and Prejudice" in 1813. This novel tells the story of the gradual union of two people- one held back by unconquerable pride and the other blinded by Prejudice- thus the name "Pride and Prejudice".

Mr. Bennet seems to be a careless father who is not bothered about the marriage of his daughters, who have attained a marriageable age. The chapter starts when Mr. Bingley rents Nether fields Park, which is in the neighborhood of Mr. Bennet' house. Mrs. Bennet becomes very cautious about her daughter because she does not want to lose this opportunity of marrying one of her daughters to Mr. Bingley. Actually, this novel is written in 19th century when there was a custom that the property was taken over by only male members. Since Mr. Bennet had no son, so his property was to be owned by any of his close relative. That is why, Mrs. Bennet was very much worried about the fate of her daughters.

On hearing about the arrival of Mr. Bingley, she tells her husband to develop some familiarity with him. But he reacts very lightly to this news. He starts teasing his wife and comments that should send the girls to meet Mr. Bingley but should not go herself, for she is very beautiful even in her old age.

Finally, Mrs. Bennet gets very disappointed because of her husband's loose reaction. As a result in a fit of anger, she scolds her daughter Kitty for coughing. Ultimately, when she comes to know that her husband, Mr. Bennet, had visited Mr. Bingley, she feels relaxed and overwhelmed. At the end, she tells her daughters "You have an excellent father, girls" because she comes to know that Mr. Bennet had actually paid the visit to Mr. Bingley unbeknownst to all of them.

Answers:

Q.1. Mrs. Bennet told her husband about the occupation of Nether field park, by Mr. Bingley who is a handsome, young and rich lad, in a way an eligible bachelor.

Q.2 Mr. Bingley takes over Nether field park, Mrs. Bennet is happy because she finds Mr. Bingley an eligible bachelor for one of her daughters.

Q.3 Mrs. Bennet insists her husband to visit Mr. Bingley. Mr. Bingley was an eligible bachelor who was apple of every one's eye there. Mrs. Benet wanted her husband to win Mr. Bingley's confidence so he could think of marrying one of her daughters.

Q.4 Mr. Bennet was a little bit inconsiderate towards his wife. This was because of her incorrigible behavior. He often used to ignore her remarks. Moreover Mr. Benet was a humorous person, he often tickled himself by vexing his wife. But Mrs. Benet was often furious at this behavior of his and used to become emotional.

Q.5 Mrs. Bennet calls Mrs. Long as selfish because she thinks that Mrs. Long would try to please Mr. Bingley for getting her own nieces married to him, instead of introducing the Bennet girls to him.

Q.6 Mr. Bennet, earlier, ignored her sayings and tried to make fun of the situation and her remarks. He took great pleasure in vexing his wife.

Q.7 She says so when she comes to know that Mr. Bennet had already paid a visit to Mr. Bingley, and had made an acquaintance with him.

Bookwork

Language work.

a) To let be
b) Single
c) Vex
d) Impatiently
e) Settle
f) Design

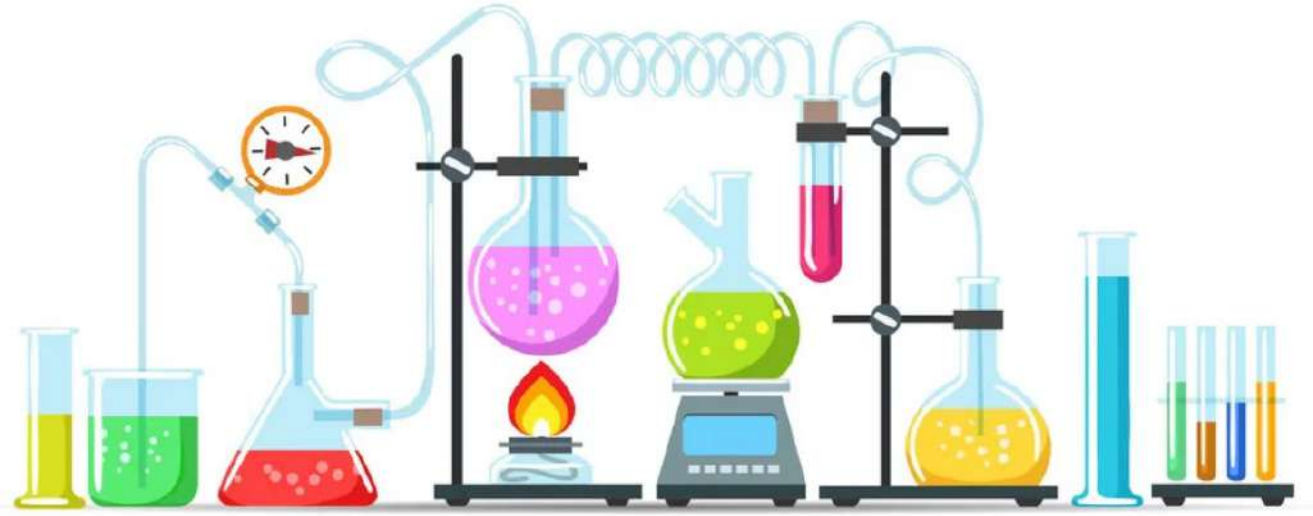
Verb in agreement with its subject.

1. Is, are
2. Make
3. Is
4. Are
5. Is
6. Is
7. Has
8. Is
9. Are
10. Is

SCIENCE

(Chemistry)

Chapter 1: Chemical Reactions and Equations

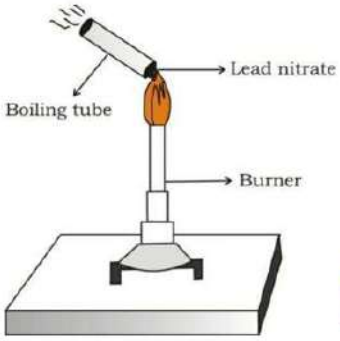


Chemical Reactions and Equations

Chemical Reactions:A chemical reaction occurs when one or more reactants (also known as reactants) are changed into one or more products (also known as products). The constituent atoms of the reactants are rearranged in a chemical reaction, resulting in the formation of various substances as products.

A change that results in the formation of one or more new compounds. Chemical changes are also known as chemical reactions.

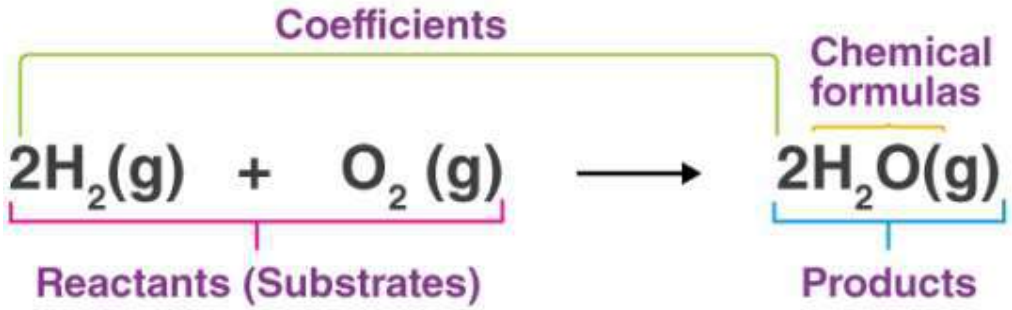
- A substance is said to undergo a chemical change when the chemical properties of a substance alter. As a result, there is either formation or breaking of atomic bonds at the molecular level. Some characteristics of a chemical change are:
  - New substances are produced during a chemical reaction.
  - Changes in energy are involved.
  - During the reaction, there occurs a change in mass.
  - There is a permanent alteration.



Examples:

- Cooking of food
- Rusting of iron
- Heating of Lead nitrate
- Souring of milk
- Ripening of fruit.

Chemical Equation



Writing Chemical Equations

- In a chemical reaction, the reactants are written on the left hand side and the products on the right hand side of the equation.
- An arrow (→) pointing towards the products is inserted between the reactants and the products. It also represents the direction of the reaction.
- A plus sign (+) is inserted between two or more reactants or products formed.
- If reactions are carried out under specific conditions of temperature, pressure, catalyst etc., then these conditions are mentioned on the arrow.
- The chemical equation can be made more informative by mentioning the physical states of the reactants and products.

Balancing the Chemical Equations

- In a balanced chemical equation, the total number of atoms of each element of the reactants on the left hand side of the equation is equal to the number of atoms of the products formed on the right hand side of the equation.
- The total mass of the reactants is equal to the total mass of the products or the number of atoms of each element before the reaction and after the reaction is equal.

Steps Involved in Balancing a Chemical Equation

Consider the chemical reaction between magnesium and oxygen to understand the steps involved in balancing a chemical equation.

Step1

Let us first write the word equation for this reaction.

Magnesium + Oxygen → Magnesium oxide

Step2

Write the chemical equation for the reaction between magnesium and oxygen.

$Mg + O_2 \rightarrow MgO$

Step 3

Count the number atoms of an element occurring on both L.H.S. and R.H.S. in this equation.

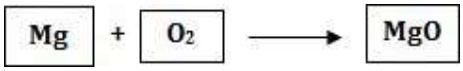
Mg + O2 → MgO

Component	Reactant	Product
Magnesium	1	1
Oxygen	2	1

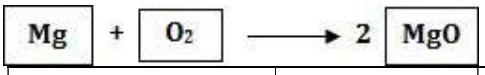
This is an unbalanced equation.

Step 4

- To balance a chemical equation, first draw boxes around each formula. Do not change anything inside the boxes while balancing theequation.



- Choose a reactant or a product which has the maximum number of atoms in it. In that compound, select the element which has the maximum number of atoms. In this equation we shall select MgO i.e. magnesium oxide and the element oxygen init.
- To balance the oxygen atoms, let us multiply magnesium oxide molecule by 2 on the right hand side. The equation can now be expressedas,



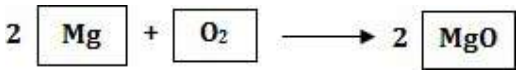
Component	Reactant	Product
Magnesium	1	1 × 2 = **2**
Oxygen	2	1 × 2 = **2**

Step 5

There are two oxygen atoms on either side of the equation but one magnesium atom on the reactant's side and two on the product's side. Therefore, multiply the magnesium atom by 2 on the left handside.

Component	Reactant	Product
Magnesium	1 × 2 = **2**	2
Oxygen	2	2

Balanced equation is,



∴ The number of atoms of each element of reactants = The number of atoms of each element of products

Types of Chemical Reactions

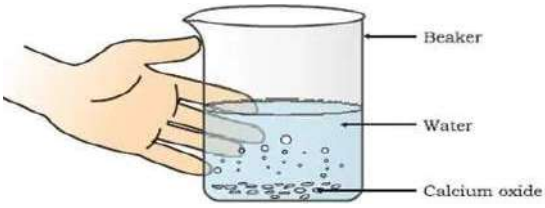
1. Combination Reaction

When two or more substances combine to form a single product, the reaction is known as a combination reaction.

For example:

In the laboratory, iron sulphide is prepared by mixing iron and sulphur.

$Fe_{(s)} + S_{(s)} \rightarrow FeS(s)$

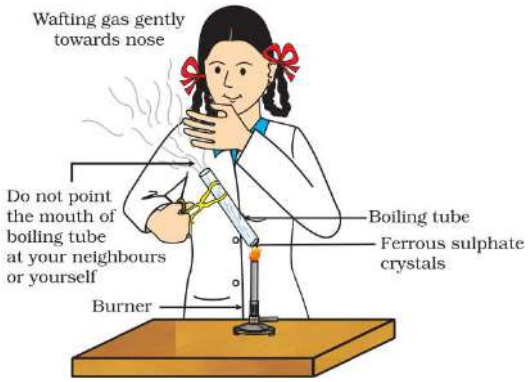


Formation of slaked lime by the reaction of calcium oxide with water

- **Endothermic Reaction**: The reactions accompanied by the absorption of heat are called endothermic reactions.
- **ExothermicReaction**:The reactions accompanied by the evolution of heat are called endothermic reactions.

2. Decomposition Reaction

A chemical reaction in which a single compound splits into two or more simple substances is called a decomposition reaction.



Correct way of heating the boiling tube containing crystals of ferrous sulphate and of smelling the odour

For example:

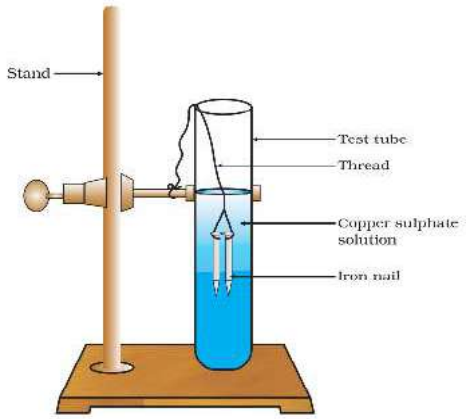
When mercuric oxide is heated in a crucible, the orange-red powder begins to darken and a silver mirror begins to deposit on the cooler parts of the crucible.

$$\underset{\text{Mercuric oxide}}{2HgO_{(s)}} \xrightarrow{\text{Heat}} \underset{\text{Mercury}}{2Hg_{(s)}} + \underset{\text{Oxygen}}{O_2 \uparrow}$$

- **Thermal Decomposition Reaction**: The decomposition reactions carried out by heating are known as thermal decomposition reactions.
- **Photochemical reaction:** The chemical reactions which proceed with the absorption of light energyare called photochemical reactions.

3. Displacement Reaction

Reactions in which the more reactive element displaces the less reactive element from its compound are called displacement reactions.



Iron nails dipped in copper sulphate solution

For example:

Zinc displaces copper in copper sulphate to form zinc sulphate.

$Zn_{(s)}$ + $CuSO_4$ (aq) → $ZnSO_{4\,(aq)}$ + $Cu_{(s)}$

Zinc Copper sulphate Zinc sulphate Copper

4. Double Displacement Reaction

Reactions in which ions of the reactants exchange places to form two new compounds, are called double displacement reactions.

For example:Sodium hydroxide reacts with hydrochloric acid to form sodium chloride and water.

$NaOH_{(aq)}$ + $HCl_{(aq)} \longrightarrow$ $NaCl_{(aq)}$ + $H2O_{(l)}$

Types of Double Displacement Reactions:

A. Precipitation

In all of the following processes, a white material is generated that is insoluble in water. A precipitate is the insoluble substance that forms. A precipitation reaction is a reaction that results in the formation of a precipitate.

B. Neutralization

The reactants are a base and an acid, and the products are salt and water. Neutralization is a form of double displacement reaction in which the reactants are a base and an acid, and the products are salt and water. The positive charge of the acid's hydrogen ion and the negative charge of the base's hydroxyl ions or oxide ions lose their electrical charge and form covalent water molecules.

$Na^+OH^- + H^+Cl^- \longrightarrow Na^+Cl^- + H_2O$

Base Acid Salt Water

$Zn_2{+}O_2{-} + 2H{+}NO_3^- \longrightarrow Zn_2^+(NO_3)_2^- + H_2O$

A neutralization reaction is basically a reaction between H+ and OHions i.e.,

$H^+_{(aq)} + OH^-_{(aq)} \longrightarrow H_2O_{(l)}$

5. Oxidation - Reduction Reactions/Redox Reactions

Oxidation and reduction take place simultaneously.

Reactions which involve the addition of oxygen, or the removal of hydrogen are called **oxidation reactions**. For example:

$C_{(s)} + 2H_{2\,(g)} \longrightarrow CH_{4\,(g)}$

Chemical reactions in which the reactants gain hydrogen are **reduction reactions**. For example:

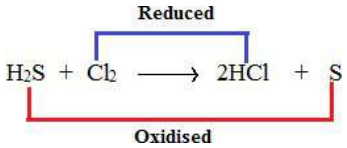
$Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2\uparrow$

Ferric oxide Carbon monoxide Iron Carbon dioxide

- **Oxidising agent**: a substance that oxidises another substance and self-gets reduced.
- **Reducing agent:** a substance that reduces another substance and self-gets oxidised.

Redox Reaction

The chemical reaction in which oxidation and reduction takes place simultaneously is known as a redox reaction.



Corrosion

The slow process of decay and destruction of metals due to the action of air, moisture or acids is called corrosion.

For example:

Iron combines with oxygen present in the air, in the presence of water, to form a red-brown flaky substance called **rust**. This process is commonly called the **rusting of iron.**

The chemical formula of rust is $Fe_2O_3. \times H_2O$.

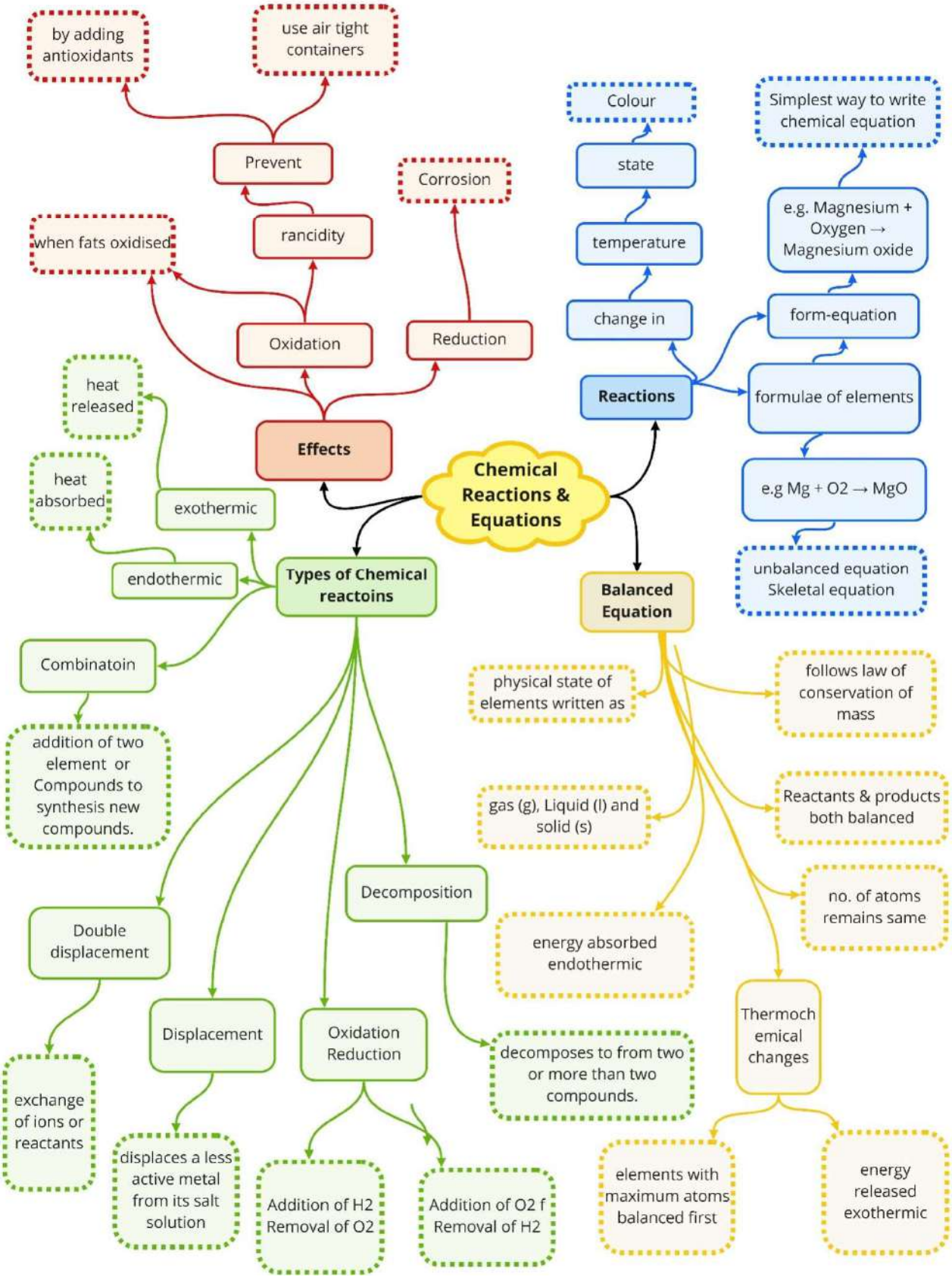
Prevention of Corrosion

- Corrosion damages buildings, bridges, ships, automobiles and other articles made of iron. Hence, prevention of corrosion is necessary. This will not only save money but can also prevent the occurrence of accidents.
- It can be prevented by processes like galvanising and electroplating with other metals.

Rancidity

- Oils and fats react with oxygen and get oxidised or turn rancid. This process is called rancidity.
- Rancidity can be prevented by keeping food in air tight containers or by using antioxidants.
- Antioxidants are used to prevent oxidation of food containing fats and oils.
- Storage of food in air tight containers also decelerates oxidation.

Class : 10th Chemistry
Chapter-1: Chemical Reactions & Equations



Important Questions

➢ Multiple Choice Questions:

1. Which of the following is a displacement reaction?

(a) $MgCO_3 \longrightarrow MgO + CO_2$
(b) $2Na + 2H_2O \longrightarrow 2NaOH + H_2$
(c) $2H_2 + O_2 \longrightarrow 2H_2O$
(d) $2Pb(NO_3)_2 \xrightarrow{Heat} 2PbO + 4NO_2 + O_2$

2. Magnesium ribbon is rubbed before burning because it has a coating of

(a) basic magnesium carbonate
(b) basic magnesium oxide
(c) basic magnesium sulphide
(d) basic magnesium chloride

3. Which of the following statements about the given reaction are correct?

$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$

(i) Iron metal is getting oxidized
(ii) Water is getting reduced
(iii) Water is acting as reducing agent
(iv) Water is acting as oxidizing agent

(a) (i), (zi) and (iii)
(b) (in) and (iv)
(c) (i), (ii) and (iv)
(d) (ii) and (iv)

4. Which of the following are exothermic processes?

(i) Reaction of water with quick lime
(ii) Dilution of an acid
(iii) Evaporation of water
(iv) Sublimation of camphor (crystals)

(a) (i) and (ii)
(b) (ii) and (iii)
(c) (i) and (iv)
(d) (ii) and (iv)

5. Oxidation is a process which involves

(a) addition of oxygen
(b) addition of hydrogen
(c) removal of oxygen
(d) removal of hydrogen

6. The process of reduction involves

(b) addition of hydrogen
(c) removal of oxygen
(d) removal of hydrogen

7. Three beakers labelled as A, B and C each containing 25 ml of water were taken. A small amount of NaOH, anhydrous $CuSO_4$ and NaCl were added to the beakers A, B and C respectively. It was observed that there was an increase in the temperature of the solution contained in beakers A and B, whereas in case of beaker C, the temperature of the solution falls. Which one of the following statement(s) is (are) correct?

(i) In beakers A and B, exothermic process has occurred.
(ii) In beakers A and B, endothermic process has occurred.
(iii) In beaker C exothermic process has occurred.
(iv) In beaker C endothermic process has occurred.

(a) (i) only
(b) (ii) only
(c) (i) and (iv)
(d) (iv), (ii) and (iii)

8. Give the ratio in which hydrogen and oxygen are present in water by volume.

(a) 1:2
(b) 1:1
(c) 2:1
(d) 1:8

9. Which among the following statement(s) is (are) true?

Exposure of silver chloride to sunlight for a long duration turns grey due to

(i) the formation of silver by decomposition of silver chloride
(ii) sublimation of silver chloride
(iii decomposition of chlorine gas from silver chloride
(iv) oxidation of silver chloride

(a) (i) only
(b) (i) and (iii)
(c) (ii) and (iii)
(d) (iv) only

10. $MnO_2 + 4HCl \rightarrow 2 + 2H_2O + Cl_2$

Identify the substance oxidized in the above equation.

(a) $MnCl_2$
(b) HCl
(c) H_2O
(d) MnO_2

➢ Very Short Question:

1. How does the food become rancid?
2. A student burnt a metal A found in the form of ribbon. The ribbon burnt with a dazzling flame and a white powder B was formed which was basic in nature. Identify A and B. Write the balanced chemical equation.
3. What is a balanced chemical equation?
4. Write a balanced equation for a chemical reaction that can be characterized as precipitation.
5. What is rust?
6. A zinc rod is left for nearly 20 minutes in a copper sulphate solution. What change would you observe in the zinc rod?
7. Name two salts that are used in black and white photography.
8. Which chemical process is used for obtaining a metal from its oxide?
9. If you collect silver coins and copper coins you may have seen that after some days a black coating forms on silver coins and a green coating on copper coins. Which chemical phenomenon is responsible for these coatings? Write the chemical name of the black and green coatings.
10. When carbon dioxide is passed through lime water, it turns milky, why?

➢ Short Questions:

1. You are given the following materials

(i) Marble chips (ii) dilute hydrochloric acid (iii) Zinc granules

Identify the type of reaction when marble chips and zinc granules are added separately to acid taken in two test tubes.

2. What do you understand by precipitation reaction? Explain with suitable examples.

3. What happens when aqueous solutions of sodium sulphate and barium chloride are mixed? What type of reaction is it?

4. Explain the following terms with suitable examples.

(a) Oxidation

(b) Reduction

5. Complete the missing components/variables given as x and y in the following reactions.

(a) $Pb(NO_3)_2$ (aq) + 2KI (aq) → PbI_2 (x) + $2KNO_3$ (y)

(b) Cu (s) + $2AgNO_3$ (aq) → $Cu(NO_3)_2$ (aq) + x (s)

(c) Zn (s) + H_2SO_4 (aq) → $ZnSO_4$ (x) + H_2 (y)

6. An iron knife kept dipped in a blue copper sulphate solution turns the blue

solution light green. Why?

7. A, B and C are three elements which undergo chemical reactions in the following way.

$A_2O_3 + 2B \rightarrow B_2O_3 + 2A$

$3CSO_4 + 2B \rightarrow B_2(SO_4)_3 + 3C$

$3CO + 2A \rightarrow A_2O_3 + 3C$

Answer the following:

(a) Which element is most reactive?

(b) Which element is least reactive?

8. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.

(a) Nitrogen gas is treated with hydrogen gas in the presence of a catalyst at 773 K to form ammonia gas.

(b) Sodium hydroxide solution is treated with acetic acid to form sodium acetate and water.

(c)Ethanol is warmed with ethanoic acid to form ethyl acetate in the presence of concentrated H_2SO_4.

(d) Ethene is burnt in the presence of oxygen to form carbon dioxide, water and releases heat and light.

➢ LongQuestions:

1. Balance the following equations:

(a) $Bacl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

(b) $CH_4 + O_2 \rightarrow CO_2 + H_2O$

(c) $FeSO_4 \xrightarrow{\Delta} Fe_2O_3 + SO_2 + SO_3$

(d) $Pb(NO_3)_2 \xrightarrow{\Delta} PbO + NO_2 + O_2$

(e) $KClO_3 \xrightarrow{\Delta} KCl + O_2$

2. On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed.

(a) Write a balanced chemical equation of the reaction.

(b) Identify the brown gas X evolved.

(c) Identify the type of reaction.

(d) What could be the pH range of aqueous solution of the gas X?

$$(a)\ CaCO_3(s) \xrightarrow{Heat} CaO(s) + CO_2(g)$$

$$(b)\ CaO(s) + H_2O(l) \xrightarrow{Heat} Ca(OH)_2\ (aq)$$

(c) $Zn(s) + H_2SO_4(ag) \rightarrow ZnSO_4(aq) + H_2(g)$

(B) "A solution of potassium chloride when mixed with silver nitrate solution, and an insoluble white substance is formed".

(i) Translate the above statement into a chemical equation.

(ii) State two types for the classification of this reaction.

➢ Assertion Reason Questions:

1. For two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

   a. Both A and R are true, and R is correct explanation of the assertion.
   b. Both A and R are true, but R is not the correct explanation of the assertion.
   c. A is true, but R is false.
   d. A is false, but R is true.

Assertion: Silver articles become black after sometime when exposed to sunlight.

Reason: It is because silver reacts with carbonates present in the air.

2. For two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

   a. Both A and R are true, and R is correct explanation of the assertion.
   b. Both A and R are true, but R is not the correct explanation of the assertion.
   c. A is true, but R is false.
   d. A is false, but R is true.

Assertion: A lead nitrate on thermal decomposition gives lead oxide, brown coloured nitrogen dioxide and oxygen gas.

Reason: Lead nitrate reacts with potassium iodide to form yellow ppt. of lead iodide and the reaction is double displacement as well as precipitation reaction.

➢ Case Study Questions:

1. Read the following and answer any four questions from (i) to (v).

Oxidation has damaging effect on metals as well as on food. The damaging effect of oxidation on metal is studied as corrosion and that on food is studied as rancidity. The phenomenon due to which metals are slowly eaten away by the reaction of air, water and chemicals present in atmosphere, is called corrosion. For example, iron articles are shiny when new, but get coated with a reddish-brown powder when left for some time. This process is known as rusting of iron. Rancidity is the process of slow oxidation of oil

and fat (which are volatile in nature) present in the food materials resulting in the change of smell and taste in them.

i. Rancidity can be prevented by:

a. Adding antioxidants.
b. Packaging oily food in nitrogen gas.
c. Both (a) and (b).
d. None of these.

ii. Combination of phosphorus and oxygen is an example of:

a. Oxidation.
b. Reduction.
c. Rancidity.
d. None of these.

iii. A science teacher wrote the following statements about rancidity:

I. When fats and oils are reduced, they become rancid.
II. ln chips packet, rancidity is prevented by oxygen.
III. Rancidity is prevented by adding antioxidants.

Select the correct option.

a. (I) only
b. (II) and (III) only
c. (III) only
d. (I), (II) and (III)

iv. Two statements are given below regarding rusting of iron.

I. The rusting of iron is a redox reaction and reaction occurs as, $4Fe + 3O_2 \rightarrow 4Fe^{3+} + 6O^{2-}$
II. The metallic iron is oxidised to Fe^{2+} and O_2 is reduced to O^{2-}.

Select the correct statement(s).

a. I only.
b. II only.
c. Both I and II.
d. None of these.

v. Which of the following measures can be adopted to prevent or slow down rancidity?

I. Food materials should be packed in airtight container.
II. Food should be refrigerated.
III. Food materials and cooked food should be kept away from direct sunlight.

a. Only II and III.
b. Only I and III.
c. Only II and III.

d. I, II and III.

2. Read the following and answer any four questions from (i) to (v).

Chemical equation is a method of representing a chemical reaction with the help of symbols and formulae of the substances involved in it. ln a chemical equation, the substances which combine or react are called reactants and new substances produced are called products. A chemical equation is a shorthand method of representing a chemical reaction. A balanced chemical equation has equal number of atoms of different elements in the reactants and products side. An unbalanced chemical equation has unequal number of atoms of one or more elements in reactants and products. Formulae of elements and compounds are not changed to balance an equation.

i. Consider the following reaction:

$pMg_3N_2 + qH_2O \rightarrow rMg(OH)_2 + sNH_3$

When the equation is balanced, the coefficients p, q, r, s respectively are:

a. 1, 3, 3, 2
b. 1, 6, 3, 2
c. 1, 2, 3, 2
d. 2, 3, 6, 2

ii. Which of the following information is not conveyed by a balanced chemical equation?

a. Physical states of reactants and products.
b. Symbols and formulae of all the substances involved in a particular reaction.
c. Number of atoms/ molecules of the reactants and products formed.
d. Whether a particular reaction is actually feasible or not.

iii. The balancing of chemical equations is in accordance with:

a. law of combining volumes.
b. law of constant proportions.
c. law of conservation of mass.
d. both (b) and (c).

iv. Which of the following chemical equations is an unbalanced one?

a. $2NaHCO_3 \rightarrow Na2CO_3 + H_2O + CO_2$
b. $2C_4H_{10} + 12O_2 \rightarrow 8CO_2 + 10H_2O$
c. $2Al + 6H_2O \rightarrow 2Al(OH)_3 + 3H_2$
d. $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

v. Which of the following statements is/ are correct?

a. A chemical equation tells us about the substances involved in a reaction.
b. A chemical equation informs us about the symbols and formulae of the substances involved in a reaction.
c. A chemical equation tells us about the atoms or molecules of the reactants and products involved in a reaction.
d. All the above

✓ Answer Key-

➢ Multiple Choice Answers:

1. (b)
2. (a) basic magnesium carbonate
3. (c) (i), (ii) and (iv)
4. (a) (i) and (ii)
5. (a) addition of oxygen
6. (b) addition of hydrogen
7. (c) (i) and (iv)
8. (a) 1:2
9. (a) (i) only
10. (d) MnO_2

➢ Very Short Answers:

1. Answer: Food becomes rancid when fat and oils present in the food are oxidized.
2. Answer: X = Mg, Y = MgO, $Mg + O_2 \rightarrow 2MgO$
3. Answer: An equation that has equal number of atoms of each element on both the sides of the equation is called a balanced chemical equation, i.e., mass of the reactants is equal to mass of the products.
4. Answer: $BaCl_2(aq) + Na_2SO_4\ (aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$
5. Answer: It is a brown mass known as hydrated ferric oxide. Its formula is $Fe_2O_3.xH_2O$.
6. Answer: The zinc rod will change into zinc sulphate.
7. Answer: Both silver chloride and silver bromide are used in black and white photography.
8. Answer: The process is known as the reduction of metal oxide.
9. Answer: Corrosion is responsible for the formation of this coating. Black coating is due to formation of Ag_2S and green coating is due to formation of $CuCO_3.Cu(OH)_2$.
10. Answer: Lime water (calcium hydroxide) combines with carbon dioxide to form a suspension of calcium carbonate which makes lime water milky.

    $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

➢ Short Answer:

1. Answer:

(i) Marble chips react with dilute hydrochloric acid to form calcium chloride and carbon dioxide. It is a double displacement reaction.

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

(ii) Zinc granules react with dilute hydrochloric acid to give hydrogen gas. It is a displacement reaction.

$Zn\ (s) + 2HCl \rightarrow ZnCl_2\ (aq) + H_2\ (g)$

2. Answer:

The reaction in which two compounds in their aqueous state react to form an insoluble compound. When two reactants react and product formed remains insoluble and settles as a solid it is substance (precipitate) is called a precipitation reaction.

For example,

(i) When aqueous solution of sodium sulphate is mixed with an aqueous solution or barium chloride, barium sulphate is obtained as a white precipitate.

$Na_2SO_4\ (aq) + BaCl_2\ (aq) \rightarrow BaSO_4\ (s) + 2NaCl\ (ag)$

(ii) When aqueous solution of sodium chloride is mixed with an aqueous solution of silver nitrate, silver chloride is obtained as a white precipitate.

3. Answer:

On mixing the solutions of sodium sulphate and barium chloride, a white precipitate of barium sulphate is obtained.

$$\underset{\text{Sodium sulphate}}{Na_2SO_4(aq)} + \underset{\text{Barium chloride}}{BaCl_2(aq)} \longrightarrow \underset{\text{Barium sulphate}}{BaSO_4(s)} + \underset{\text{Sodium chloride}}{2NaCl(aq)}$$

It is a double displacement reaction.

4. Answer:

(a) Oxidation is a process of addition of oxygen to a substance or removal of hydrogen from a substance, for example,

$$2Cu + O_2 \xrightarrow{\Delta} 2CuO$$

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Copper is oxidized to CuO, as oxygen is added to copper.

(b) It is the process of removal of oxygen from a substance or addition of hydrogen to a substance, for example,

$$CuO + H_2 \xrightarrow{\Delta} Cu + H_2O$$

Copper oxide is reduced to copper as it involves removal of oxygen.

5. Answer:

(a) x = (s), y = (aq)

(b) x = 2Ag

(c) x = (aq); y = (g)

(d) x = heat

6. Answer:

We know that iron is more reactive than copper, so it displaces copper from copper sulphate solution and forms ferrous sulphate which is of light green colour.

$$\underset{\text{Blue colour}}{CuSO_4(aq)} + Fe(s) \longrightarrow \underset{\text{Light green colour}}{FeSO_4(aq)} + Cu(s)$$

7. Answer:

(a) The most reactive element is 'B'. It has displaced both 'A' and 'C' from their compounds.

(b) The least reactive element is 'C' as it has been displaced by both 'A' and 'B'.

8. Answer:

$$(a)\ N_2(g) + 3H_2(g) \xrightarrow[773\ K]{\text{Catalyst (pt)}} 2NH_3(g),\ \text{Combination reaction}$$

$$(b)\ KOH(aq) + \underset{\text{Acetic acid}}{CH_3COOH(aq)} \longrightarrow \underset{\text{Potassium acetate}}{CH_3COOK(aq)} + H_2O(l)$$

Double displacement or neutralisation reaction

$$(c)\ \underset{\text{Ethanol}}{C_2H_5OH(l)} + \underset{\text{Ethanoic acid}}{CH_3COOH(l)} \xrightarrow{H_2SO_4\,(conc)} \underset{\text{Ethyl ethanoate}}{CH_3COOC_2H_5(l)} + H_2O(l)$$

Double displacement reaction

$$(d)\ \underset{\text{Ethene}}{C_2H_4(g)} + 3O_2(g) \longrightarrow 2CO_2(g) + 2H_2O(g) + \text{heat} + \text{light}$$

Combustion or redox reaction

➢ Long Answer:

1. Answer:

(a) $Bacl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

(b) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

$$(c)\ 2FeSO_4 \xrightarrow{\Delta} Fe_2O_3 + SO_2 + SO_3$$

$$(d)\ 2Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + 4NO_2 + O_2$$

$$(e)\ 2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$$

2. Answer:

(a) $\underset{\text{Copper (II) nitrate}}{2Cu(NO_3)_2} \xrightarrow{\text{Heat}} \underset{\substack{\text{Copper (II) oxide}\\\text{(Black)}}}{2CuO} + O_2 + \underset{\text{(Brown gas)}}{4NO_2}$

(b) Brown gas X is nitrogen dioxide (NO_2).

(c) It is a thermal decomposition reaction.

(d) The gas (NO_2) is an oxide of a non-metal. Hence, its aqueous solution will be acidic, i.e., pH range would be between 0 and 7.

3. Answer:

(A) (a) Decomposition reaction

(b) Combination reaction

(c) Displacement reaction.

(B) (i) KCl (aq) + $AgNO_3$ (aq) → AgCl (s) + KNO_3 (aq)

(ii) It is a double displacement reaction also called precipitation reaction.

➢ Assertion Reason Answer:

1. Answer:

c. A is true, but R is false.

Silver reacts with sulphur present in the air and form the layer of silver sulphide therefore silver articles get tarnished.

2. Answer:

d. Both A and R are true, but R is not the correct explanation of the assertion.

Explanation:

Decomposition reaction is a reaction in which a compound breaks down into two or more simpler substances.

2Pb(NO3)2 → 2Pb0 + 4NO2 + O2

➢ Case Study Answer:

1. Answer:

i. (c) Both (a) and (b).

Explanation:

Antioxidants and nitrogen gas prevent oxidation of food.

ii. Oxidation.

Explanation:

$4P + 3O_2 \rightarrow 2P_2O_3$

$4P + 5O_2 \rightarrow 2P_2O_5$

iii. (c) (III) only

Explanation:

The oils and fats are slowly oxidised to certain bad smelling compounds, which release foul smell. This is known as rancidity. Rancidity is prevented by filling nitrogen gas in chips packets.

iv. Only II and III.

v. (d) I, II and III.

2. Answer:

i. (b) 1, 6, 3, 2

Explanation:

$Mg_3N_2 + 6H_2O$- $3Mg(OH)_2 + 2NH_3$

i. (d) Whether a particular reaction is actually feasible or not.

ii. (c) law of conservation of mass.

Explanation:

In a balanced chemical equation, total mass of reactants must be equal to the total mass of products. This is the statement of law of conservation of mass.

iv. (b) $2C_4H_{10} + 12O_2 \rightarrow 8CO_2 + 10H_2O$

v. (d) All the above.

TEXTUAL QUESTIONS

Q1. Why should a magnesium ribbon be cleaned before burning in air?

Ans. The magnesium ribbon which we use usually has a coating of basic magnesium carbonate on its surface. It is formed by the slow action of moist air on it. Basic magnesium carbonate is a mixture of magnesium hydroxide. Therefore, before burning in air, the magnesium ribbon is caleaned by rubbing with a sand paper for removing the protective layer of basic magnesium carbonate from the surface of magnesium ribbon so that it may readily combine with the oxygen of air on heating.

Q2. Write the balanced equation for the following chemical reactions:

(i) Hydrogen + Chlorine → Hydrogen chloride

(ii) Barium chloride + Aluminium sulphate →

Barium sulphate + Aluminium chloride

(iii) Sodium + water → Sodium hydrxide + Hydrogen.

Ans. (i) H_2 (g) + Cl_2 (g) → 2HCl (g)

(ii) $3BaCl_2$ (aq) + Al_2 $(SO_4)_3$ (aq) → $3BaSO_4$ (s) + $2AlCl_3$ (aq)

(iii) 2Na (s) + $2H_2O$ (l) → 2NaOH (aq) + H_2 (g)

Q3. Write a balanced chemical equation with state symbols for the following reaction.

(i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.

(ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.

Ans. (i) Barium chloride + Sodium sulphate → Barium sulphate + Sodium chloride

$BaCl_2$ (aq) + Na_2SO_4 (aq) → $BaSO_4$ (s) + 2 NaCl (aq)

(ii)Sodium hydroxide + Hydrochloric acid → Sodium chloride + Water

NaOH (aq) + HCl (aq) → NaCl (aq) + H_2O (l)

Q4. A solution of a substance 'X' is used for white washing

(i) Name the substance 'X' and write its formula

Ans.(i) The substance 'X' used for white washing is quick lime (calcium oxide). The formula is CaO.

(ii) When quick lime is mixed with water, the following reaction takes place:

$$\underset{\text{Quick lime (Calcium oxide)}}{CaO\ (s)} + \underset{\text{Water}}{H_2O\ (l)} \rightarrow \underset{\text{Calcium hydroxide (Slaked lime)}}{Ca(OH)_2\ (aq)}$$

Q5. Why is double the amount of gas collected in one of the test tubes on electrolysis of water experiment? Name this gas.

Ans. The gas which is collected in double the amount in the electrolysis of water experiment is hydrogen. This is because water (H_2O) contains two parts of hydrogen element as compared to only one part of oxygen element.

$$2H_2O\ (l) \xrightarrow{\text{Electric current}} 2H_2\ (g) + O_2\ (g)$$

Q6. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

Ans. Iron is more reactive than copper. it displaces copper from copper sulphate solution according to the following reaction:

$$\underset{\text{Iron}}{Fe\ (s)} + \underset{\text{copper sulphate}}{CuSO_4\ (aq)} \rightarrow \underset{\text{iron (II) sulphate}}{FeSO_4\ (aq)} + \underset{\text{Copper}}{Cu\ (s)}$$

Thus, as copper sulphate reacts to form iron (II) sulphate, the blue of copper sulphate solution fades.

Q7. Give an example of a double displacement reaction other than the one between barium chloride and sodium sulphate solutions.

Ans. $\underset{\text{Silver nitrate}}{AgNO_3\ (aq)} + \underset{\text{sodium chloride}}{NaCl\ (aq)} \rightarrow \underset{\text{silver chloride}}{AgCl\ (s)} + \underset{\text{sodium nitrate}}{NaNO_3\ (aq)}$

Q8. Identify the substances oxidized and the substances reduced in the following reactions:

(i) $4Na\ (s) + O_2\ (g) \rightarrow 2Na_2O\ (s)$

(ii) $CuO\ (s) + H_2\ (g) \rightarrow Cu\ (s)\ H_2O\ (l)$

Ans. (i) In this reaction, sodium (Na) is changed into sodium oxide (Na2O). This is the addition of oxygen to sodium. Since addition of oxygen is called oxidation, therefore, the substance oxidized is sodium (Na).

Oxygen (O_2) is changed into Na_2O. Here, the addition of metal to oxygen takes place. So the substance reduced is oxygen.

(ii) Here, copper oxide is reduced to copper metal whereas hydrogen is oxidized to water.

Q9. When you mix the solutions of lead (II) nitrate and potassium iodide

(i) What is the colour of the precipitate formed? Name the compound precipitated.

(ii) Write the balanced chemical equation for this reaction.

(iii) Is this also a double displacement reaction?

Ans. (i) Colour of the precipitate formed is yellow. The compound precipitated is lead iodide PbI_2.

(ii) $\underset{\text{Lead (II) nitrate}}{Pb(NO_3)_2\ (aq)} + \underset{\text{Potassium iodide}}{2KI\ (aq)} \rightarrow \underset{\text{Lead iodide}}{PbI_2\ (s)} + \underset{\text{Potassium nitrate.]}}{2KNO_3\ (aq)}$

(iii) Yes, it is a double displacement reaction.

Q10. Which of the statements about the reaction below are incorrect?

2PbO (s) + C (s) → 2Pb (s) + CO2 (g)

(a): Lead is getting reduced.

(b): Carbon dioxide is getting oxidized.

(c): Carbon is getting oxidized.

(d): Lead oxide is getting reduced

(i) a and b **(ii) a and c**

(iii) a, b and c **(iv) all**

Ans. The incorrect statements are:

(a) Lead is getting reduced (b) carbon dioxide is getting oxidized.

Hence, (i) is the correct answer.

Q11. Fe2O3 + 2 Al → Al2O3 + 2Fe

The above reaction is an example of

(a) Combination reaction.

(b): Double displacement reaction.

(c): Decomposition reaction

(d): Displacement reaction

Ans. The given equation is a displacement reaction in which Fe of Fe_2O_3 has been displaced by Al

Hence, (d) is the correct answer.

Q12. What happens when dilute hydrochloric acid is added to iron filings? Choose the correct answer.

(a): Hydrogen gas and iron chloride are produced.

(b): Chlorine gas and iron hydroxide are produced. (c): No reaction takes place.

(d): Iron salt and water are produced.

Ans. The following reaction takes place:

$$Fe + 2HCl \rightarrow FeCl_2 + H_2$$

Iron hydrochloric acid iron chloride hydrogen.

Thus, hydrogen and iron chloride are produced. Therefore, (a) is the correct answer.

Q13.What is a balanced chemical equation? Why should the chemical equation be balance?

Ans. A balance chemical equation is one which contains an equal number of atoms of each element on both sides of the equation. For example,

$$2H_2 + O_2 \rightarrow 2H_2O$$

According to the law of conservation of mass, matter can neither be created nor destroyed in a chemical reaction. During a chemical reaction, the total mass of reactants and products remain the same. Hence, in a chemical reaction, the number of atoms of the various elements on both sides should be equal. Therefore, a chemical equation is to be balanced in accordance with the law of conservation of mass.

Q14.Translate the following statements into chemical equations and then balance them.

(a): Hydrogen gas combines with nitrogen to form ammonia.

(b): Hydrogen sulphide gas burns in air to give water an dsulphur dioxide.

(c): Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

(d): Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

Ans. (a): $3H_2(g) + N_2(g) \rightarrow 2NH_3(g)$

(b): $2H_2S(g) + 3O_2(g) \rightarrow 2H_2O(l) + 2SO_2(g)$

(c): $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 2AlCl_3 + 3BaSO_4$

(d): $2K + 2H_2O \rightarrow 2KOH + H_2$

Q15. Balance the following chemical equations.

(a): $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$ (b): $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

(c): $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$ (d): $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

Ans. (a): $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$

(b): $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

(c): $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(d): $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$.

Q16. Write the balanced chemical equation for the following reactions.

(a): Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water.

(b): Zinc + Silver nitrate → Zinc nitrae + Silver.

(c): Aluminium + Copper chloride → Aluminium chloride + Copper.

(d): Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride.

Ans. (a) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

(b): $Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$

(c): $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

(d): $BaCl_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$.

Q17. Write the balanced chemical equation for the following and identify the type of reaction in each case.

(a): Potassium bromide (aq) + Barium iodide (aq)→Potassium iodide (aq) Barium bromide (s)

(b): Zinc carbonate (s) → Zinc oxide (s) + Carbon dioxide (g).

(c): Hydrogen (g) Chlorine (g) → Hydrogen chloride (g)0

(d): Magnesium (s) + Hydrochloric acid (aq) Magnesium chloride (aq) + Hydrogen (g)

Ans. (a): $2KBr(aq) + BaI_2(aq) \rightarrow 2KI(aq) + aBr_2(s)$; Double displacement reaction.

(b): $ZnCO_3(s) \rightarrow ZnO(s) + CO_2(g)$ Decomposition reaction

(c): $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$ Combination reaction.

(d): $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$; Displacement reaction.

Q18. What does one mean by exothermic and endothermic reactions? Give example.

+ heat sign on the right hand side of the equation for example,
$CaO + 2H_2O \rightarrow Ca(OH)_2 + H_2 + Heat$.
Endothermic reaction: In this reaction heat is absorbed which is indicated by putting + heat sign on the left hand side of the equation.
For example:
$N_2(g) + 3H_2(g) + Heat \rightarrow 2NH_2(g)$.

Q19. Why is respiration considered as an exothermic reaction? Explain.

Ans. Rice, potatoes and bread contain carbohydrates. During digestion, these carbohydrated are broken down into simpler substances called glucose. This glucose combines with oxygen in the cells of our body and provides energy. the special name of this reaction is respiration. Thus respiration is an exothermic process because energy is produced during this process.
$C_6H_{12}O6(aq) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l) + Energy$

Q20. Why are decomposition reactions called the opposite of combination reactons? Write equations for these reactions.

Ans. In a combination reaction, two or more substances combine to form a single product. Also, a large amount of heat is evolved.
The decomposition reactions require energy either in the form of heat, light or electricity for breaking down the reactants.
$N_2 + 3H_2 \rightarrow 2NH_3 + Heat$ Combination
$2NH_3 + Heat \rightarrow N_2 + 3H_2$ Decomposition (thermal)

Q21. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

Ans. Decomposition reaction involving absorption of heat
$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$
Calcium carbonate — Calcium oxide — Carbon dioxide
Decomposition reaction involving absorption of light
$2AgCl(s) \rightarrow 2Ag(s) + Cl_2(g)$
Silver chloride — Silver — Chlorine
Decomposition reaction involving absorption of electrical energy
$2H_2O(l) \xrightarrow{\text{Electric current}} 2H_2(g) + O_2(g)$
Water — Hydrogen — Oxygen

Q22. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Ans.

	Displacement reaction	Double displacement reaction
1.	In a displacement reaction, a more reactive element displaces or removes another element from a compound.	The reactions in which two compounds react by an exchange of ions to form two new compounds are called double displacement reactions.
2	$Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$	$AgNO_3(aq) + NaCl(aq) \rightarrow AgCl(s) + NaNO_3(aq)$

Q23. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

Ans. $Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$
Copper — Silver nitrate — Copper (II) nitrate — Silver

Q24. What do you mean by precipitation reactions? Explain giving examples.

Ans. On mixing the clear solutions of two ionic compounds, a substance which is insoluble in water, is formed. This insoluble substance formed is known as a precipitate. Any reactin that produces a precipitate can be called a precipitation reaction.
When sodium sulphate solution is mixed with barium chloride solution, a white substance BaSO4 is formed.
$Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$
The white precipitate of BaSO4 is formed by the reaction of SO^{2-}_4 and Ba^{2+}. The other product formed is sodium chloride which remains in the solution.

Q25. Explain the following in terms of gain or loss of oxygen with two examples each:
(a) Oxidation (b) Reduction.

Ans. (a) Oxidation: It is defined as a process which involves gain of oxygen. For example

(i) $2Mg\ (s) + O_2\ (g) \rightarrow 2MgO\ (s)$
Magnesium, Oxygen, Magnesium oxide

Here, Mg has gained oxygen to form MgO. Hence, Mg has been oxidized to MgO.

(ii) $2Cu\ (s) + O_2\ (g) \rightarrow 2CuO\ (s)$
Copper, Oxygen, Copper oxide

In this reaction, Cu has gained oxygen to form CuO. Thus, Cu is oxidized to copper oxide (CuO).

(b) Reduction: It is defined as the process, which involves loss of oxygen. For example,

(i) $CuO + H_2 \xrightarrow{Heat} Cu + H_2O$
Copper oxide, Hydrogen, Copper, Water

In this reaction, copper oxide is losing oxygen. So it is being reduced to copper.

(ii) $ZnO + C \xrightarrow{Heat} Zn + CO$
Zinc oxide, Carbon, Zinc, Carbon monoxide

In this reaction, zinc oxide is losing oxygen, so it is being reduced to zinc.

Q26. A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

Ans. Element X is copper. The black coloured compound formed is copper (II) oxide CuO.

$2Cu + O_2 \xrightarrow{Heat} 2CuO$
Copper (Brown), Oxygen, Copper oxide (black)

Q27. Why do we apply paint on iron articles?

Ans. Paint covers the surface of the iron articles. Hence, moist air cannot attack iron and prevents rusting.

Q28. Oil and fat containing food items are flushed with nitrogen. Why?

Ans. In the presence of oxygen of the air, the fats present in the fatty food are oxidized to compound which have a bad smell, i.e., the food becomes rancid. Flushing with nitrogen cuts off oxygen and protects the food from rancidity.

Keeping in refrigerator lowers the temperature. as a result, oxidation of the food is slowed down. Hence, the food can be preserved for longer time.

Q29. Explain the following terms with one example each.
(a) Corrosion (b) Rancidity

Ans. (a) Corrosion: Corrosion is defined as the process of slow and gradual conversion of metal into their compounds by the attack of air, water in the atmosphere. For example, the iron articles are shiny when new, but get coated with a reddish brown powder when left for some time. Corrosion in case of iron is called rusting. The black coating on silver and green coating on copper are other examples of corrosion.

(b) Rancidity: When fats and oils are oxidized, they become rancid and their smell and taste change. Usually substances which prevent oxidation (antioxidants) are added to foods containing fats and oil. Keeping food in airtight containers helps to slow down oxidation. Chips manufactures usually flush bags of chips with an inert gas such as nitrogen to prevent the chips from getting oxidized.

ENGLISH

CHAPTER 5: FOOTPRINTS WITHOUT FEET

FOOTPRINTS WITHOUT FEET

~Summary~

-by H G Wells

Boys See Footprints in Street

Two boys on a street in London were surprised to see fresh muddy footprints of bare feet on the steps of a house without finding who was making them. Further on, the footprints disappeared. These footprints had been made by Griffin, an eccentric scientist who had discovered how to make his body transparent. He could only be seen with the clothes he was wearing.

Griffin : A Lawless Person

Griffin was having a criminal bent of mind and was a lawless person. He set fire to his landlord's house to take revenge against him for trying to evict (throw out) him. To get away, he had to remove his clothes so that he became invisible. He was a homeless wanderer in London without clothes or money during winter.

Escape of Griffin

Griffin managed to escape from the two keen boys' observation and entered unseen into a big store to get warm. After the store was closed at night, Griffin put on some new clothes, consumed meat and coffee from the restaurant in the store and went to sleep on a pile of quilts. He overslept and only woke up when the shop had opened and the assistants had arrived. On being seen and chased by them, he again took off his clothes so that they could not see him.

Griffin at a Theatrical Company

Then Griffin entered a theatrical company which gave items used in plays. There he wore bandages to outline his face, dark glasses, a false nose and bushy side-whiskers. He robbed the shopkeeper of his money and escaped to a village away from London to avoid being caught.

Griffin Arrives at Iping Village

Griffin booked two rooms at an inn belonging to Mrs Hall in the village Iping. He explained to her that he had an accident and did not want to be disturbed, as Mrs Hall tried to be social with him. Soon his money was finished and so he robbed a clergyman's house by using his invisibility.

Mrs Hall Enters Griffin's Room

That same day, when Mrs Hall found Griffin's room open, with his bandages and clothes lying around, she and her husband entered the room. Suddenly both of them were attacked by the furniture being flung at them, but they could not see who was doing this. Mrs Hall felt that the furniture was haunted by spirits, as she could not see Griffin.

Griffin becomes Invisible and Escapes from Iping

When the clergyman reported the burglary to the police, most people in the village felt that the strange scientist had a hand in it, because he paid his due rent, whereas earlier he was not able to do so. So Mr Jaffers, the village police constable, was called to arrest Griffin on suspicion. Meanwhile, Mrs Hall asked Griffin to explain all the unusual happenings. Griffin lost his temper and decided to tell everything. He started removing his clothes and even Jaffers could not catch someone whom he could not see. He was knocked unconscious by the invisible man, who escaped.

Conclusion of Footprints without Feet

In the chapter – Footprints without Feet describes the tendency of human nature to misuse creative discoveries meant for common good but end up creating menace by misappropriating it.

NCERT SOLUTION

Questions (Page No. 26)

(READ AND FIND OUT)

Question 1:How did the invisible man first become visible?

Answer:The invisible man, Griffin first became visible when he stepped in some mud and his footprints were all over the steps of a house in the middle of London. His footprints were noticed by two boys who followed, fascinated, until the muddy impressions became fainter and fainter and at last disappeared altogether. He escaped easily enough from the boys who followed his footprints in London. As it was mid-winter, he slipped into a big London store to keep himself warm and slept there while picking up a pair of shoes, an overcoat and a wide-brimmed hat from the store. When he wore the clothes, it made him visible to the shop assistants when the shop opened in the morning. Thereafter, he had to shed all his clothes to escape from them and became invisible again.

Question 2:Why was he wandering the streets?

Answer:Although Griffin was a brilliant scientist, but he was a lawless person. His landlord disliked him and tried to evict him from the house. In revenge, the scientist set the house on fire. To escape from the scene, he removed his clothes and became a homeless wanderer without clothes, no money and totally invisible, roaming around the streets of London.

Questions (Page No. 28)

(READ AND FIND OUT)

Question 1:Why does Mrs Hall find the scientist eccentric?

Answer:The arrival of a stranger with an uncommon appearance at an inn in mid-winter was an unusual event in itself. Mrs Hall tried to be friendly with Griffin, but he gave her a cold response. He rebuffed her by saying that he was not interested to talk to anyone and had come there for solitude and did not wish to be disturbed in his work. Considering all these reasons, Mrs Hall found the scientist to be an eccentric person.

Question 2:What curious episode occurs in the study?

Answer:In the early hours of one morning, the clergyman and his wife woke up owing to noises coming from their study. Creeping downstairs, they heard the sound of coins being taken from the clergyman’s desk. To their amazement, when they entered the study, the room was empty. He and his wife looked under the desk and behind the curtains and even up the chimney.

However, they did not find anybody there. Yet the desk was found open and the housekeeping money was also missing.

Question 3:What other extraordinary things happen at the inn?

Answer:A series of extraordinary things happened at the inn. When Mrs Hall and her husband went into the scientist's room, they found its door wide open. Usually it was always shut and locked and the scientist became furious if anyone entered his room. However, when Mrs Hall and her husband peeped round the door, he was nowhere to be seen in the room. His clothes and bandages that he always wore were lying about the room. Suddenly, Mrs Hall heard a sniff close to her ear and the hat on the bedpost leapt up and dashed itself into her face. Out of nowhere, the bedroom chair sprang into the air and pushed them both out of the room and then it slammed and locked the door after them. All these incidents made Mrs Hall believe that her furniture and the room was haunted by spirits, and that the stranger had somehow caused these to enter into her furniture.

Questions (Page No. 31)

(THINK ABOUT IT)

Question 1:"Griffin was rather a lawless person." Comment.

Answer:Griffin was indeed a lawless person as he did not refrain from harming others to fulfill his selfish interests. He set his landlord's house on fire when he tried to evict the scientist from his house. Thereafter, he robbed clothes from shops and stole money from Mrs. Hall's house that was kept for housekeeping purposes inside the desk in the study room. However, when the landlady encountered him at the inn, he threw a chair at her and her husband. Finally, he also escaped from the clutches of Mr Jaffers, the constable who had come to arrest him for his misdeeds. Lawless people like Griffin are very vengeful in nature and do not think about the safety and well-being of others in the society. They are only self-obsessed, thinking about themselves.

Question 2:How would you assess Griffin as a scientist?

Answer:Griffin was a brilliant scientist, as he discovered the scientific formula to make a human body invisible. This was indeed a big achievement in science. But he seemed to enjoy the feeling of power when he became invisible. He misused his discovery to satisfy his personal needs and got sadistic pleasure by hurting others. Although he was brilliant in his job, but he was not a noble scientist who made contribution to the larger benefit of society. His discovery of invisibility was therefore, done just for his own benefit.

Questions (Page No. 31)

(TALK ABOUT IT)

Question 1:Would you like to become invisible? What advantages and disadvantages do you foresee, if you did?

Answer:Yes, it would be an exciting idea for most people to become invisible. Just like there are two facets of every coin, invisibility can also have certain advantages and disadvantages. A prime advantage of becoming invisible for military personnel could help them in maintaining law and order in the society by tracking illegal crimes caused by anti-social elements without their knowledge and put an end to the nuisance created by terrorists or criminals. On a lighter note, for a child being invisible is an open license to play pranks on his friends without getting caught. On the other hand, a disadvantage of invisibility would mean isolation and having no friends and family to share joys and sorrows with. A person is likely to become like the eccentric scientist, Griffin, as mentioned in this story.

Question 2:Are there forces around us that are invisible, for example, magnetism? Are there aspects of matter that are 'invisible' or not visible to the naked eye? What would the world be like if you could see such forces or such aspects of matter?

Answer:Yes, electrostatic and magnetic forces are good examples of invisible forces. The atoms and molecules in a particular matter are so tiny that they cannot be seen with the naked eye. Similarly, sound and heat energy are transparent and cannot be seen. Although it is quite an exciting idea to see invisible things, heir visibility could create a lot of issues too. For instance, if we are able to view the magnetic force, it might cause a lot of irritation to our senses.

Question 3:What makes glass or water transparent (what is the scientific explanation for this)? Do you think it would be scientifically possible for a man to become invisible, or transparent? (Keep in mind that writers of science fiction have often turned out to be prophetic in their imagination!)

Answer:We know that light can pass through glass or water as they are transparent. When light rays fall on an object, the reflection of that light from the object makes it visible for us. Similarly, if any device of similar kind can be made that can prevent reflection of light from the human body, then the human body can also become transparent and invisible.

FROMTHE DIARY OF A YOUNG GIRL

(ANNE FRANK)

This is an extract from the personal diary of Anneliese Marie Frank. She was a German-born Jewish girl who wrote while in hiding with her family and four friends in Amsterdam.
The diary was given to Anne on her thirteenth birthday and records the events of her life from 12 June 1942 until its final entry of 1 August 1944. The diary was originally written in Dutch from which it was translated into many languages and became one of the world's most widely read books.
Described as the work of a mature and insightful mind, the diary provides an intimate description of daily life under Nazi occupation. Anne Frank has become one of the most renowned and discussed of the holocaust victims.

SUMMARY: -

This chapter contains the first few pages of Anne Frank's diary. Here she reasons out why she kept a diary. She had no one to share the most intimate feelings of her heart with, though she had about thirty friends. Thus the diary comes into play. She treats her diary like her best friend soaking the pages with the innermost feelings of her heart. She calls her diary 'Kitty'.

First of all she gives a brief sketch of her family. She calls her father the most adorable of all fathers. She also had an unflinching relationship with her Grandmother. Her Grandmother had passed away and Anne missed her terribly. Anne was also greatly attached to one of her nursery teachers, Mrs. Kuperus. In one of the entries Anne tells Kitty about the students in her class. She tells how nervous the students felt at the time of annual results. Then she writes about her maths teacher, Mr. Keesing. This teacher would punish her for talking in the class. He would give her extra homework. Once he asked her to write an essay on 'A chatterbox'. The next day, he asked her to write another essay on 'An incorrigible chatterbox'. He was impressed by her essays but could no longer take her incessant chatter so he gave her the most unusual topic for her next essay. The title was: 'Quack, Quack, Quack,' said mistress chatterbox. The teacher had intended to play a joke on Anne. But she wrote the essay in such a way that it became a joke on him. Luckily, Mr. Keesing took the joke the right way and hence allowed Anne to talk in class.

Answers:

Q.1. If it would be diary of a normal girl, certainly no body would have been interested in the daily instances scribbled in it. But it was the daily account of a girl of holocaust, narrating instances which rents every heart. So we can say Anne was right, but when the dairy was turned into a book, her own remark was nullified.

Q.2 Anne was a Dutch, so her dairy, which later on turned into a book, was written in Dutch language.

Q.3 Anne treats Kitty as her friend, a new friend. When friends meet they give details about their families same is done by Anne.

Q.4 Anne felt her father as the most adorable one she had ever seen. She finds her Grandma as the one whom she loves even after she is died. She finds her headmistress i.e. Mrs. Kuperus an affectionate teacher, to whom she was attached a lot. Her maths teacher, Mr. Keesing, was a person she remembered for her whole life as he was the one who was much annoyed with her. She considered him unpredictable.

Q.5 Anne had been assigned an essay by her maths teacher to write about "A Chatter box". She in her essay justifies herself as being a chatter box she writes that talking is an inherent quality of a child.

Nothing can be done to stop a child from talking. Moreover, she writes that she cannot help this quality of hers because her mother also used to talk much.

Q.6 Mr Keesing seems to be unpredictable because he at first behaves cooly on Anne's essay. It seems to Anne that he will allow her to talk in class but when she repeats her act again, Mr. Kessing terms her habit as incorrigible and assigns her a new essay. He repeats the same again. Each time behaving in an unpredicted way. So Anne calls him unpredictable.

Match the following.

1. Heartbreaking: Producing great sadness.
2. Homesick: Missing home and family very much.
3. Blockhead: A very stupid person.
4. Law-abiding: Obeying and respecting the law.
5. Overdo: Do something to an excessive degree.
6. Daydream: Think about pleasant things, forgetting about present.
7. Breakdown: An occasion when vehicles stop working.
8. Output: Something produced by a person, machine or organization.

Q2

i) Plunge in – Go straight to the topic.
ii) Kept back – Not promoted.
iii) Move up – Go to the next grade.
iv) Ramble on – Speak or write without focus.
v) Get along with – Have a good relationship with.
vi) Calm down – make (them) remain quiet.
vii) Stay in – Stay indoors.
viii) Make up for – Compensate.
ix) Hand in – Give an assignment to a person in authority.

III. Idioms

i) is very afraid.
ii) To feel discouraged.
iii) For a very long time.
iv) To make joke of someone.

2)

i) Caught my eye – caught my attention.
ii) Fed had enough – to do something in excess.
iii) Laugh ourselves silly – when one is not able to do something sensible.
iv) Can't bring myself to – do have the ability to talk or do something.

iv). **Fill in the blanks with correct form of pronoun.**

1.	His	2.	Its
3.	They	4.	My
5.	They, they	6.	Mine
7.	Yours	8.	He
9.	Him	10.	Me, him

SCIENCE

(Biology)

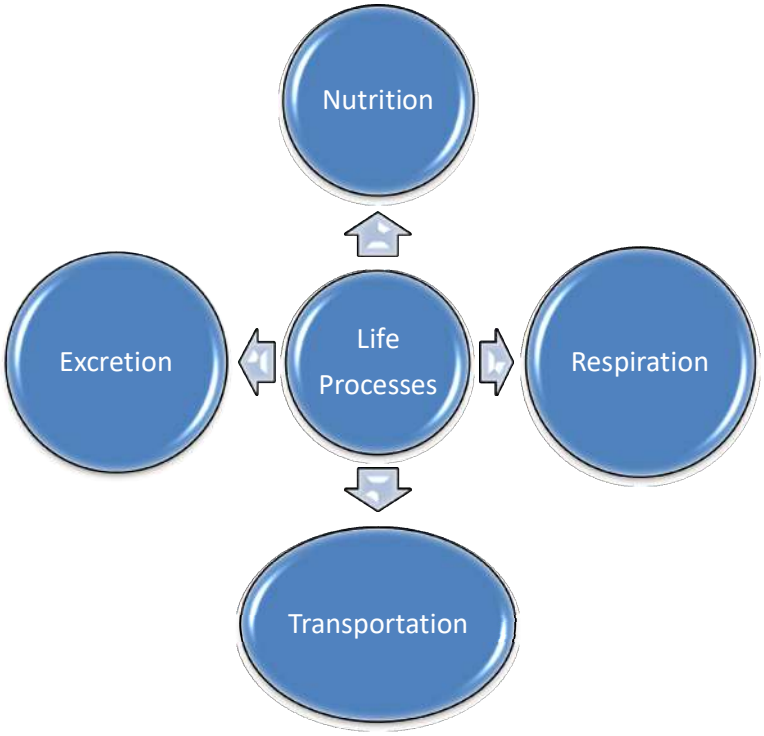
Chapter 5: Life Processes

10th

Life Processes

The basic functions performed by organisms to maintain their life on Earth are called **life processes**.

All living things perform certain life processes like growth, excretion, respiration, circulation etc. All the processes like respiration, digestion, which together keep the living organisms live and perform the job of body maintenance are called life processes.

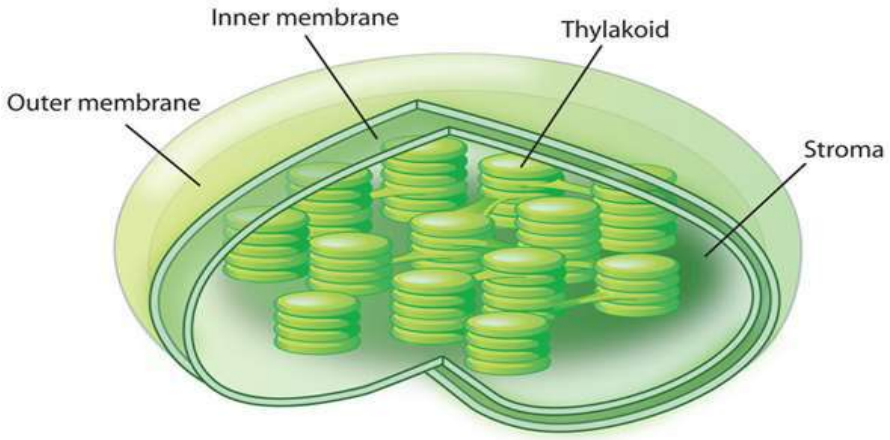


Nutrition

1. Autotrophic Nutrition

- It is the mode of nutrition in which organisms synthesise their own food from simple inorganic substances such as water and carbon dioxide.
- Green plants are autotrophs. They synthesise food by the process of photosynthesis.
- **Photosynthesis** is a physiological process by which plant cells containing chlorophyll produce food in the form of carbohydrates using carbon dioxide, water and light energy. Oxygen is released as a by- product of this process.
- **Chlorophyll** is the green pigment found in green plants.
- Chlorophyll is present in chloroplasts.
- **Chloroplast** is a membrane-bound oval cell organelle.
- It is enclosed by a double membrane. Its interior contains closely packed flattened sacs called **thylakoids**. Chlorophyll is present in the thylakoids.

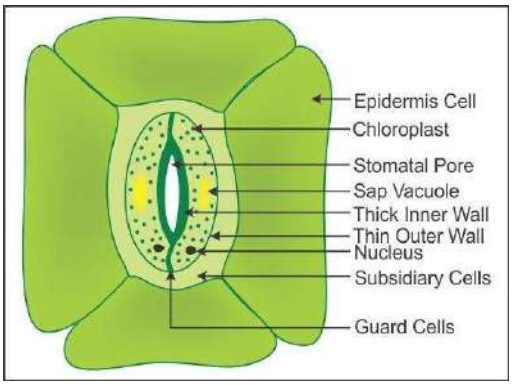
- Thylakoids are arranged in piles called **grana** lying in a colourless ground substance called **stroma**.
- Cells present in the spongy mesophyll layer and the palisade layer contain chloroplasts; therefore, they are the site of photosynthesis.



Chloroplast

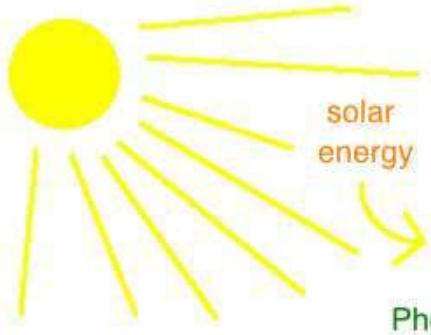
Stomata

- Stomata are minute openings present in the epidermal layers of leaves.
- They are responsible for gas exchange during photosynthesis.



Process of Photosynthesis

- The **palisade layer** is the centre for photosynthesis. Light energy is trapped in the chlorophyll of the mesophyll cells in the palisade layer of leaves.
- The chemical equation for photosynthesis is



$$6CO_2 + 6H_2O \xrightarrow{\text{Photosynthesis}} C_6H_{12}O_6 + 6O_2$$

carbon dioxide — water — glucose — oxygen

Light is absorbed by chlorophyll.

Light energy absorbed is converted into chemical energy.

At the same time photolysis of water takes place i.e. a water molecule is split into hydrogen and oxygen.

Carbon dioxide is converted into glucose by using ATP and NADPH produced during the light reaction.

Chlorophyll, light, carbon dioxide and water are necessary for photosynthesis.

2. Heterotrophic Nutrition

- It is the mode of nutrition of organisms which cannot synthesise their own food, but they are dependent on other organisms for food.
- Organisms exhibiting heterotrophic nutrition are called **heterotrophs**.

  Examples: yeasts, fungi, bacteria, human beings, tiger, monkey, birds, lion, cow etc.

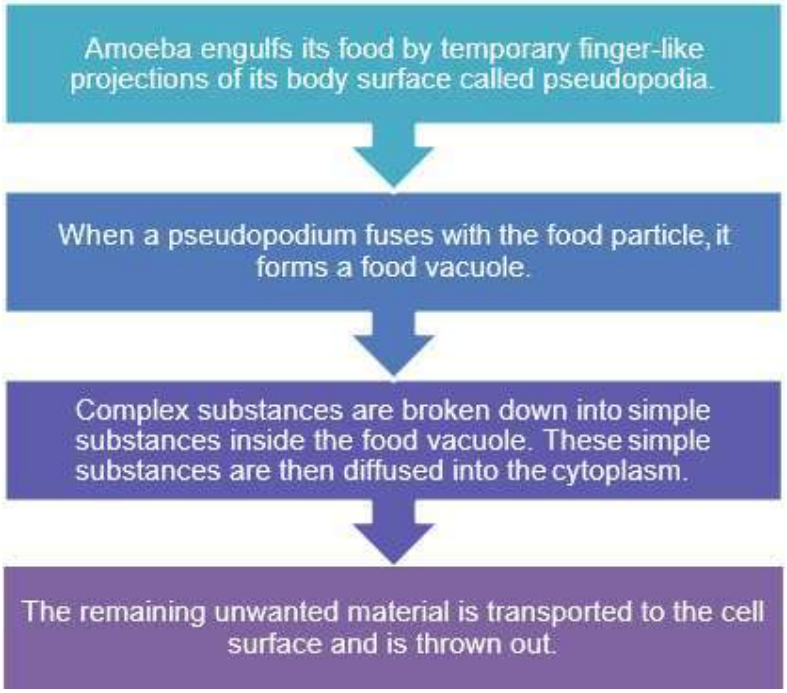
Types of Heterotrophic Nutrition

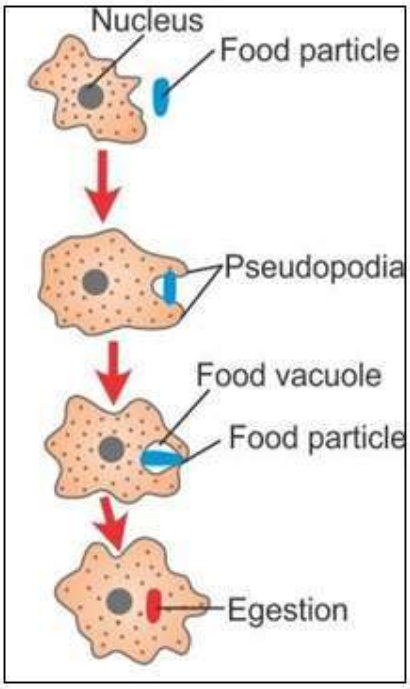
- **Saprotrophic Nutrition:** Organisms obtain their food from dead, decaying plants and animals. Example: Mushrooms
- **Parasitic Nutrition:** Organisms obtain their food from the bodies of other living organisms. Parasites usually harm the host while obtaining their food.
- Example: Leech
- **Holozoic Nutrition:** It is a mode of nutrition in which organisms feed on solid food. The food is complex organic material which when ingested is broken down into simple

inorganic substances by the process of digestion.

Example: Humans

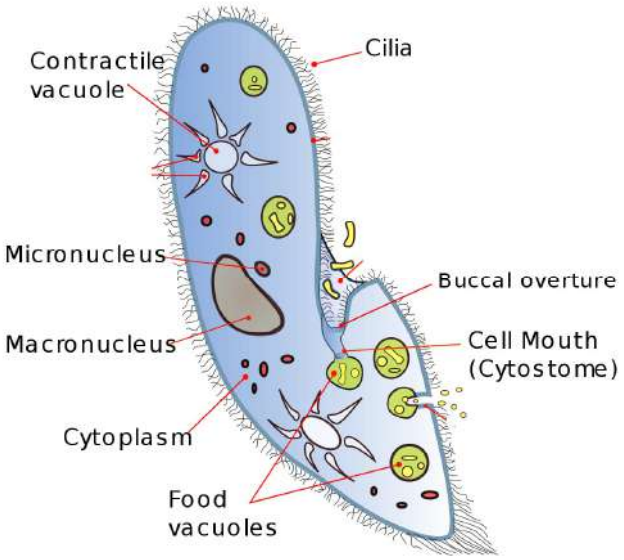
3. Nutrition in Amoeba



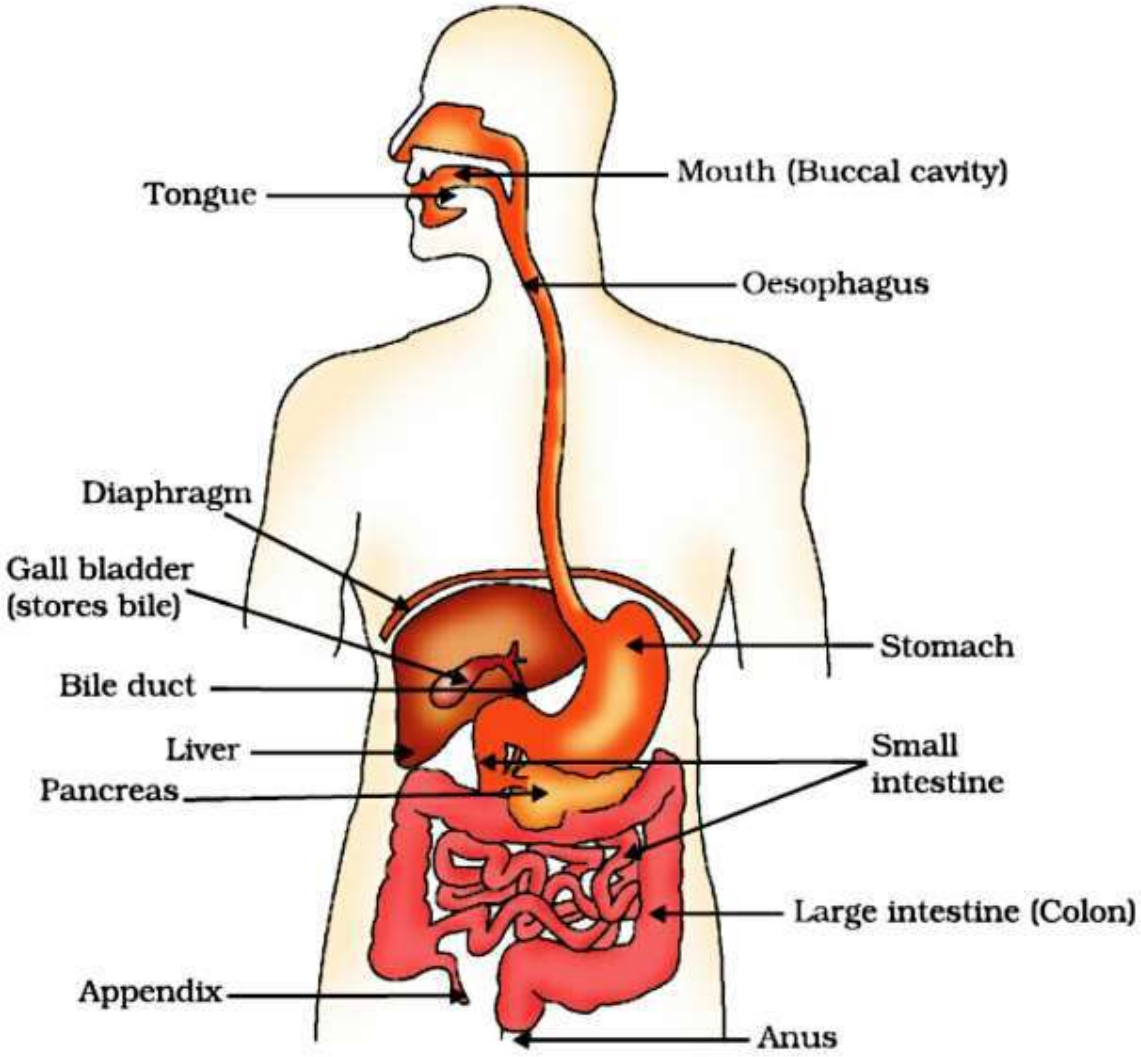


Nutrition in Paramecium

- The food is taken in at a specific spot, i.e. the oral groove.
- The food is brought close to the oral groove by the cilia present on the body surface of paramecium.



4. Nutrition in Human Beings



The alimentary canal is the long tube extending from the mouth to the anus.

- Food is chewed and mixed with saliva in the mouth with the help of tongue and teeth.
- Saliva which contains salivary amylase acts on the starch present in food.
- Saliva is secreted by 3 pairs of salivary glands.
- The food is converted into smaller particles and made smooth by mixing it with mucus and saliva. It is now called bolus.
- The bolus moves down through the esophagus by peristaltic movements of the esophageal wall.
- Once the bolus reaches the stomach, it is acted upon by HCl, gastric juices and pepsin.
- HCl creates an acidic medium for the action of pepsin.
- Mucus prevents the lining of the stomach wall from the acidic environment.
- Pepsin converts proteins into peptides.
- The exit of food from the stomach is regulated by a sphincter muscle called the pyloric sphincter or pylorus which releases small amounts of partially digested food into the

small intestine.

- The small intestine is a very long tube found in the abdomen. It is about 6–7 metre in length and about 2.5–3 cm wide.
- Bile and pancreatic juices are secreted into the small intestine.
- Bile acts on the fat molecules and breaks them into small flat droplets. This eases the action of lipase on the fats. This process is called **emulsification**.
- Pancreatic juices contain different enzymes such as trypsin, lipase, maltase, peptidases, sucrose, which act on the food to convert it into simpler units of carbohydrates, proteins and fats.
- Intestinal glands also secrete intestinal juices which also contain enzymes, which act on the carbohydrates, proteins and fats.
- The digested food is then absorbed by the walls of the small intestine.
- Presence of brush-like borders called microvilli increase the surface area for absorption.
- The unabsorbed food is sent to the large intestine where water is absorbed into the blood stream.
- The left over material in the large intestine is sent to the rectum.
- It is excreted out through the anus.
- The opening of the anus is controlled by the anal sphincters.

Respiration

- Respiration is a catabolic process of releasing energy from the simple sugar glucose for carrying out various life processes.

$$\underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6O_2} \rightarrow \underset{\text{Carbon dioxide}}{6CO_2} + \underset{\text{Water}}{6H_2O} + \underset{\text{Energy}}{ATP}$$

The energy required for all cellular activities is obtained by the oxidation of glucose.

- If glucose is not available, then the cells may break down proteins and fats to produce glucose. This glucose is then oxidised further to fulfil the respiratory needs of the cell.
- The first step towards obtaining energy is that the six-carbon glucose is broken down into two molecules of three-carbon pyruvate. This process takes place in the cytoplasm.

Aerobic Respiration

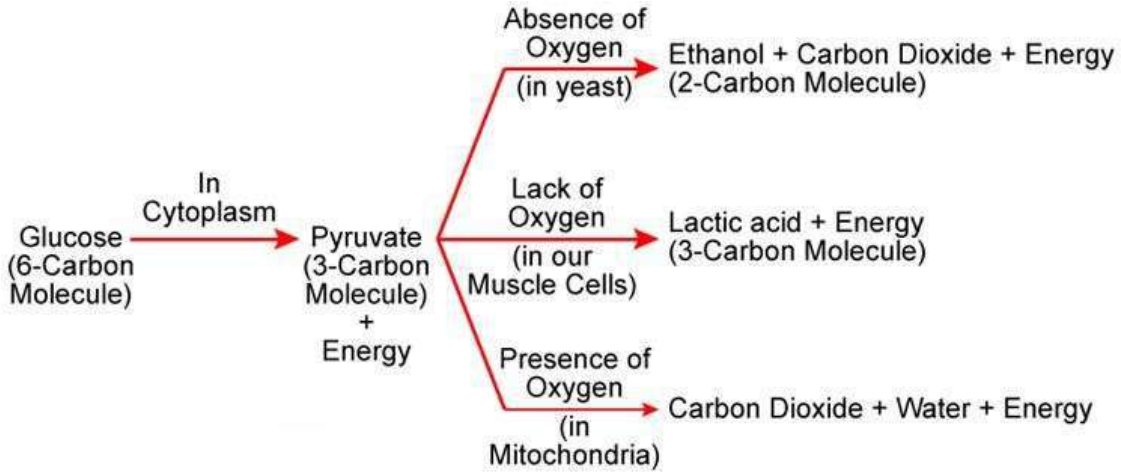
- The breakdown of glucose in the presence of oxygen is called **aerobic respiration**.
- The process of aerobic respiration releases carbon dioxide, water and energy.
- The energy released in aerobic respiration is 686 kcal or 38 ATP of chemical energy and 420 kcal of heat energy.
- Most of the animals, plants, human beings, several bacteria and fungi are aerobic.

Anaerobic Respiration

- The breakdown of glucose in the absence of oxygen is called **anaerobic respiration**.
- The process of anaerobic respiration results in the formation of ethanol (in plants) or

lactic acid (in animals), along with the release of carbon dioxide and energy.

- Water is not released in this process.
- 2 ATPs are released during anaerobic respiration.
- During heavy physical exercise such as cycling, running or lifting heavy weights, the body is often deprived of oxygen. The demand for energy is high, while the supply of oxygen to the body is limited. Therefore, muscle cells perform anaerobic respiration to fulfil the increasing energy demands of the body. In this case, glucose gets converted to lactic acid.



- Sometimes, lactic acid formed during anaerobic respiration in muscle cells gets accumulated, causing muscular cramps. This condition is called oxygen debt. In the presence of sufficient oxygen, lactic acid gets oxidised to carbon dioxide and water.

Respiration in Plants

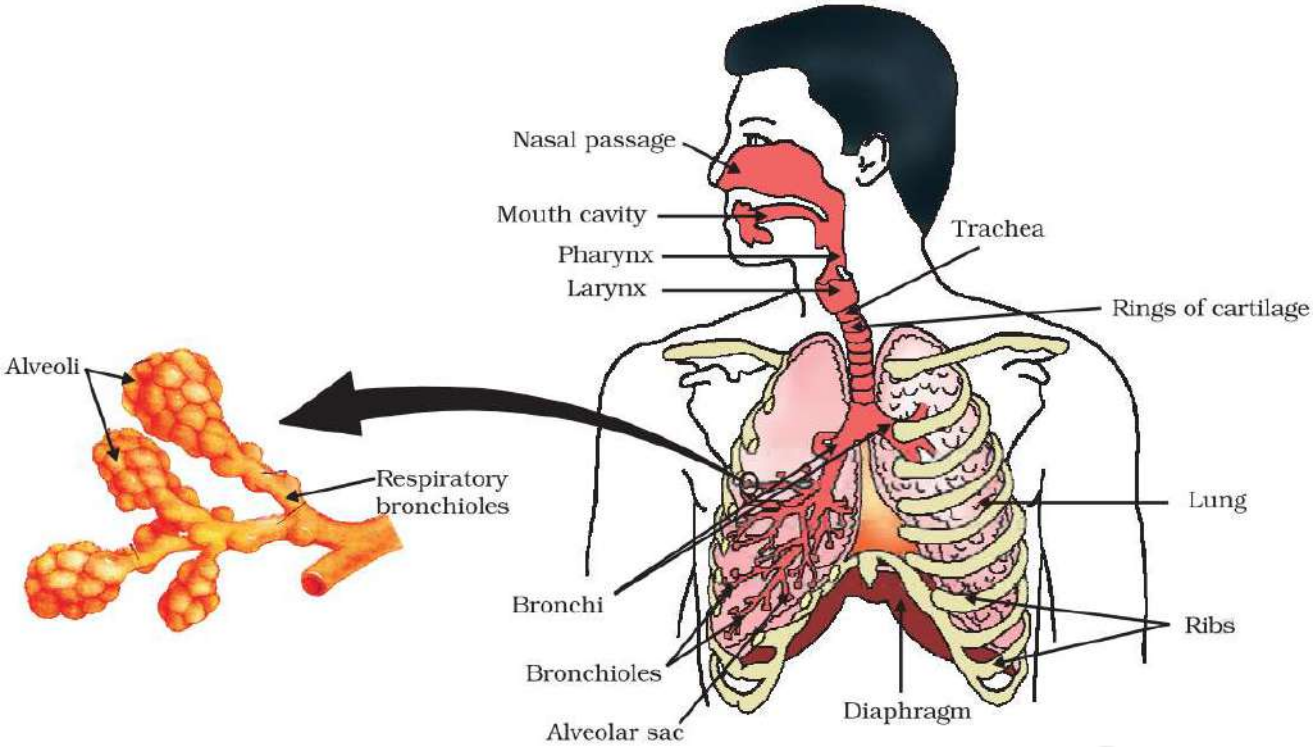
- All parts of a plant perform respiration.
- Plants exchange gases by diffusion through the stomata.
- Oxygen from the air diffuses into a leaf and reaches all the cells for respiration.
- Carbon dioxide produced during respiration is released into the air through the stomata.
- In plants, respiration occurs during the day as well as during the night.
- During the day, oxygen produced during photosynthesis is used for respiration and the extra amount of oxygen is given out through the stomata.
- The roots of plants take up oxygen from the air present between the roots and soil particles.
- In stems, the exchange of gases occurs through either the stomata or lenticels.

Respiration in Animals

Different animals have evolved different respiratory organs:

Human Respiratory System

The respiratory system in human beings consists of the nose, pharynx, larynx, trachea, bronchi and lungs.



Air is taken in through the nostrils.

- Hairs present in the nostrils prevent the entry of dust particles inside the nose.
- Nostrils further continue into the nasal cavity.
- Nostrils humidify the air passing through it.
- There is a bony plate called the palate, which separates the oral cavity from the nasal cavity.
- Nasal cavity opens into the pharynx.
- The pharynx is a muscular chamber acting as a common passage for the windpipe or trachea and the food pipe or esophagus.
- It is connected to the larynx through a slit-like opening called the glottis.
- The larynx is also called the voice-box or Adam's apple.
- The larynx connects the pharynx to the trachea.

- The trachea shows the presence of cartilaginous rings.
- The cartilaginous rings provide flexibility thus, facilitating continuous air flow.
- The inner wall of the trachea is lined by a mucous membrane consisting of ciliated columnar epithelium.
- The trachea divides into two branches or tubes called bronchi, one of which enters the right lung and the other enters the left lung.
- The bronchi have cartilaginous rings for distention.
- Each bronchus divides into fine secondary bronchi. These bronchi further divide into finer tertiary bronchi. In the lungs, each bronchus finally divides into finer and smaller branches called bronchioles.
- The bronchioles further divide to form smaller terminal bronchioles.
- The bronchioles divide repeatedly to form a cluster of tiny air chambers called air sacs or alveoli.
- Alveoli have thin and moist walls which enable gaseous diffusion with blood capillaries.
- The lungs are a pair of spongy and elastic respiratory organs protected by a bony rib cage.
- The base of the lungs rests on the diaphragm.
- Each lung is covered by two membranes. The inner membrane is called the inner or visceral pleura and the outer membrane is called the outer or parietal pleura.
- The diaphragm is a curved, musculo-fibrous sheath which separates the thoracic cavity from the abdominal cavity.
- The diaphragm plays a major role during respiration.
- The intercostal muscles found between the ribs and the radial muscles of the diaphragm bring about the breathing movements.
- When we breathe in, the ribs are pulled upwards and the diaphragm becomes flat which results in an increase in the volume of lungs.
- When we breathe out, the ribs come back to their normal position, the diaphragm is relaxed, lungs attain their normal size and air is expelled out of the body through the nostrils.

Transportation

- All living organisms need a few necessary components like air, water, and food for their survival.
- On our regular basis, animals ensure these elements by breathing, drinking and eating.
- The required elements are transported to their body cells and tissues by a transportation system.
- In plants, the vascular tissue is responsible for transporting the substances.

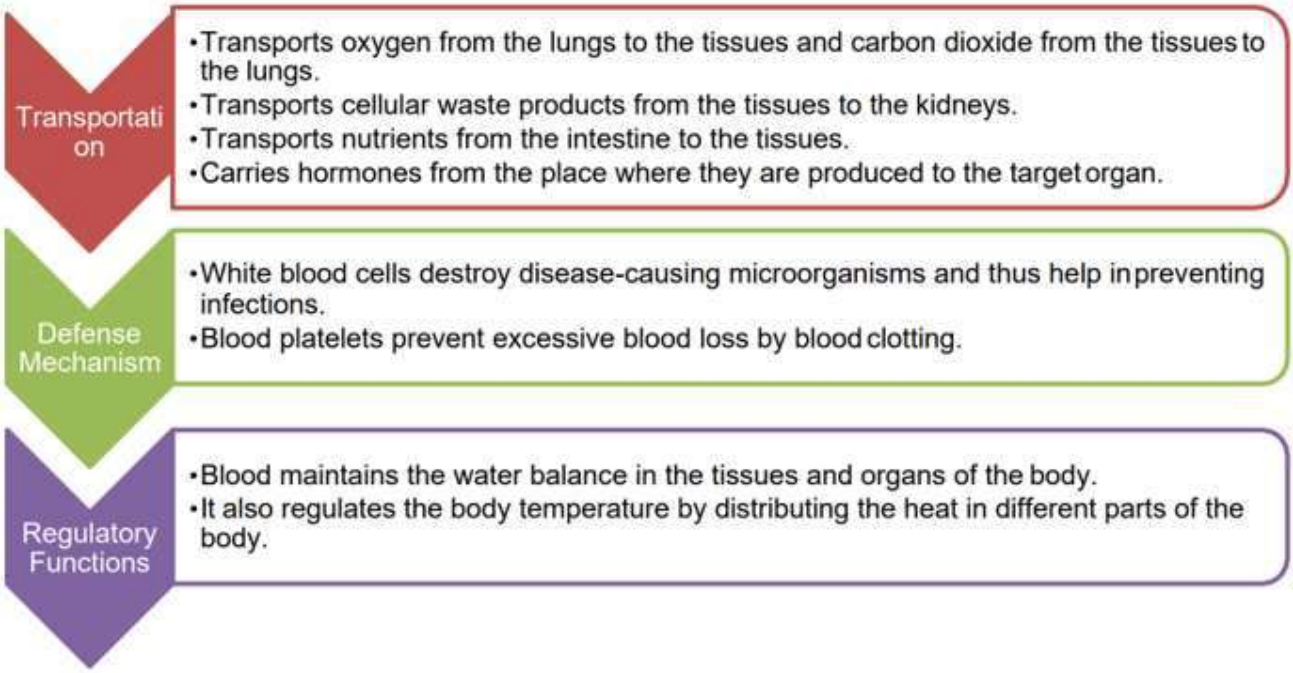
Transportation in Human Beings

- Transportation in humans is done by the circulatory system.
- The circulatory system in humans mainly consists of blood, blood vessels and heart.
- It is responsible for the supply of oxygen, nutrients, removal of carbon dioxide and other excretory products.
- It also helps to fight the infections.

Blood

Blood being a fluid connective tissue. Blood consists of a fluid medium called plasma in which the cells are suspended. Plasma transports food, carbon dioxide and nitrogenous wastes in dissolved form. Oxygen is carried by the red blood corpuscles. Many other substances like salts, are also transported by the blood. We thus need a pumping organ to push blood around the body, a network of tubes to reach all the tissues and a system in place to ensure that this network can be repaired if damaged.

Functions of Blood



Composition of Blood Plasma

- It is a light yellow-coloured or straw-coloured liquid.
- It constitutes 55% of the total blood volume.

Blood Cells

- Blood cells constitute 45% of the total blood volume.
- Three kinds of cells are found in the blood.

Red Blood Cells (RBCs/erythrocytes)

- RBCs are circular, disc-shaped and biconcave.
- They are produced in the bone marrow of long bones.
- Mature RBCs do not have nuclei.
- The lifespan of RBCs is 120 days.
- RBCs are made up of a iron- containing respiratory pigment called hemoglobin. Hemoglobin transports oxygen from the lungs to tissues.

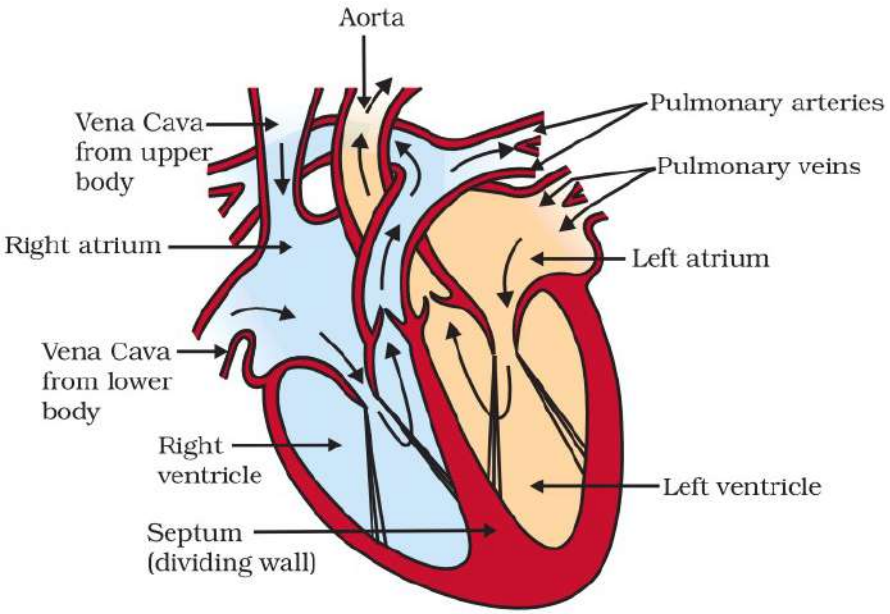
White Blood Cells (WBCs/leucocytes)

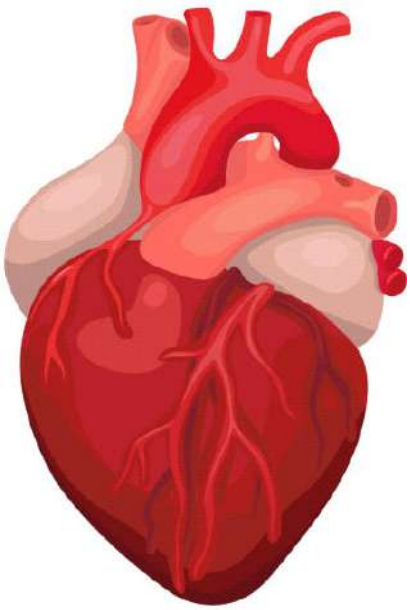
- Irregular, colourless, larger than RBCs. They have a large and lobed nucleus.
- WBCs are produced in the bone marrow, lymph glands and spleen.
- WBCs provide immunity.

Blood Platelets (Thrombocytes)

- Blood platelets are minute, oval or round, non- nucleated cells.
- Platelets are formed in the bone marrow.
- Blood platelets play an important role in blood clotting.

Heart – The Pumping Organ





Schematic sectional view of the human heart **Human heart**

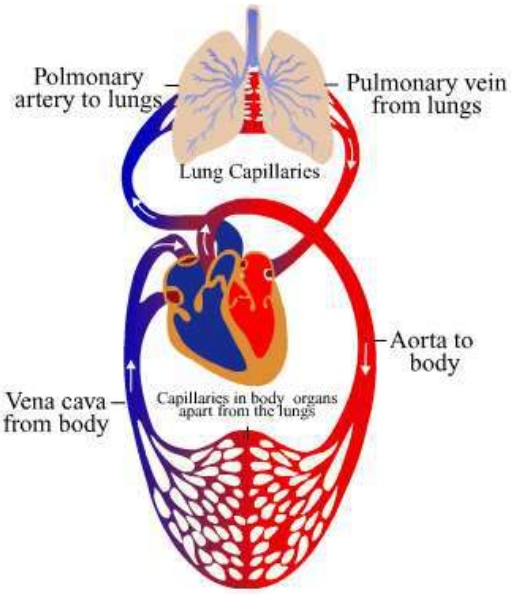
Location	• The heart is a muscular organ located in the chest cavity towards the left side.
Size	• In adult humans, it is about the size of one's fist.
Covering	• Covered by a double membrane called **pericardium**. It contains the lubricating **pericardial fluid**. • The pericardial fluid provides lubrication during the contraction and relaxation of the heart. • It also protects the heart from mechanical injuries.

Chambers of the heart	• Internally, the heart is divided into four chambers:
	  ○ Two thin-walled upper chambers-left atrium and right atrium.
	  ○ Two thick-walled lower chambers-left ventricle and right ventricle.

	• The superior vena cava brings deoxygenated blood from the anterior part of the body, i.e. head, chest and arms, to the right atrium.
	• The inferior vena cava brings blood from the posterior region of the body, including the abdomen and legs, to the right atrium.
	• The blood from the right atrium enters the right ventricle. • From the right ventricle, the blood is sent to the lungs through the pulmonary artery.
Blood vessels leaving the heart	• Four pulmonary veins carry oxygenated blood from the lungs to the left atrium. • From the left atrium, the blood enters the left ventricle.
	• From the left ventricle, oxygenated blood is sent to all parts of the body through the aorta.
Heart valves Heart valves prevent the backflow of blood or regulate the flow of blood in a single direction.	• The tricuspid valve which has three projections or cups is located between the right atrium and the right ventricle.
	• The bicuspid valve/mitral valve has two projections or cups and is located between the left atrium and the left ventricle.
	• The opening of the left ventricle into the aorta and the opening of the right ventricle into the pulmonary artery is guarded by semilunar valves.

Double Circulation

The heart receives deoxygenated blood from different parts of the body, and it pumps this blood to the lungs. The oxygenated blood from the lungs returns to the heart, which is pumped again into different parts of the body by the heart. Thus, the blood passes twice through the heart making one complete round through the body. This is called **double circulation**.



The pulmonary circulation pertains to lungs. The blood flows from the right ventricle to the lungs. Pulmonary veins collect oxygenated blood from the lungs and carry it back to the heart (left auricle).

The systemic circulation pertains to the major circulation of the body. The aorta receives the blood from the left ventricle and sends it to the various parts of the body. Veins collect the deoxygenated blood from the body parts and pour it back into the right auricle.

Blood Pressure

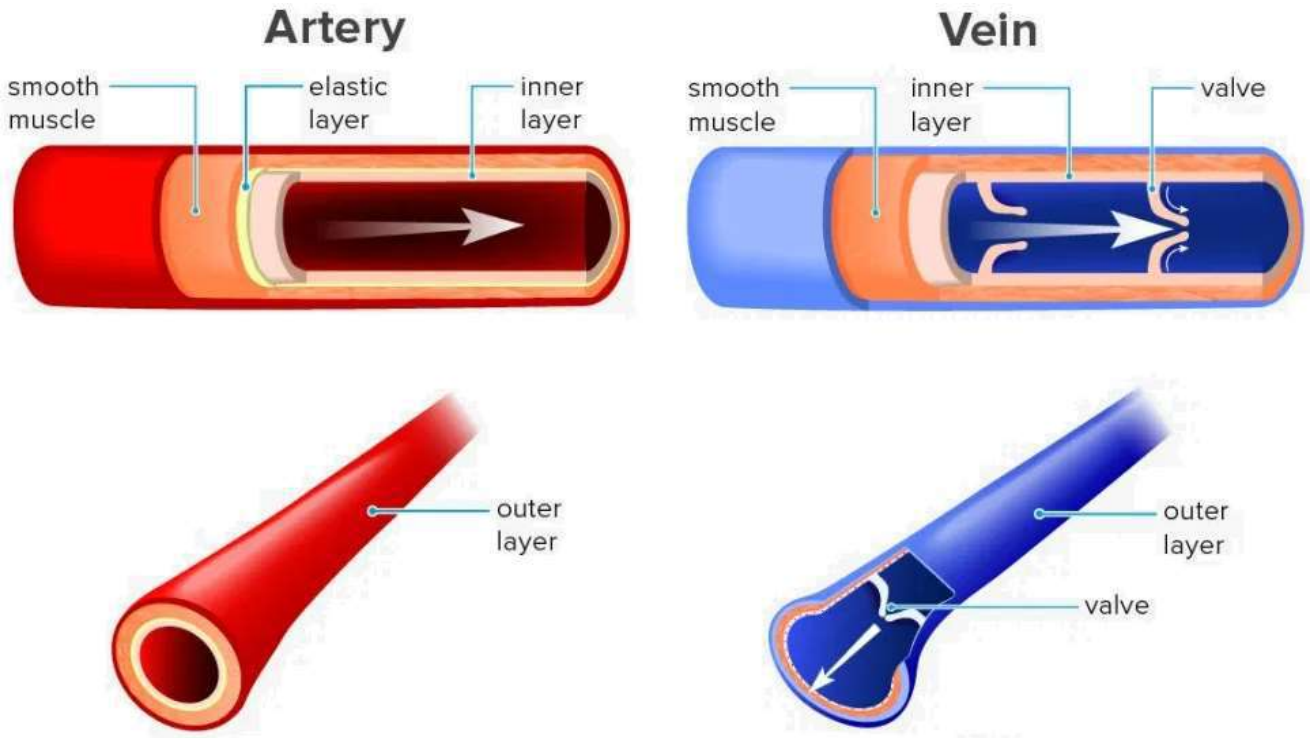
- **Blood pressure** is the pressure which the blood exerts on the walls of the blood vessels.
- The blood pressure in the arteries during ventricular systole is called **systolic pressure**, and the blood pressure in the arteries during the ventricular diastole is called **diastolic pressure**.
- A person's blood pressure is usually expressed in systolic pressure over diastolic pressure.
- The normal blood pressure for an adult human is 120/80 mm Hg.
- Blood pressure varies according to the age and health of a person.
- A sphygmomanometer is an instrument used to measure blood pressure.
- High blood pressure is also called hypertension, while low blood pressure is called hypotension.

Blood Vessels

- The blood vessels are tubes from which blood from the heart is carried to all parts of the body and again brought back to the heart.
- There are three types of blood vessels.

Artery	Vein	Capillaries
An artery is a blood vessel which carries blood away from the heart towards any organ.	A vein is a vessel which carries the blood away from an organ towards the heart.	A capillary is a very narrow blood vessel which is located within the tissue.

It has elastic and thick muscular walls.	It has thin muscular walls.	It has an extremely thin wall.
Narrow cavity through which the blood flows.	Broad cavity through which the blood flows.	-
-	The veins have valves which prevent the backflow of blood.	The arteries branch to form arterioles, and arterioles break up into capillaries.
The largest artery is the aorta.	-	The capillaries gradually reunite to form venules. Venules further combine to form veins.
-	-	Capillaries allow the exchange of materials such as nutrients, metabolic wastes and respiratory gases between the blood and cells.



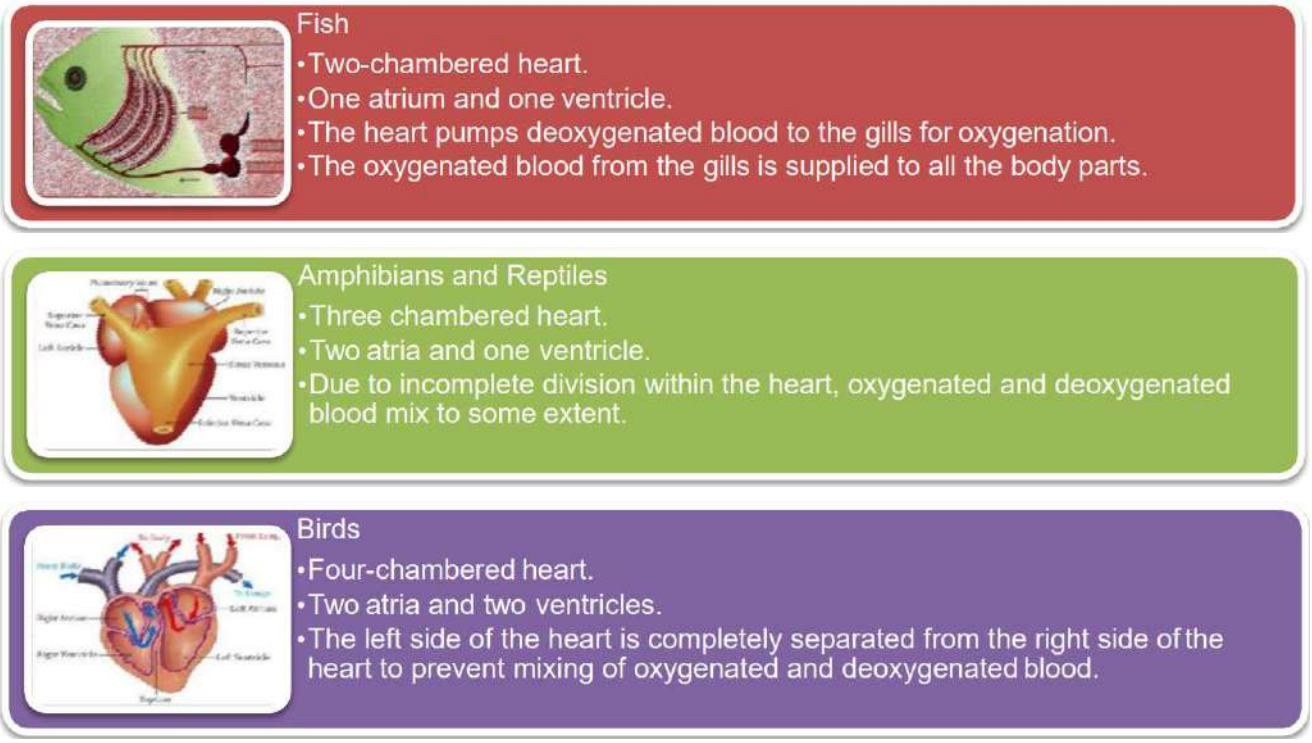
Maintenance by platelets

Naturally the loss of blood from the system has to be minimised. In addition, leakage would lead to a loss of pressure which would reduce the efficiency of the pumping system. To avoid this, the blood has platelet cells which circulate around the body and plug these leaks by helping to clot the blood at these points of injury.

Lymph and Lymphatic System

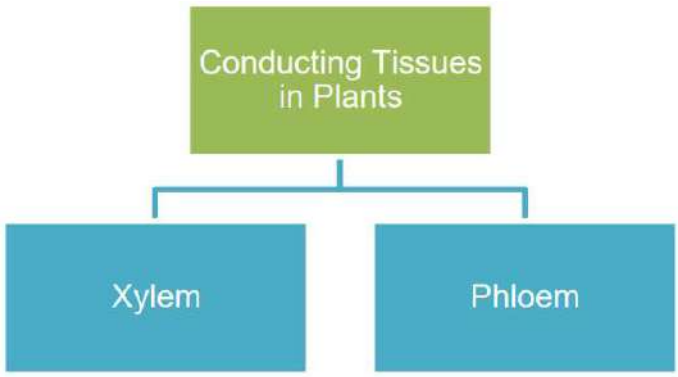
- As the blood flows through capillaries, the water, dissolved substances and a few white blood cells pass through the capillary walls into the spaces between the cells, i.e. intercellular spaces. This fluid is called **tissue fluid**.
- White blood cells in the lymph protect the body against diseases.
- The lymphatic system carries excessive tissue fluid back to the blood.

Heart in Other Vertebrates



Transportation in Plants

- **Transportation** in plants is the process by which a substance, absorbed or synthesised in one part of the plant, is transported to the other parts of the plant.
- Substances transported by the transport system are water, mineral and food prepared by plants.



1. Xylem

- It conducts water upwards in a plant.
- Xylem also provides strength to the stem and helps the plant to stand upright.
- It is located in the centre of the plant body.
- Xylem mainly consists of tracheids and vessels.

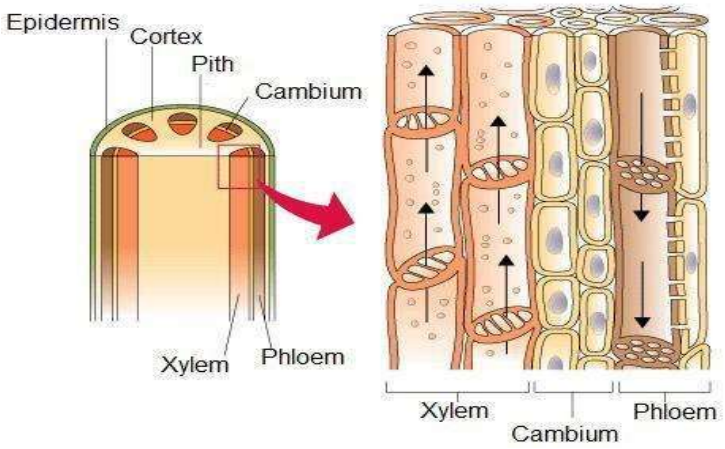
Mechanism of Transport of Water and Minerals

A.

- Water enters the root hair through osmosis, and mineral ions enter the root cells by active transport.
- Both water and minerals move upward from cell to cell through the cortex of the root by osmosis.
- From the cortex, water and minerals are brought to the xylem.
- The sap which contains water and dissolved minerals move upwards from the root cells to xylem. The upward movement of sap is called the ascent of sap.
- The xylem vessels of the roots are in continuation with the xylem vessels of the stem.

B.

- **Transpiration** is the loss of water in the form of water vapour from the aerial parts of a plant.
- It occurs through openings called stomata.
- Water loss through evaporation lowers the concentration of water inside the mesophyll cells.
- Due to this, water enters mesophyll cells from neighbouring xylem vessels through osmosis.
- As water evaporates from the leaves, a suction force is created. This force helps to draw more water up through the stem which causes the roots to absorb more water from the soil.
- Higher the rate of transpiration, greater the rate of absorption of water and solutes from the soil.
- Transpiration also helps in maintaining the temperature of the plant body.



2. Phloem

- It conducts manufactured food from the leaves to different parts of the plant.
- The food in the phloem can move in the upward and downward directions.
- Phloem mainly consists of sieve tube cells and companion cells.
- Sieve tubes are living cells of the phloem. They contain cytoplasm but no nucleus.
- The end walls of the cells form sieve plates.
- Sieve plates have small pores in them which allow food to pass through the phloem.
- Each sieve tube cell has a companion cell next to it.

Mechanism of Transport of Water and Minerals

- Food synthesised during photosynthesis is loaded into sieve tubes by utilising ATP.
- The presence of food inside the phloem develops the concentration gradient for water. Thus, water enters the phloem by osmosis.
- Osmosis develops high pressure inside the phloem which transports the food from the phloem to plant parts where the concentration of food is less.
- This process is called **translocation**.
- In spring, the sugar stored in the root or stem tissues is transported to the buds.

Xylem and phloem constitute the conducting tissues and are known as vascular tissues.

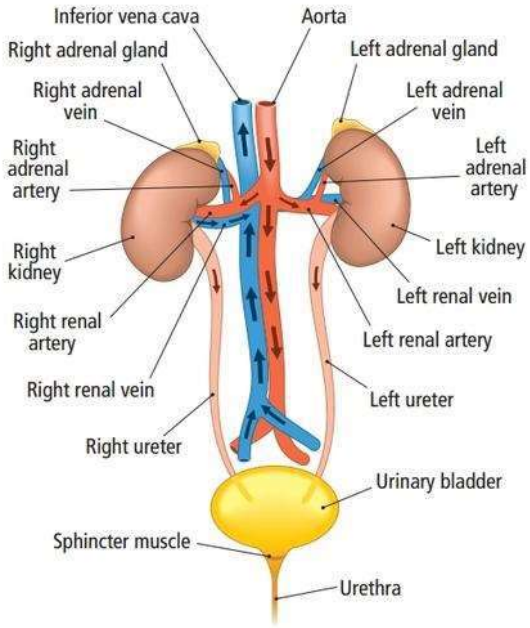
Excretion

organisms get rid of gaseous wastes generated during photosynthesis or respiration. Other metabolic activities generate nitrogenous materials which need to be removed. The biological process involved in the removal of these harmful metabolic wastes from the body is called excretion. Different organisms use varied strategies to do this. Many unicellular organisms remove these wastes by simple diffusion from the body surface into the surrounding water.

Excretion is the removal of harmful and unwanted substances, especially nitrogenous

wastes, from the body.

Excretion in Human Beings

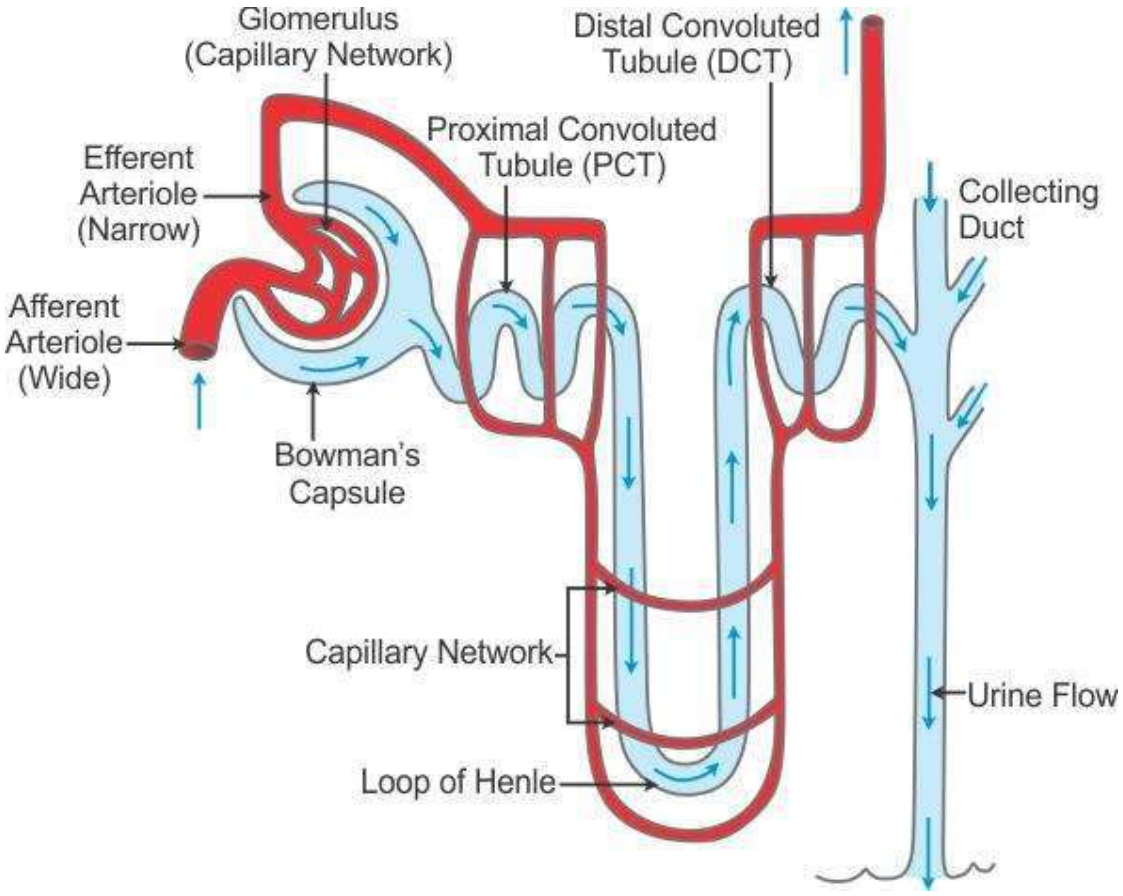


Human Urinary System

The human urinary system consists of-

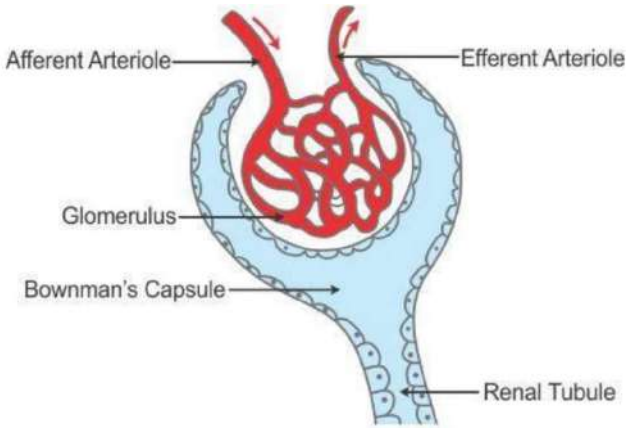
Pair of kidneys	• Dark red, bean-shaped, 10 cm long, 6 cm wide. • The right side of the kidney is slightly lower in position due to the presence of the liver.
Pair of ureters	• Ureters are tube-like structures which arise from the notch, i.e. the hilum of each kidney. • The ureters connect behind with the urinary bladder. • The ureters carry the urine produced to the urinary bladder.
Urinary bladder	• Muscular sac-like structure. • It stores urine temporarily. • Its opening is guarded by muscular sphincters. • The sphincters open at the time of micturition (urination).
Urethra	• Short muscular tube which expels urine out of the body. • The urethra is long in males and is very short in females. • The opening is guarded by sphincters which open at the time of urination.

Uriniferous Tubule



Uriniferous Tubule

- Each kidney is composed of an enormous number of uriniferous tubules.
- They are also known as nephrons, renal tubules or kidney tubules.
- Uriniferous tubules are the structural and functional units of the kidney.



Malpighian Tubule

- Each nephron has a Malpighian body and body of tubules.
- Malpighian body is nothing but a cup-shaped Bowman's capsule. In its cup-shaped depression, a tuft of blood capillaries called glomerulus is situated.
- The body of tubules contains proximal convoluted tubule (PCT), loop of Henle and distal

convoluted tubule (DCT).

- DCT opens into the collecting duct.

> Approximately 2 million uriniferous tubules are present in both the kidneys. Each single uriniferous tubule is 4 to 5 cm long.
> The great length of the uriniferous tubule provides a large surface area for the reabsorption of usable substances such as water.
> Blood flow through the kidneys per minute = 1 litre
> Glomerular filtrate produced in 24 hours = 160 litre
> Urine produced from the glomerular filtrate after reabsorption per day = 1.2 litre

Formation of Urine

The process of urine formation occurs in two major steps.

Ultrafiltration

- The efferent arteriole is narrower than the afferent arteriole which develops a hydrostatic pressure on the blood.
- Thus, the blood flows through the glomerulus with a great pressure.
- Due to the pressure, the liquid part of the blood filters out from the glomerulus and passes into the Bowman's capsule.
- The glomerular filtrate consists of water, urea, salts, glucose and other plasma solutes.
- Blood corpuscles, proteins and other large molecules remain behind in the glomerulus.
- Therefore, the blood carried away by the efferent arteriole is relatively thick.

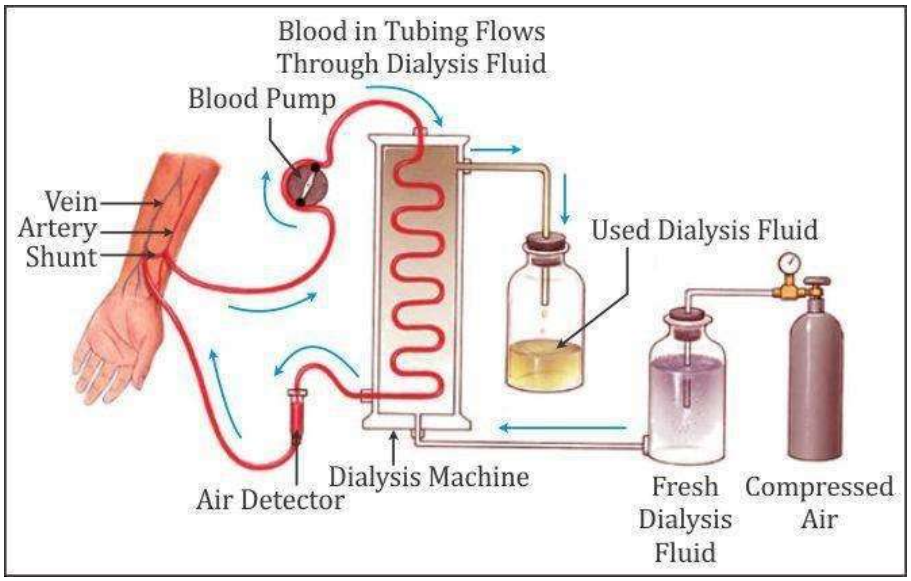
Reabsorption

- The glomerular filtrate entering the renal tubule contains many useful substances.
- Hence, as the filtrate passes down the tubule, water and other substances required by the body are reabsorbed.
- Potassium ions and certain substances such as penicillin are passed into the forming urine through the distal convoluted tubule (DCT).
- The cells of the walls of DCT are involved in bringing potassium ions and other substances back into the renal tubule; hence, this process is known as tubular secretion.

Urine Excretion

- The filtrate left after reabsorption and tubular secretion is called urine.
- The urine passes from the collecting duct into the pelvis of the kidney. From there it is sent to the urinary bladder through the ureters.
- By relaxing the sphincters present at the opening of the urethra, the urine is expelled from the body. This process is known as micturition or urination.

Artificial Kidney



If one kidney is damaged or removed, then the other kidney alone can fulfil excretory needs.

- However, the failure of both the kidneys allows urea and other wastes to accumulate in the blood.
- Such a patient undergoes dialysis.
- In dialysis, an artificial kidney is used.
- The artificial kidney contains tubes with a semi-permeable lining.
- These tubes are suspended in a tank filled with a dialysing solution.
- This fluid contains water and glucose in concentrations similar to those in blood.
- The patient's blood is led from the radial artery through the tubes of the artificial kidney where excess salts and urea are removed.
- The purified blood is returned through a vein in the same arm.
- The function of dialysis is similar to the function of the kidney, but the only difference is there is no reabsorption during dialysis.

Excretion in Plants

- Plants also produce several waste products during their life processes.
- The major waste products are water, carbon dioxide and oxygen produced during respiration and photosynthesis.
- These wastes are excreted through the stomata and lenticels.
- Plants store some waste products in leaves which fall off.
- Wastes such as gums and resins are stored in the old xylem.

Class : 10th Biology
Chapter-6 life processes

Life Processes

Nutrition

- Autotrophic nutrition in plants.
- Process Invilved is Photosynthesis

Various steps included in Heterotrophic nutrition in animals
- Ingestion
- Digestion
- Absorption
- Assimilation
- Egestion

Alimentary canal and their secretions
- Mouth (saliva)
- Pharynx
- Oesophagus
- Stomach (HCl, Gastric Juice)
- Small Intestine
- Large Intestin
- Anus

Respiration in Animal (Human Beings)

Parts of Human Respiratory System
- Alveoli
- Bronchioles
- Trachea
- Lungs
- Bronchi
- Nostrils

Mechenism of Breathing
- Expiration
- Gaseous exchange
- Inspiration

Excretion

In Plants: Process involved is Transpiration

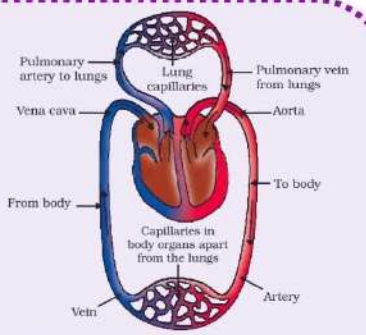
In Human: Kidney helps in formation of urine

In Human, basic unit of kidney-Nephron
Parts of Nephron
- Bowman's Capsule
- Glomerulus
- Proximal Convoluted Tubule
- Loop of Henle
- Distal Comvoluted Tubule

Double Circulation in Human

Circulatory system in Human
- Blood
- Heart
- Vlood Vessels

Transportation in Plants
- Phleom (Transport of water)
- Xylem (Transport of food)



Important Questions

➢ Multiple Choice Questions:

1. The autotrophic mode of nutrition requires:

(a) carbon dioxide and water

(b) chlorophyll

(c) sunlight

(d) all of the above

2. The largest gland in human body is:

(a) liver

(b) gastric glands

(c) pancreas

(d) salivary glands.

3. Number of salivary glands found in man are:

(a) one pair

(b) two pairs

(c) three pairs

(d) five pairs

4. Pancreatic juice helps in the digestion of:

(a) proteins

(b) proteins and fats

(c) proteins and carbohydrates

(d) proteins, carbohydrates, and fats

5. ATP and NADP 2H are produced in:

(a) Mitochondria

(b) Chloroplast

(c) Peroxisomes

(d) Lysosomes

6. Oxygen evolved during photosynthesis comes from:

(a) water

(b) CO_2

(c) soil

(d) atmosphere.

7. Rate of photosynthesis is high in:

(a) orange light

(b) green light

(c) red light

(d) yellow light

8. The ultimate source of all metabolic energy on our earth is:

(a) green plants

(b) the sun

(c) O_2

(d) O_2 and H_2O.

9. Light reaction takes place in:

(a) grana

(b) stroma

(c) mitochondria

(d) leucoplast.

10. Plants purify air by:

(a) transpiration

(b) photosynthesis

(c) respiration

(d) absorption of water

➢ Very Short Question:

1. Name the term for transport of food from leaves to other parts of plants.
2. What process in plants is known as transpiration?
3. Name the tissue which transports soluble products of photosynthesis in a plant.
4. Name the tissue which transports water and minerals in a plant.
5. How do autotrophs obtain CO_2 and N_2 to make their food?
6. Which pancreatic enzyme is effective in digesting protein?
7. Which enzyme present in saliva breaks down starch?
8. What is the role of acid in our stomach?
9. What is the role of saliva in the digestion of food?

10. State the function of digestive enzymes.

➢ Short Questions:

1. (a) Name two different ways in which glucose is oxidized to provide energy in various organisms.

(b) Write any two differences between the two ways of oxidation of glucose in organisms.

2. What is the function of trachea? Why do the walls not collapse even when there is less air in it?

3. Name any two digestive enzymes secreted in the human digestive system and write their function.

4. How do they take up carbon dioxide and perform photosynthesis?

5. (a) What will happen to guard cells and the stomatal pore when water flows into guard cells.

(b) How do plants transmit information from cell to cell?

6. What are the different ways in which glucose is oxidized to provide energy in various organisms?

7. What is excretion? How do unicellular organisms remove their wastes?

8. What is internal energy reserve in plants? Do the animals have the same energy reserve? Justify your answer.

➢ Long Questions:

1. (a) List two differences between 'holozoic nutrition' and 'saprophytic nutrition. Give two examples each of these two types of nutrition.

(b) State the roles of liver and pancreas.

(c) Name the organ which performs the following functions in humans:

- Absorption of digested food
- Absorption of water.

(d) Explain the statement, "Bile does not contain any enzyme but it is essential for digestion."

2. (a) Draw a diagram to show the human alimentary canal and label on it the following: Gall bladder,

Stomach. Name the longest part of the alimentary canal.

(b) Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?

3. (a) List three events that occur during the process of photosynthesis. State in brief

the role of stomata in this process.

(b) Describe an experiment to show that sunlight is essential for photosynthesis.

➢ Assertion Reason Questions:

1. For two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:
   a. Both A and R are true, and R is correct explanation of the assertion.
   b. Both A and R are true, but R is not the correct explanation of the assertion.
   c. A is true but R is false.
   d. A is false but R is true.

Assertion: Ventricles have thicker walls than auricles.

Reason: Ventricles have to pump blood into various organs with great pressure.

2. For two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:
   a. Both A and R are true, and R is correct explanation of the assertion.
   b. Both A and R are true, but R is not the correct explanation of the assertion.
   c. A is true but R is false.
   d. A is false but R is true.

Assertion: Ureters are the tubes which carry urine from kidneys to the bladder.

Reason: Urine is stored in the urethra.

➢ Case Study Questions:

1. Read the following and answer any four questions from (i) to (v).

   Heterotrophic nutrition is a mode of nutrition in which organisms obtain readymade organic food from outside sources. The organisms that depend upon outside sources for obtaining organic nutrients are called heterotrophs. Heterotrophic nutrition is of three types: saprophytic, parasitic, and holozoic nutrition.

   i. In which of the following groups of organisms' food material is broken outside the body and absorbed?
      a. Mushroom, green plants, Amoeba.
      b. Yeast, mushroom, bread mould.
      c. Paramecium, Amoeba, Cuscuta.

d. Cuscuta, lice, tapeworm.

ii. Which of the following is a parasite?

a. Yeast
b. Taenia
c. Amoeba
d. Earthworm

iii. Which of the following is an example of saprotroph?

a. Grass
b. Mushroom
c. Amoeba
d. Paramecium

iv. Heterotrophic nutrition involves:

a. Production of simple sugar from inorganic compounds.
b. Utilisation of chemical energy to prepare food.
c. Utilisation of energy obtained by plants.
d. All of these.

v. In Paramecium, food enters the body through:

a. Mouth
b. Pseudopodia
c. Cilia
d. Cytostome.

2. Read the following and answer any four questions from (i) to (v).

All living cells need nutrients, O_2 and other essential substances. Also, the waste and harmful substances need to be removed continuously for healthy functioning of cells. So, a well-developed transport system is mandatory for living organisms. Complex organisms have special fluids within their bodies to transport such materials. Blood is the most commonly used body fluid by most of the higher organisms. Lymph also helps in the transport of certain substances.

i. Which of the following does not exhibit phagocytic activity?

a. Monocytes.
b. Neutrophils.
c. Basophil.

d. Macrophage.

ii. Amount of blood corpuscles in changed in dengue fever. One of the common symptoms observed in people infected with dengue fever is:

a. Significant decrease in RBC count.

b. Significant decrease in WBC count.

c. Significant decrease in platelets count.

d. Significant increase in platelets count.

iii. Why are WBCs called soldiers of the body?

a. They are capable of squeezing out of blood capillaries.

b. They are manufactured in bone marrow.

c. They fight against disease causing germs.

d. They have granular cytoplasm with lobed nucleus.

iv. Name the blood cells, whose reduction in number can cause clotting disorder, leading to excessive loss of blood from the body.

a. Erythrocytes.

b. Neutrophils.

c. Leucocytes.

d. Thrombocytes.

v. Which of the following is the correct feature of lymph?

a. It is similar to the plasma of blood but is colourless and contains less proteins.

b. It is similar to the WBCs of blood but is colourless and contain more proteins.

c. It is similar to the RB Cs of blood and red in colour.

d. It contains more fats.

✔Answer Key-

➢ Multiple Choice Answers:

1. (d) all of the above
2. (a) liver
3. (c) three pairs
4. (d) proteins, carbohydrates and fats
5. (a) Mitochondria

6. (a) water
7. (c) red light
8. (b) the sun
9. (a) grana
10. (b) photosynthesis

➢ Very Short Answers:

1. Answer: Translocation of food.
2. Answer: It is loss of water in the vapour form from the exposed parts of a plant.
3. Answer: Phloem.
4. Answer: Xylem.
5. Answer: Autotrophs obtain CO_2 from air and N_2 as nitrate or ammonium ion from soil.
6. Answer: Trypsin.
7. Answer: Ptyalin or salivary amylase.
8. Answer: HCl of gastric juice disinfects the food and acidifies it for proper functioning of proteolytic enzyme pepsin.
9. Answer: Saliva moistens the ingested food with mucus, sterilizes it with lysozyme and partially digests starch part of food into sugar with the help of salivary amylase or ptyalin.
10. Answer: Digestive enzymes are hydrolytic enzymes which cause breakdown of complex and insoluble components of food into simple, soluble, and absorbable substances.

➢ Short Answer:

1. Answer:

   (a) Aerobic and anaerobic.

   (b) Differences

2. Answer: Trachea is a tube that connects pharynx with lungs for carrying air to and from lungs. Trachea is lined by ciliated mucus secreting pseudostratified epithelium for trapping dust particles and microbes.

   Trachea does not collapse in reduced air pressure due to support of C-shaped cartilaginous rings.

3. Answer:

(*i*) Salivary Amylase or Ptyalin. Starch $\xrightarrow{\text{ptyalin}}$ Maltose + Dextrins

(*ii*) Pepsin (of Gastric Juice). Protein $\xrightarrow{\text{pepsin}}$ Peptones + Proteoses.

4. Answer: Carbon dioxide is absorbed during night when stomata are open. It is fixed in malic acid from which the same is released during day time for performing Calvin cycle in light.
5. Answer:

   (a) Guard cells swell up and a stomatal pore is created in between them.

   (b) Information is transmitted from one plant cell to another through plasmodesmata and hormones.
6. Answer:

   (i) Aerobic. $C_6H_{12}O_6 + 6O_2 \rightarrow 6\ CO_2 + 6\ H_2O$ + Energy

   (ii) Anaerobic,

   (a) $C_6H_{12}O_6 \rightarrow$ 2 Ethanol + 2 CO_2 + Energy.

   (b) $C_6H_{12}O_6 \rightarrow$ 2 Lactic acid + Energy
7. Answer: Excretion is the biological process of removal of harmful metabolic waste products from the body.

   In unicellular organisms, excretion occurs through simple diffusion from the surface.
8. Answer: The major internal energy reserve in plants is starch (a complex carbohydrate). Animals do not have the same energy reserve. Instead, they possess glycogen (and fat).

➢ Long Answer:

1. Answer:

   (a) Differences between Holozoic Nutrition and Saprophytic Nutrition

Saprophytic Nutrition	Holozoic Nutrition
Organisms obtain their nutrients from dead and decaying organic matter.	It involves ingestion and digestion of food materials which are then absorbed and assimilated to produce energy.
It is seen in fungi and bacteria.	It is observed in higher organisms like vertebrates.
Dead and decaying organic matter is used.	Complex organic food material is used.

Such organisms do not have a complete digestive system.	Such organisms have a complete digestive system.
Nutrients are absorbed through the cell wall.	Nutrients are absorbed through the digestive system.

(b) Role of Liver: Decomposition of haemoglobin, formation and secretion of bile for emulsification of fat. Formation of urea, heparin fibrinogen and prothrombin. Detoxification of chemicals and elimination of pathogens.

Role of Pancreas: Secretion of pancreatic juice having lipase, trypsin and amylase; secretion of hormones, insulin and glucagon.

(c) Absorption of Digested Food. Ileum part of small intestine.

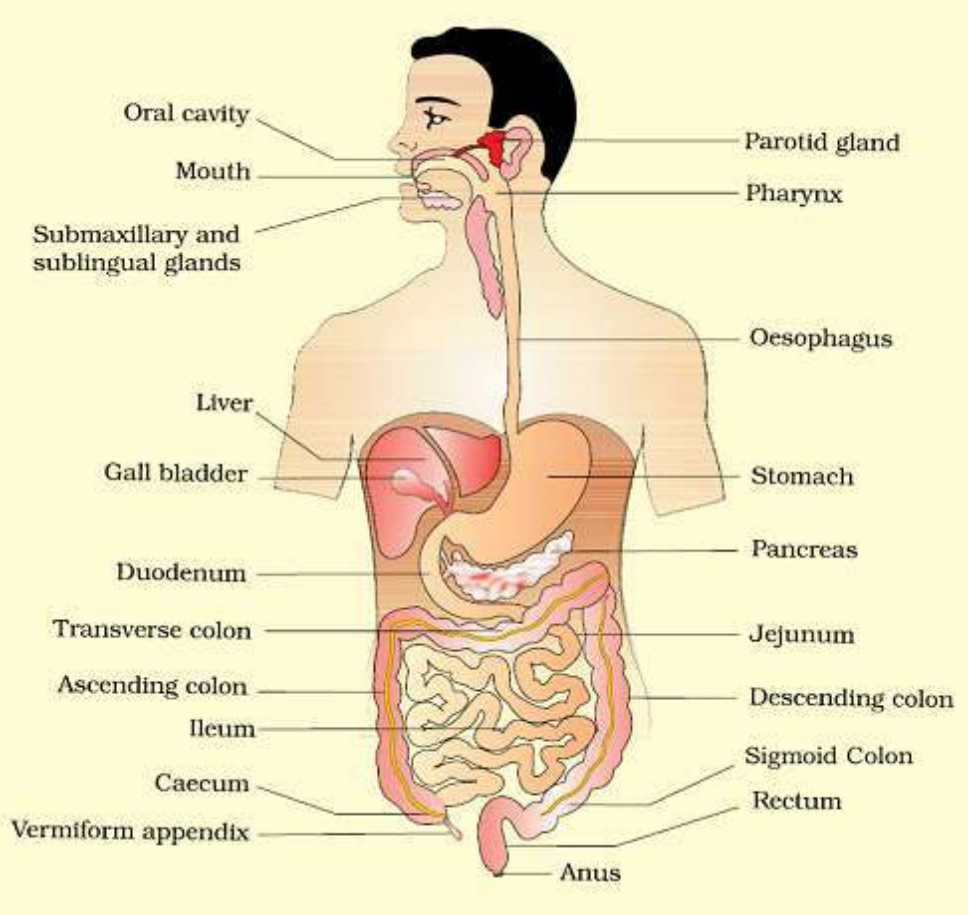
Absorption of Water. Large intestine.

(d) Role of Bile in Digestion.

Breaking of fat into fine globules or emulsification,

Neutralisation of acidity and making food alkaline for action of pancreatic and other enzymes.

2. Answer:



Human Alimentary canal

Longest Part. Small intestine (about 6 meters).

(b) Separation of Oxygenated and Deoxygenated Bloods in Birds and Mammals.

Energy needs of birds and mammals are higher due to thermoregulation of body and increased activity. They require regular and quicker supply of oxygenated blood for all body parts. This is possible only when there is complete separation of oxygenated blood and quicker oxygenation of deoxygenated blood.

3. Answer:

(a) Three Events of Photosynthesis: Information is transmitted from one plant cell to another through plasmodesmata and hormones.

Role of Stomata in Photosynthesis. Inward diffusion of carbon dioxide and outward diffusion of oxygen.

(b) Sunlight is Essential for Photosynthesis: It is the source of energy for photosynthesis. Light is visible part of the electromagnetic radiations. It has a wavelength of 390-760 nm. Photosynthetically active radiations or PAR are 400-700 nm. Natural source of light is sun but artificial light can also provide energy to plants for their photosynthesis. Plants absorb light mostly in violet-blue and red parts of visible light. Violet-blue light carries more energy as compared to red light.

Plants growing under shade of others receive mostly green and some violet light. They have lower rates of photosynthesis.

Light has two functions, photolysis of water and excitation of chlorophyll to emit electrons. Photolysis of water produces oxygen, protons, and electrons. Electrons and protons (Hydrogen ions) help in producing ATP and NADPH2, popularly called assimilatory power.

➢ Assertion Reason Answer:

1. (a) Both A and R are true, and R is correct explanation of the assertion.

Explanation:

Ventricles are larger and thick-walled chambers of the heart. These act as distribution chambers, as they supply blood to all parts of our body with high pressure.

2. A is true but R is false.

Explanation:

The bladder is a bag which stores urine till the time we go to toilet. The urine collected in the bladder is passed out from the body through the urethra.

➢ Case Study Answer:

1. i (b) Yeast, mushroom, bread mould.

Explanation:

Yeast, mushroom, and bread mould have a saprophytic mode of nutrition which is chemoheterotrophic in nature. They breakdown complex organic substances by secreting digestive enzyme outside their body and absorb simple molecules as nutrients.

ii. (b) Taenia

iii. (b) Mushroom

iv. (c) Utilisation of energy obtained by plants.

Explanation:

Heterotrophic nutrition is mode of nutrition in which an organism depends on other living organisms for food.

v. (d) Cytostome.

Explanation:

Feeding apparatus in Paramecium consists of peristome, vestibule, buccal cavity, cytostome (cell mouth) and cytopharynx.

2. i (c) Basophil.

Explanation:

Basophiles release heparin, serotonin, and histamine. They are like mast cells of connective tissue and are not phagocytic in nature.

ii. (c) Significant decrease in platelets count.

iii. (c) They fight against disease causing germs.

Explanation:

WBCs manufacture antibodies, which fight against disease causing germs and are responsible for immunity, thus called soldiers of the body.

iv. (d) Thrombocytes.

v. (a) It is similar to the plasma of blood but is colourless and contains less proteins.

Explanation:

Lymph is a colourless fluid, which contains blood plasma along with leucocytes and have fewer proteins.

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Ans. Every living cell requires oxygen for performing cellular respiration. In unicellular organisms (e.g. Amoeba), the single cell is in direct contact with environment. Oxygen passes into it through diffusion. In simple multicellular organisms (e.g. Hydra), every cell may also get oxygen through diffusion from environment. This is not possible in complex multicellular organisms like humans. The living cells are not in contact with external environment. Diffusion cannot carry oxygen to each and every cell through a small opening meant for passage of air because cell to cell diffusion is a very slow process. Passage of oxygen from lungs to toes through cell to cell diffusion will take about three years.

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Ans. Each lung has a highly branched respiratory tract called respiratory tree. A primary bronchus divides into secondary bronchi, secondary into segmental bronchi, segmental bronchus into bronchioles which divide into terminal bronchioles, respiratory bronchioles, alveolar sacs and alveoli. Alveoli are small rounded or polyhedral pouches which are extremely thin walled and possess a network of capillaries over their surface. They function as respiratory surfaces. The total area of all the alveoli is more than 80 m^2. It is several times more than the surface area of the whole human body.

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Ans. Human transport system has two components, blood vascular system and lymphatic system.

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Ans. Amount of urine is regulated by volume of blood and amount of antidiuretic hormone (ADH). Volume of blood is determined by presence or absence of extra water in the body. more blood volume will increase pressure in the glomerulus. It increases the amount of glomerular or nephric filtrate. ADH is not secreted. Dilute urine is allowed to pass through the kidneys. The amount of urine is higher than the normal.

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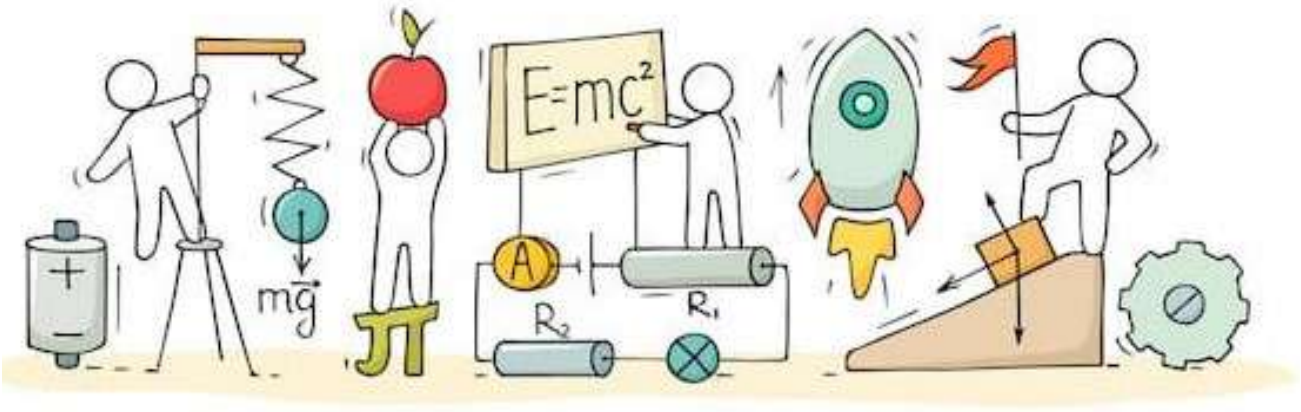
SCIENCE

(Physics)

Chapter 9: Light – Reflection and Refraction



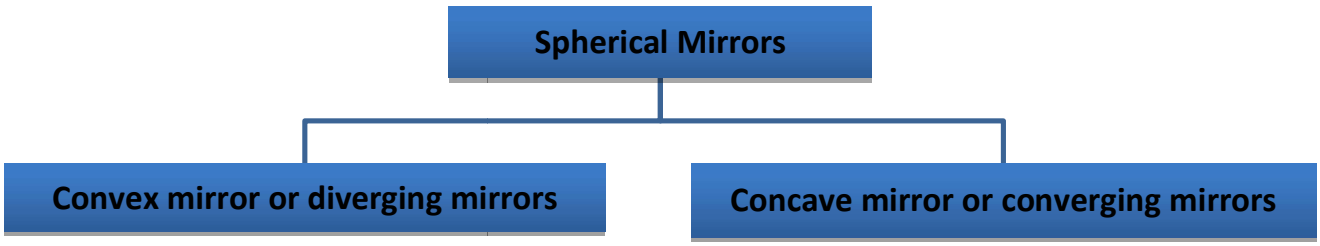
Light – Reflection and Refraction

Reflection of Light

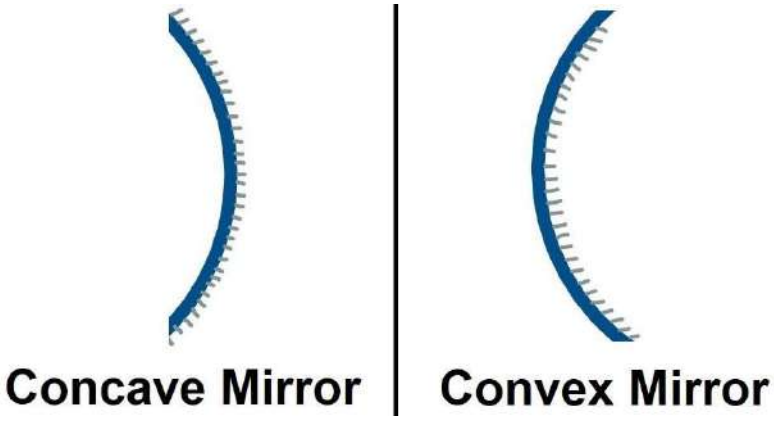
- Reflection is the phenomenon of bouncing back of light into the same medium on striking the surface of any object.
- **Laws of Reflection**
  - **First law:** The incident ray, the normal to the surface at the point of incidence and the reflected ray, all lie in the same plane.
  - **Second law:** The angle of incidence(i) is always equal to the angle of reflection (r).

    ∠i = ∠r
- The image formed by a **plane mirror** is always
  - virtual and erect
  - of the same size as the object
  - as far behind the mirror as the object is in front of it
  - laterally inverted

Spherical mirrors are of two types:



- **Convex mirrors or diverging mirrors** in which the reflecting surface is curved outwards.
- **Concave mirrors or converging mirrors** in which the reflecting surface is curved inwards.



Some terms related to spherical mirrors:

- The **centre of curvature (C)** of a spherical mirror is the centre of the hollow sphere of glass, of which the spherical mirror is a part.

- The **radius of curvature (R)** of a spherical mirror is the radius of the hollow sphere of glass, of which the spherical mirror is a part.
- The **pole (P)** of a spherical mirror is the centre of the mirror.
- The **principal axis** of a spherical mirror is a straight line passing through the centre of curvature C and pole P of the spherical mirror.
- The **principal focus (F) of a concave mirror** is a point on the principal axis at which the rays of light incident on the mirror, in a direction parallel to the principal axis, actually meet after reflection from the mirror.
- The **principal focus (F) of a convex mirror** is a point on the principal axis from which the rays of light incident on the mirror, in a direction parallel to the principal axis, appear to diverge after reflection from the mirror.
- The **focal length (f)** of a mirror is the distance between its pole (P) and principal focus(F).
- For spherical mirrors of small aperture, **R =2f**.

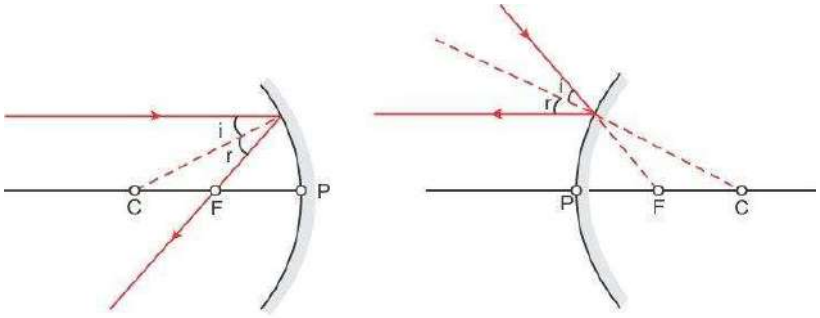
Sign Conventions for Spherical Mirrors

According to **New Cartesian Sign Conventions**,

- All distances are measured from the pole of the mirror.
- The distances measured in the direction of incidence of light are taken as positive and *viceversa*.
- The heights above the principal axis are taken as positive and *viceversa*.

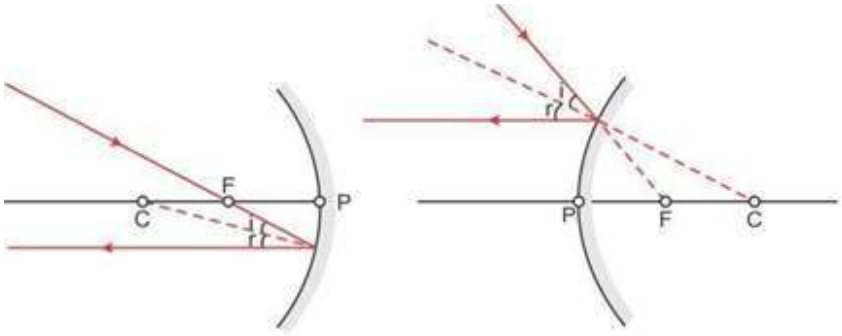
Rules for tracing images formed by Spherical Mirrors

Rule 1: A ray which is parallel to the principal axis after reflection passes through the principal focus in case of a concave mirror or appears to diverge from the principal focus in case of a convex mirror.



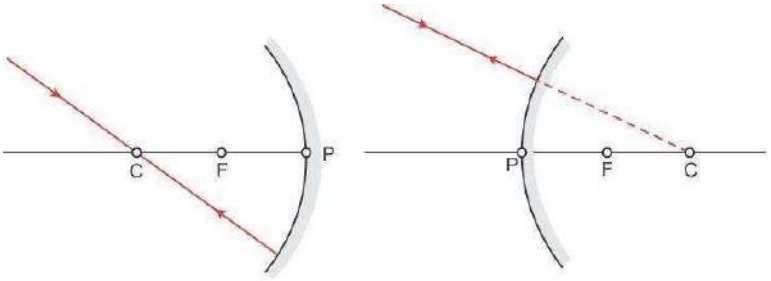
Concave Mirror Convex Mirror

Rule 2: A ray passing through the principal focus of a concave mirror or a ray which is directed towards the principal focus of a convex mirror emerges parallel to the principal axis after reflection.



Concave Mirror Convex Mirror

Rule 3: A ray passing through the centre of curvature of a concave mirror or directed towards the centre of curvature of a convex mirror is reflected back along the same path.



Concave Mirror Convex Mirror

Rule 4: A ray incident obliquely towards the pole of a concave mirror or a convex mirror is reflected obliquely as per the laws of reflection.

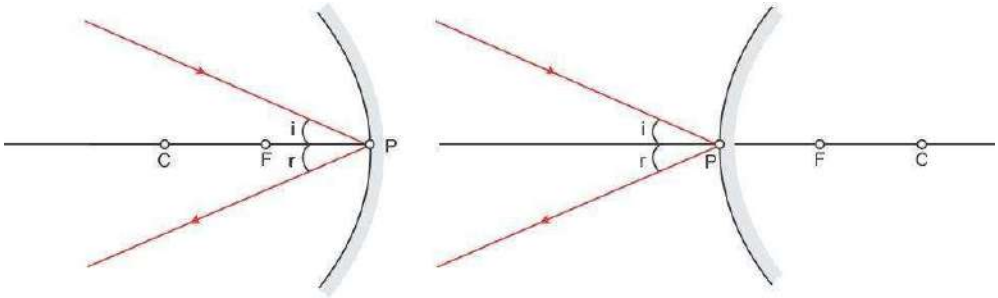
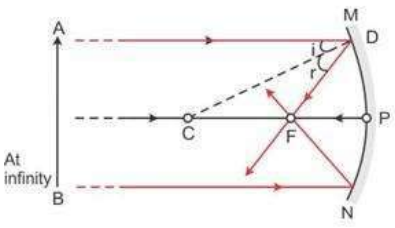
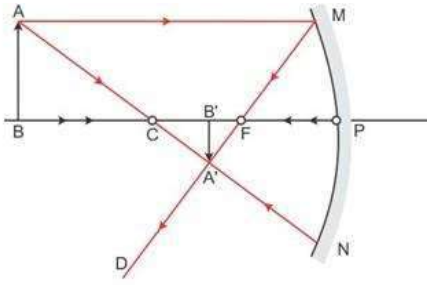


Image formation by a concave mirror

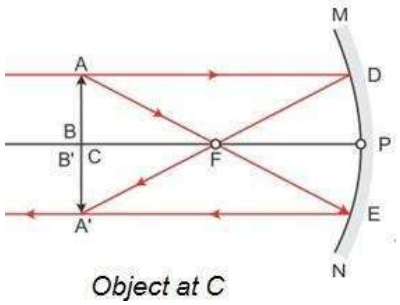
- **Ray Diagrams**



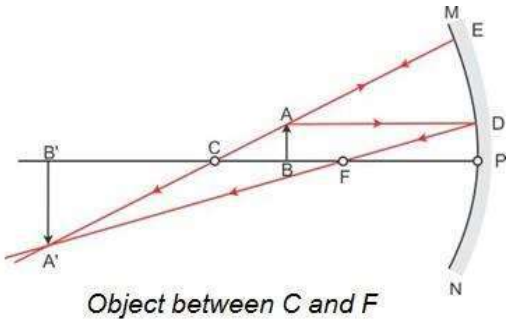
Object at infinity



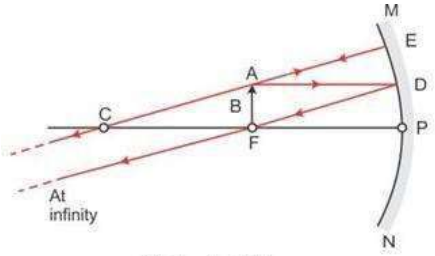
Object beyond C



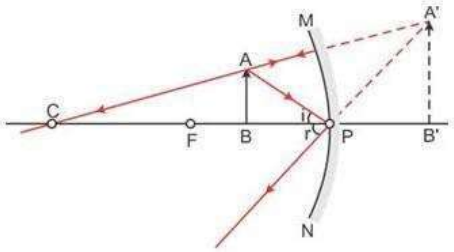
Object at C



Object between C and F



Object at F



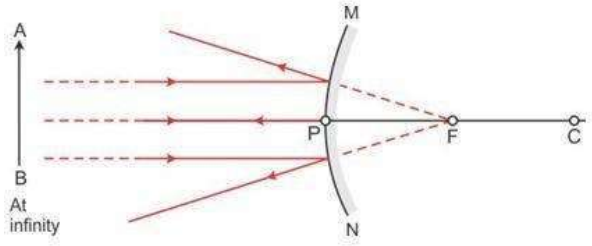
Object between F and P

- **Characteristics of images formed**

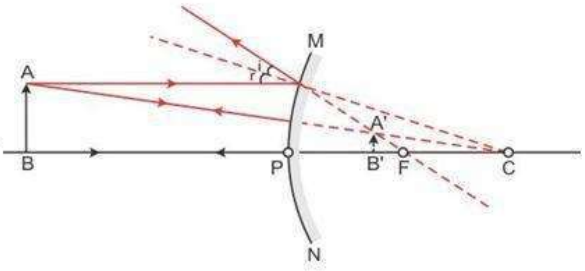
Position of object	Position of image	Size of image	Nature of image
At infinity	At focus F	Highly diminished	Real and inverted
Beyond C	Between F and C	Diminished	Real and inverted
At C	At C	Equal to size of object	Real and inverted
Between C and F	Beyond C	Enlarged	Real and inverted
At F	At infinity	Highly enlarged	Real and inverted
Between F and P	Behind the mirror	Enlarged	Virtual and erect

Image formation by a convex mirror

- **Ray Diagrams**



Object at infinity



Object anywhere between infinity and P

- **Characteristics of images formed**

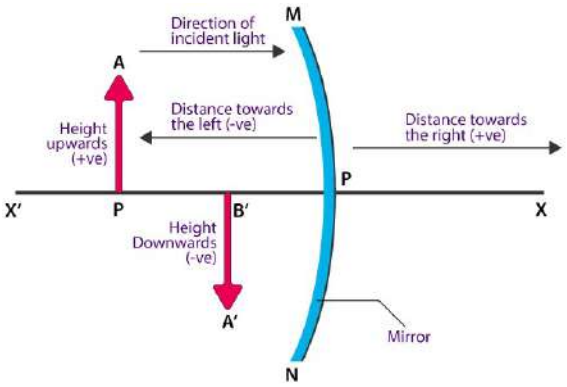
Position of object	Position of image	Size of image	Nature of image
At infinity	At focus F behind the mirror	Highly diminished, point sized	Virtual and erect

Anywhere between infinity and the pole of the mirror	Between P and F behind the mirror	Diminished	Virtual and erect

Sign Convention for Reflection by Spherical Mirrors

While dealing with the reflection of light by spherical mirrors, we shall follow a set of sign conventions called the New Cartesian Sign Convention. In this convention, the pole (P) of the mirror is taken as the origin. The principal axis of the mirror is taken as the x-axis (X'X) of the coordinate system. The conventions are as follows:

- The object is always placed to the left of the mirror. This implies that the light from the object falls on the mirror from the left-hand side.
- All distances parallel to the principal axis are measured from the pole of the mirror.
- All the distances measured to the right of the origin (along + x-axis) are taken as positive while those measured to the left of the origin (along – x-axis) are taken as negative.
- Distances measured perpendicular to and above the principal axis (along + y-axis) are taken as positive.
- Distances measured perpendicular to and below the principal axis (along –y-axis) are taken as negative.



The New Cartesian Sign Convention for spherical mirrors

- **Mirror Formula**

The object distance (u), image distance (v) and focal length (f) of a spherical mirror are related as

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

- **Linear Magnification (m)**

The magnification produced by a spherical mirror indicates the extent to which an object's

Magnification is defined as the ratio of the image's height to the object's height. The letter m is commonly used to represent it.

If h is the object's height and h' is the image's height, then the magnification m produced by a spherical mirror can be written as

$$m = \frac{\text{Height of the Image}}{\text{Height of the object}} = \frac{h'}{h}$$

it is also defined as the ratio of image distance from pole to object distance from pole with negative sign i.e

$$m = \frac{-v}{u}$$

m is **negative** for real images and **positive** for virtual images.

Refraction of Light

- The phenomenon of change in the path of a beam of light as it passes from one medium to another is called refraction of light.
- The **cause of refraction** is the change in the speed of light as it goes from one medium to another.
- **Laws of Refraction**
  - **First Law:** The incident ray, the refracted ray and the normal to the interface of two media at the point of incidence, all lie in the same plane.
  - **Second Law:** The ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant for a given pair of media.

    $$\frac{\sin \sin i}{\sin \sin r} = \text{constant} = {}^{1}n_2$$

    This law is also known as **Snell's law**.

The constant, written as ${}^{1}n_2$ is called the **refractive index** of the second medium (in which the refracted ray lies) with respect to the first medium (in which the incident ray lies).

- **Absolute refractive index (n)** of a medium is given as

$$n = \frac{\text{speed of light in vacuum}}{\text{speed of light in the medium}} = \frac{C}{V}$$

- When a beam of light passes from medium 1 to medium 2, the refractive index of medium 2 with respect to medium 1 is called the **relative refractive index**, represented by ${}^{1}n$,where

$${}^{1}n_2 = \frac{n_2}{n_1} = \frac{cv_2}{cv_1} = \frac{v_1}{v_2}$$

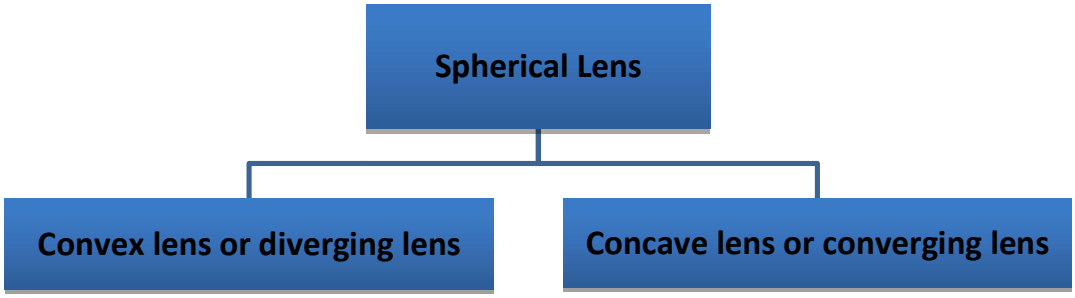
Similarly, the refractive index of medium 1 with respect to medium 2 is

$$^2n_1 = \frac{n_1}{n_2} = \frac{cv_1}{cv_2} = \frac{v_2}{v_1}$$

$$\Rightarrow {}^1n_2 \times {}^2n_1 = 1$$

$$\text{or, } {}^1n_2 = \frac{1}{{}^2n_1}$$

- While going from **a rarer to a denser medium**, the ray of **light bends towards the normal**. While going from **a denser to a rarer medium**, the ray of **light bends away from the normal.**
- **Conditions for no refraction**
  - When light is incident normally on a boundary.
  - When the refractive indices of the two media are equal.
- In the case of a **rectangular glass slab**, a ray of light suffers **two refractions**, one at the air–glass interface and the other at the glass–air interface. The emergent ray is **parallel** to the direction of the incident ray.



  - **Convex lens or converging lens** which is thick at the centre and thin at the edges.
  - **Concave lens or diverging lens** which is thin at the centre and thick at the edges.
- Some terms related to spherical lenses:
  - The central point of the lens is known as its **optical centre(O)**.
  - Each of the two spherical surfaces of a lens forms a part of a sphere. The centres of these spheres are called **centres of curvature** of the lens. These are represented as $\mathbf{C_1}$and$\mathbf{C_2}$.
  - The **principal axis** of a lens is a straight line passing through its two centres of curvature.
  - The **principal focus of a convex lens** is a point on its principal axis to which light rays parallel to the principal axis converge after passing through the lens.
  - The **principal focus of a concave lens** is a point on its principal axis from which light rays, originally parallel to the principal axis appear to diverge after passing through the lens.
  - The **focal length (f)** of a lens is the distance of the principal focus from the optical centre.
- **Sign Conventions for Spherical Lenses**

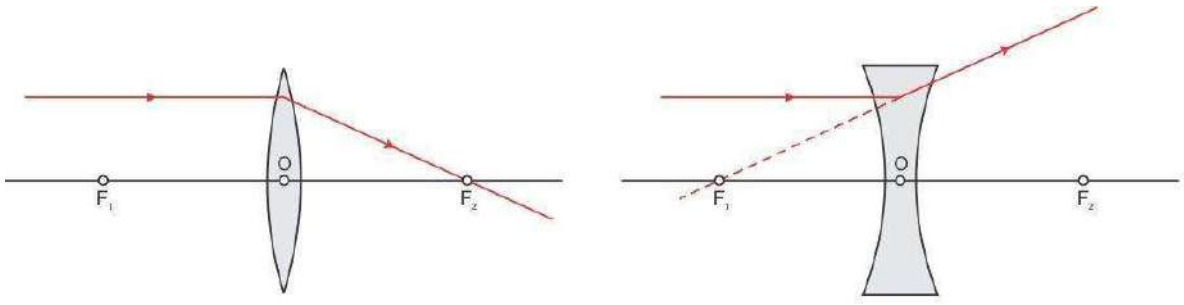
  According to **New Cartesian Sign Conventions**,

  - All distances are measured from the optical centre of the lens

- The distances measured in the direction of incidence of light are taken as positive and *vice versa*.
- The heights above the principal axis are taken as positive and *vice versa*.
- Focal length of convex lens is taken positive and that of concave lens negativel.

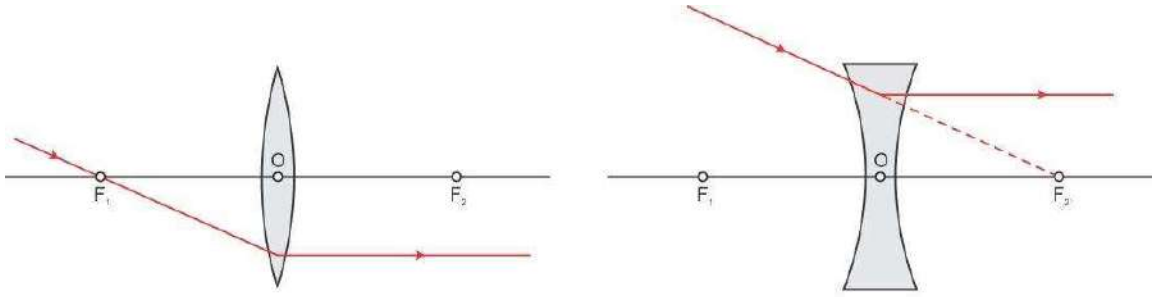
- **Rules for tracing images formed by spherical lens**

Rule 1: A ray which is parallel to the principal axis, after refraction passes through the principal focus on the other side of the lens in case of a convex lens or appears to diverge from the principal focus on the same side of the lens in case of a concave lens.



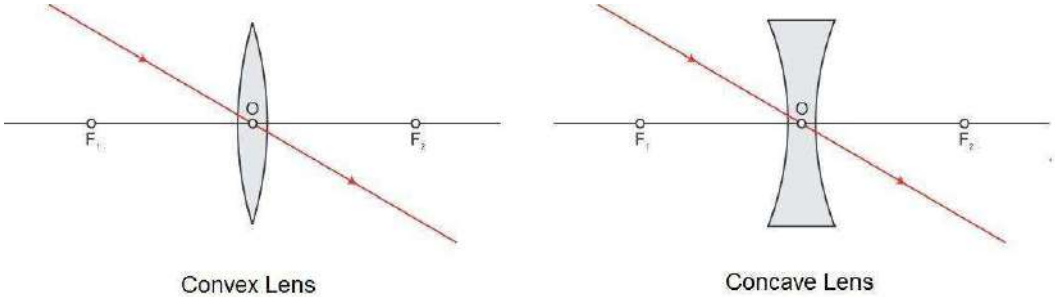
Convex Lens Concave Lens

Rule 2: A ray passing through the principal focus of a convex lens or appearing to meet at the principal focus of a concave lens after refraction emerges parallel to the principal axis.



Convex Lens Concave Lens

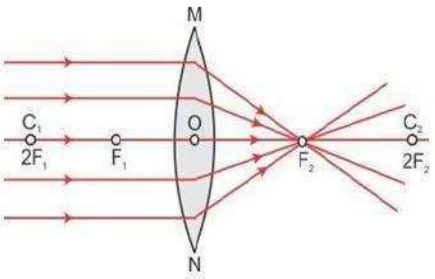
Rule 3: A ray passing through the optical centre of a convex lens or a concave lens emerges without any deviation.



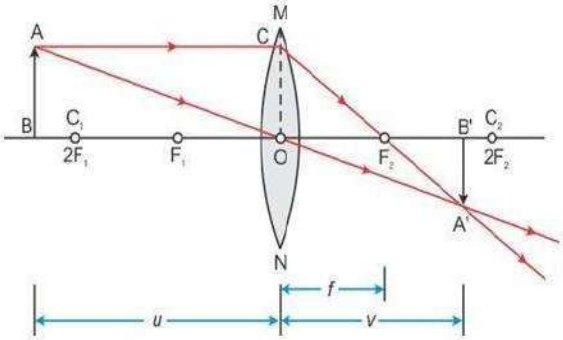
Convex Lens Concave Lens

Image formation by a convex lens

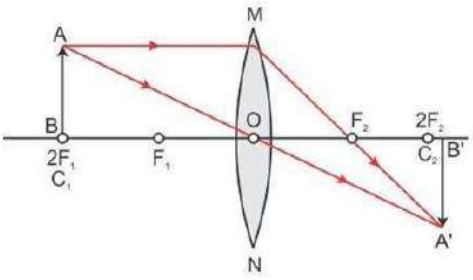
- **Ray Diagrams**



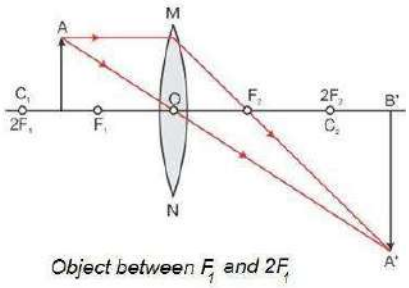
Object at infinity



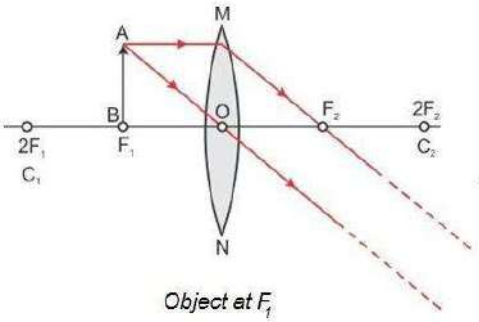
Object beyond $2F_1$



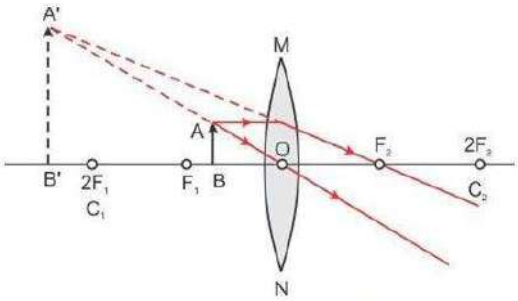
Object at $2F_1$



Object between F_1 and $2F_1$



Object at F_1



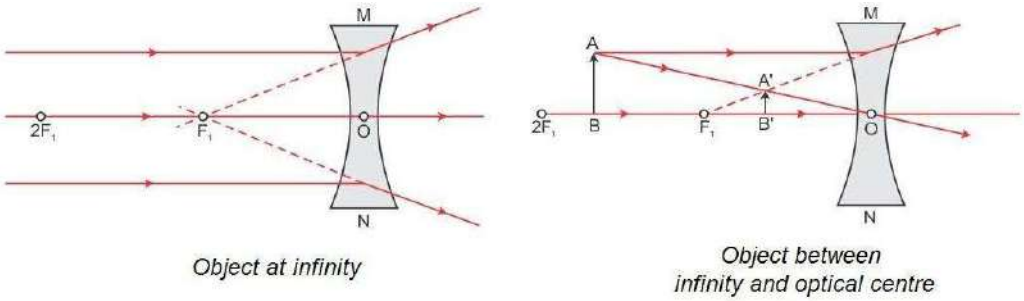
Object between F_1 and C

- **Characteristics of images formed**

Position of object	Position of image	Size of image	Nature of image
At infinity	At focus F_2	Highly diminished	Real and inverted
Beyond $2F_1$	Between F_2 and $2F_2$	Diminished	Real and inverted
At $2F_1$	At $2F_2$	Equal to size of object	Real and inverted
Between F_1 and $2F_1$	Beyond $2F_2$	Enlarged	Real and inverted
At focus F_1	At infinity	Highly enlarged	Real and inverted
Between F_1 and O	Beyond F_1 on the same side as the object	Enlarged	Virtual and erect

- **Image formation by a concave lens**

- **Ray Diagrams**



Object at infinity | *Object between infinity and optical centre*

- **Characteristics of imagesformed**

Position of object	Position of image	Size of image	Nature of image
At infinity	At focus F_1	Highly diminished	Virtual and erect
Between infinity and O	Between focus F_1 and O	Diminished	Virtual and erect

- **Lens Formula**

Object distance (u), image distance (v) and focal length (f) of a spherical lens are related as

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

- **Linear Magnification (m)** produced by a spherical lens is

$$m = \frac{\text{Height of the Image}}{\text{Height of the object}} = \frac{h'}{h} \text{ or}$$

$$m = \frac{-v}{u}$$

m is **negative** for real images and **positive** for virtual images.

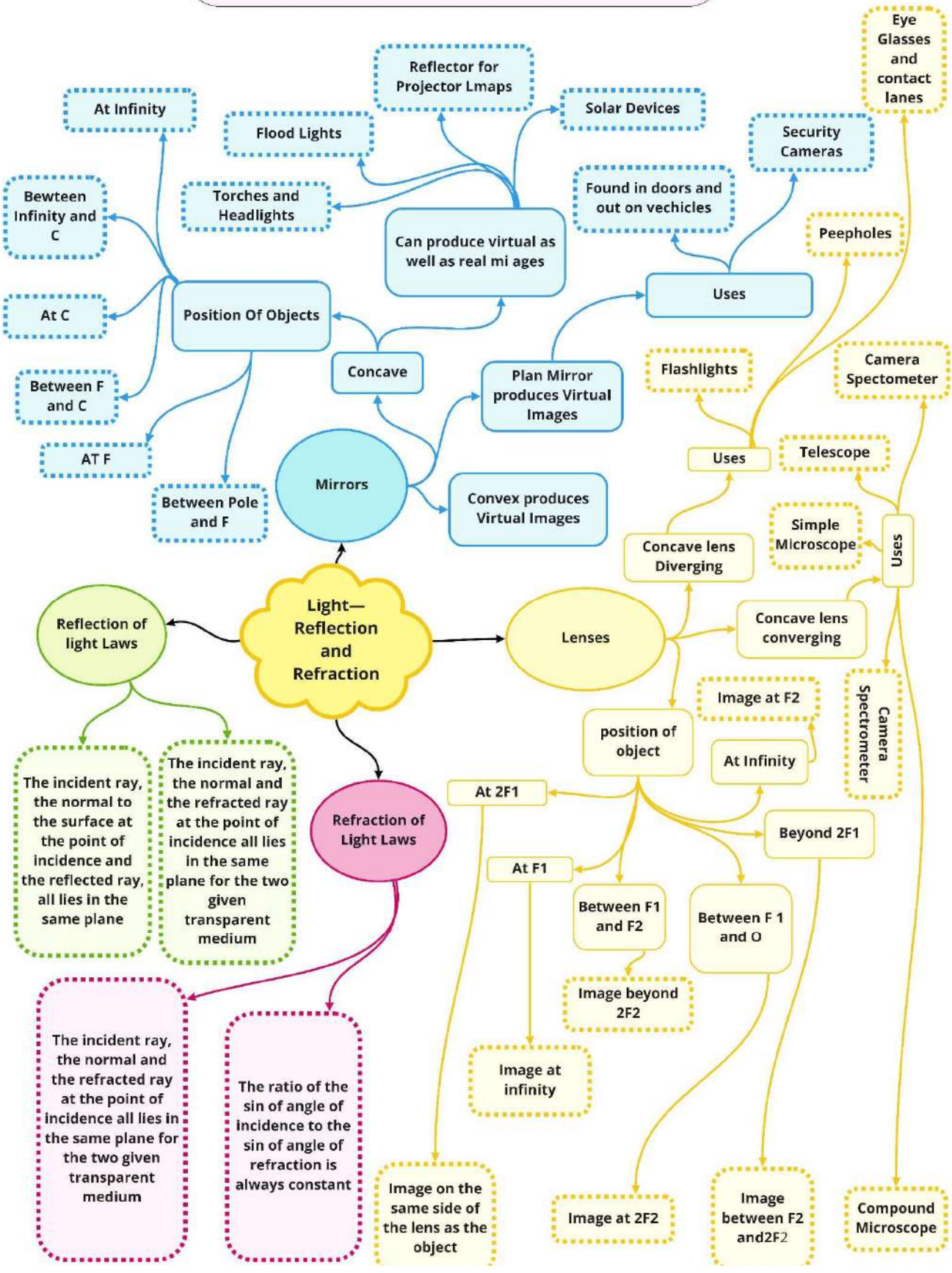
- **Power of a lens**
- Power of a lens is the reciprocal of the focal length of the lens. Its S.I. unit is **dioptre (D)**.

$$P\ (\text{dioptre}) = \frac{1}{f\ (\text{metre})}$$

- Power of a **convex lens** is **positive** and that of a **concave lens** is **negative**.
- When several thin lenses are placed in contact with one another, the **power of the combination of lenses** is equal to the algebraic sum of the powers of the individual lenses.

$P = P_1 + P_2 + P_3 + P_4 + \ldots$

Class : 10th Physics
Chapter-10 : Light—Reflection and Refraction



Important Questions

➢ Multiple Choice Questions:

1. Which of the following can make a parallel beam of light when light from a point source is incident on it?

(a) Concave mirror as well as convex lens

(b) Convex mirror as well as concave lens

(c) Two plane mirrors placed at 90° to each other

(d) Concave mirror as well as concave lens

2. A 10 mm long awl pin is placed vertically in front of a concave mirror. A 5 mm long image of the awl pin is formed at 30 cm in front of the mirror. The focal length of this mirror is

(a) -30 cm

(b) -20 cm

(c) -40cm

(d) -60 cm

3. Under which of the following conditions a concave mirror can form an image larger than the actual object?

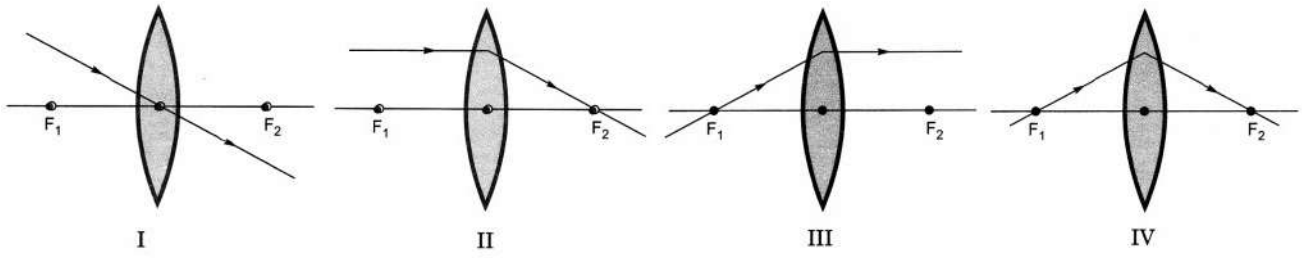
(a) When the object is kept at a distance equal to its radius of curvature

(b) When object is kept at a distance less than its focal length

(c) When object is placed between the focus and center of curvature

(d) When object is kept at a distance greater than its radius of curvature

4. The diagrams showing the correct path of the ray after passing through the



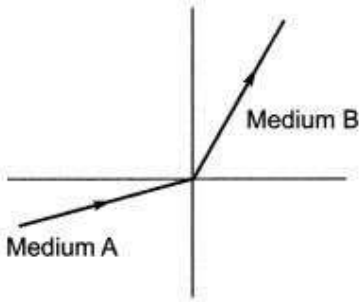
(a) II and III only

(b) I and II only

(c) I, II and III

(d) I, II and IV

5. A light ray enters from medium A to medium B as shown in figure. The refractive index of medium B relative to A will be



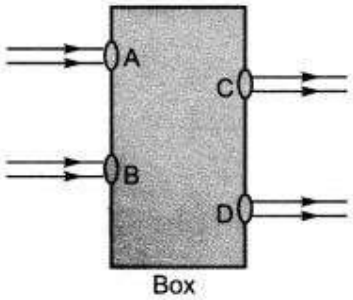
(a) greater than unity

(b) less than unity

(c) equal to unity

(d) zero

6. Beams of light are incident through the holes A and B and emerge out of box through the holes C and D respectively as shown in the figure. Which of the following could be inside the box?



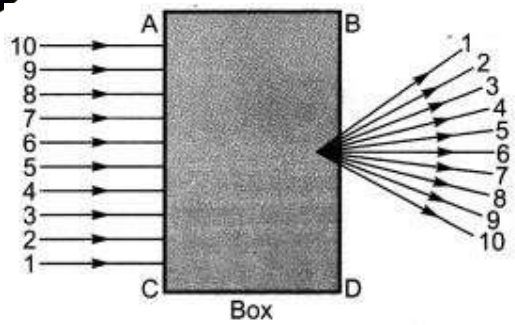
a) A rectangular glass slab

(b) A convex lens

(c) A concave lens

(d) A prism

7. A beam of light is incident through the holes on side A and emerges out of the holes on the other face of the box as show in the figure. Which of the following could be inside the box?



(a) Concave lens

(b) Rectangular glass slab

(c) Prism

(d) Convex lens

8. Which of the following statements is true?

(a) A convex lens has 4 dioptre power having a focal length 0.25 m

(b) A convex lens has -4 dioptre power having a focal length 0.25 m

(c) A concave lens has 4 dioptre power having a focal length 0.25 m

(d) A concave lens has -4 dioptre power having a focal length 0.25 m.

9. Magnification produced by a rear view mirror fitted in vehicles

(a) is less than one

(b) is more than one

(c) is equal to one

(d) can be more than or less than one depending upon the position of the object in front of it.

10. Rays from Sun converge at a point 15 cm in front of a concave mirror. Where should an object be placed so that size of its image is equal to the size of the object?

(a) 15 cm in front of the mirror

(b) 30 cm in front of the mirror

(c) between 15 cm and and 30 cm in front of the mirror

(d) more than 30 cm in front of the mirror

➢ Very Short Question:

1. Define reflection of light?

2. What is a reflector?

3. State laws of reflection.

4. What are the values of angle of incidence ∠i and angle of reflection ∠r for normal incidence of light on a planemirror?

5. What is real image?

6. What is virtual image?

7. Mention the nature of image produced by a plane mirror.

8. Define center of curvature of a spherical mirror.

9. Define radius of curvature of a spherical mirror.

10. Define aperture of a spherical mirror.

➢ Short Questions:

1. List two differences between real and virtual images.

2. State the laws of reflection of light.

3. With the ray diagram show that angle of incidence is equal to the angle of reflection when a ray is incident on the concave mirror.

4. An object is placed at the following distances from a concave mirror of focal length 15 cm.

(a) 10 cm

(b) 20 cm

(c) 30 cm

(d) 40 cm

Which position of the object will produce

- Virtual image
- A diminished real image
- An enlarged real image
- An image of same size.

5. Draw ray diagram to show the formation of images when the object is placed in front of a concave mirror

(i) between its pole and focus point,

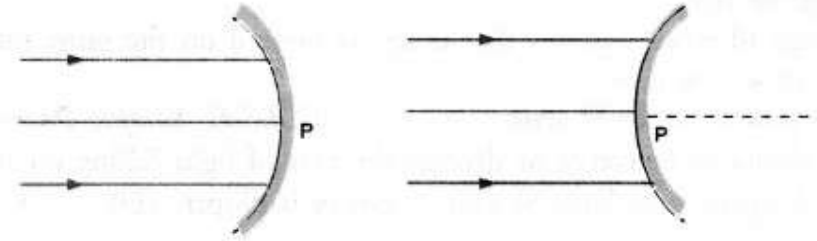
6. State three uses of a concave mirror.

7. State two uses of a convex mirror.

8. Parallel rays of light incident on a concave mirror and a convex mirror as shown in figure,

(i) Redraw the reflected rays in both the cases,

(ii) Name the points where the reflected rays meet or appear to meet on the principal axis.



➢ Long Questions:

1. A thin converging lens forms a:

(i) real magnified image

(ii) virtual magnified image of an object placed in front of it.

(a) Write the positions of the objects in each case.

(b) Draw labelled diagrams to show the image formation in each case.

(c) How will the following be affected on cutting this lens into two halves along the principal axis?

- focal length,
- intensity of the image formed by half lens.

2. For the given data showing object distance and focal length of three concave mirrors, answer the following questions:

S.No.	*Object distance (cm)*	*Focal length (cm)*
1.	*30*	*20*
2.	*10*	*15*
3.	*20*	*10*

- Out of the three in which case the mirror will form the image having same size as the object?
- Which mirror is being used as a make-up-mirror?
- Draw the ray diagram for part (1) and part (2)

➢ Assertion Reason Questions:

1. For two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

   a. Both A and R are true, and R is correct explanation of the assertion.

   b. Both A and R are true, but R is not the correct explanation of the assertion.

c. A is true, but R is false.

d. A is false, but R is true.

Assertion: Keeping a point object fixed, if a plane mirror is moved, the image will also move.

Reason: In case of a plane mirror, distance of object and its image is equal from any point on the mirror.

2. For two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

   a. Both A and R are true, and R is correct explanation of the assertion.

   b. Both A and R are true, but R is not the correct explanation of the assertion.

   c. A is true, but R is false.

   d. A is false, but R is true.

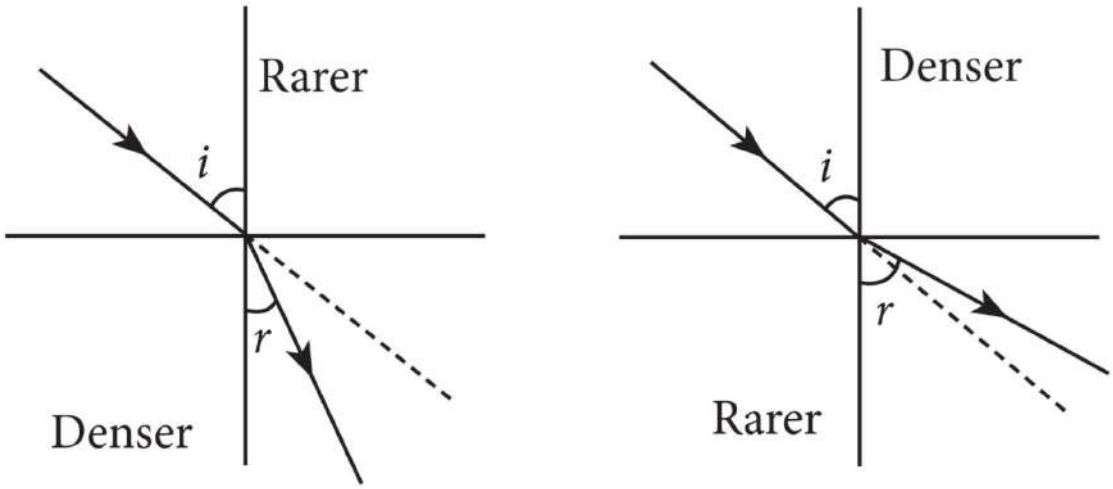
Assertion: The size of the mirror affects the nature of the image.

Reason: Small mirrors always form virtual images.

➢ Case Study Questions:

1. Read the following and answer any four questions from (i) to (v).

   When the rays of light travels from one transparent medium to another, the path of light is deviated. This phenomenon is called refraction of light. The bending of light depends on the optical density of medium through which the light pass.



This speed of light varies from medium to medium. A medium in which the speed of light is more is optically rarer medium whereas in which the speed of light is less is optically denser medium. Whenever light goes from one medium to another, the

frequency of light does not change however, speed and wavelength change. It concluded that change in speed of light is the basic cause of refraction.

i. When light travels from air to glass, the ray of light bends:
   a. Towards the normal.
   b. Away from normal.
   c. Anywhere.
   d. None of these.

ii. A ray of light passes from a medium A to another medium B. No bending of light occurs if the ray of light hits the boundary of medium B at an angle of:
   a. 0º
   b. 45º
   c. 90º
   d. 120º

iii. When light passes from one medium to another, the frequency of light:
   a. Increases
   b. Decreases
   c. Remains same
   d. None of these

iv. When light passes from glass to water, the speed of light:
   a. Increases.
   b. Decreases.
   c. Remains same.
   d. First increases then decrease.

v. The bottom of pool filled with water appears to be due to refraction of light:
   a. Shallower
   b. Deeper
   c. At same depth
   d. Empty

2. The lenses form different types of images when object placed at different locations. When a ray is incident parallel to the principal axis, then after refraction, it passes through the focus or appears to come from the focus. When a ray goes through the optical centre of the lens, it passes without any deviation. If the object is placed between focus and optical

canter of the convex lens, erect and magnified image is fanned. As the object is brought closer to the convex lens from infinity to focus, the image moves away from the convex lens from focus to infinity. Also, the size of image goes on increasing and the image is always real and inverted. A concave lens always gives a virtual, erect, and diminished image irrespective to the position of the object.

i. The location of image fanned by a convex lens when the object is placed at infinity is
   a. At focus
   b. At 2F
   c. At optical center
   d. Between F and 2F

ii. When the object is placed at the focus of concave lens, the image formed is:
   a. Real and smaller
   b. Virtual and inverted
   c. Virtual and smaller
   d. Real and erect

iii. The size of image formed by a convex lens when the object is placed at the focus of convex lens is:
   a. Small
   b. Point in size
   c. Highly magnified
   d. Same as that of object

iv. When the object is placed at 2F in front of convex lens, the location of image is:
   a. At F
   b. At 2 F on the other side
   c. At infinity
   d. Between F and optical center

v. At which location of object in front of concave lens, the image between focus and optical centre is formed:
   a. Anywhere between centre and infinity
   b. At F
   c. At 2F

d. Infinity

✔Answer Key-

➢ Multiple Choice Answers:

1. (a) Concave mirror as well as convex lens
2. (b) -20 cm
3. (c) When object is placed between the focus and centre of curvature
4. (c) I, II and III
5. (a) greater than unity
6. (a) A rectangular glass slab
7. (d) Convex lens
8. (a) A convex lens has 4 dioptre power having a focal length 0.25 m
9. (a) is less than one
10. (b) 30 cm in front of the mirror

➢ Very Short Answers:

1. Answer: The process of returning or bouncing back the light to the same medium after striking the surface is called reflection of light.
2. Answer: A surface which reflects the light is called reflector.
3. Answer: Angle of incidence is equal to the angle of reflection. That is, $\angle i = \angle r$.

   Incident ray, reflected ray and normal to the reflecting surface at the point of incidence lie in the same plane.
4. Answer: For normal incidence, $\angle i = 0$. Therefore, according to law of reflection $\angle r = \angle i = 0$.
5. Answer: When rays of light from an object actually meet at a point after refraction, then image formed is real.
6. Answer: When rays of light from an object do not meet at a point but appears to meet at a point, then image formed is virtual.
7. Answer: Image is virtual, erect and of the same size as that of the object.
8. Answer: The center of a hollow sphere of which the spherical mirror forms a part is called the center of curvature of the spherical mirror.
9. Answer: The radius of a hollow sphere of which the spherical mirror forms a part is called radius of curvature of the spherical mirror.

10. Answer: The part of spherical mirror exposed to the incident light is called the aperture of the spherical mirror.

➢ Short Answers:

1. Answer:

Real Image	Virtual Image
Real images are formed by a concave mirror	Convex mirror form a virtual image
Real images are formed due to the actual intersection of light rays	Virtual images are formed due to the imaginary intersection of light rays

2. Answer:

   Angle of incidence is equal to the angle of reflection. That is, ∠i = ∠r .

   Incident ray, reflected ray and normal to the reflecting surface at the point of incidence lie in the same plane.

3. Answer:

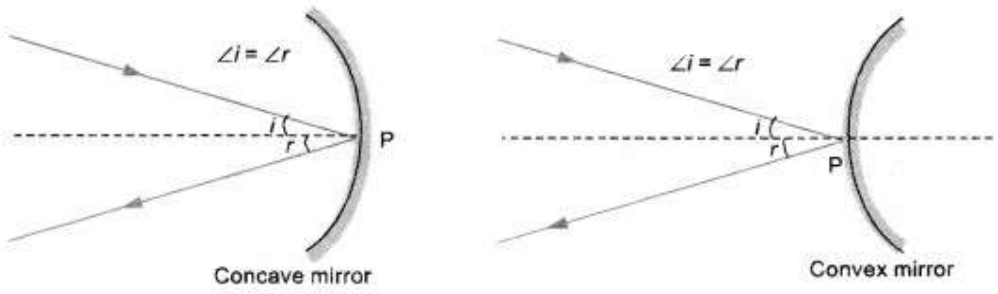


FIGURE 17

4. Answer:

   Concave mirror forms virtual image if object is placed between the focus and pole of the mirror. Therefore, for the position of object at 10 cm mirror forms the required image.

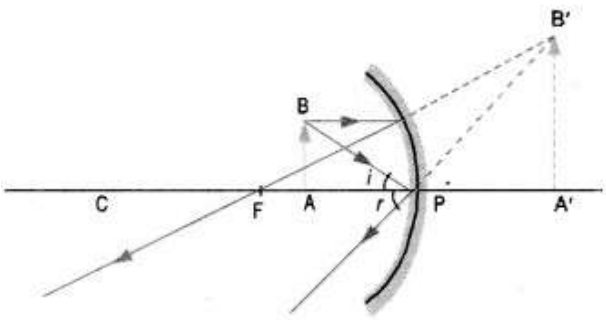
   A real and diminished image is formed when object lies beyond C i.e., beyond 2F. So, for the position of object at 40 cm, mirror forms the required image.

   An enlarged real image is formed when object lies between F and 2 F. So, for the position of object at 20 cm, mirror forms the required image.

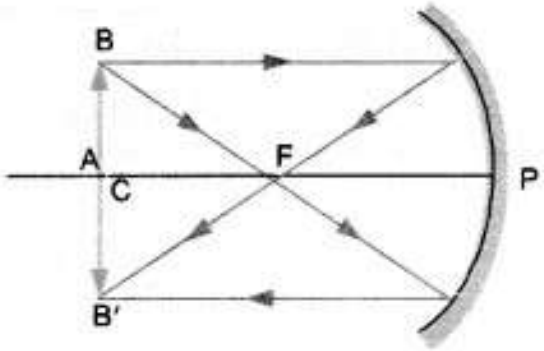
   An image of same size of the object is formed when object lies at C or 2F. So, for the position of object at 30 cm, mirror forms the required image.

5. Answer:

(i)



(ii)



6. Answer:

Reflector: Concave mirrors are used in motor head lights, search lights and torches etc. to produce an intense parallel beam of light. A bulb is placed at the focus of concave mirror or concave reflecting surface. The beam of light from the bulb after reflecting from the concave mirror goes as a parallel beam (figure 24).

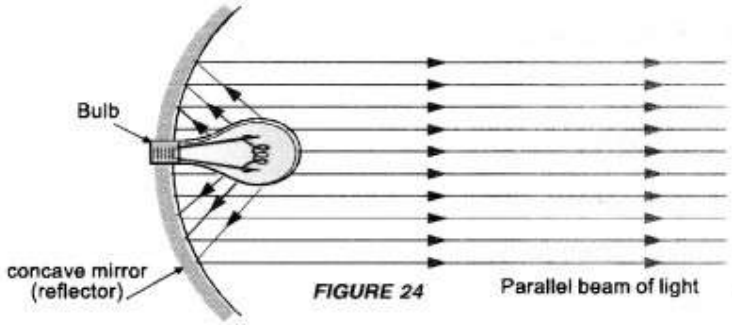


FIGURE 24

This parallel beam of – light illuminates the road ahead of the vehicle.

Shaving and make up mirror: When an object is placed close to a concave mirror (i.e between the pole and focus of the concave mirror), an erect and enlarged (large in

size) image of the object is formed. Because of this fact, concave mirror is used by men to see their enlarged faces while shaving. Similarly, a lady can see her face better with the help of a concave mirror while doing make up.

In solar cookers: When a parallel beam of sun light falls on a concave mirror, this beam is brought to the focus of the concave mirror. As a result of this, the temperature of an object (say a container containing un-cooked food) placed at this focus increases considerably. Hence the food in the container is cooked (figure 25).

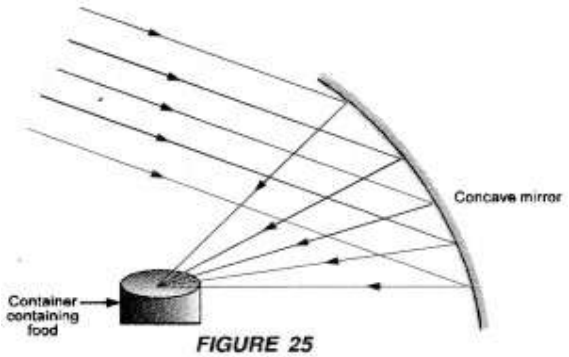


FIGURE 25

7. Answer:

Rear view or driver's mirror. Convex mirror is used as a rear view mirror in vehicles because this mirror forms an erect and diminished image of an object behind the vehicle. Since the image of the object formed is small in size, so the field of view is increased. It means, the driver of a vehicle can see the traffic over large area behind his vehicle. This mirror is also known as driver's mirror.

In street lights. Convex mirror is used in street lights to diverge light over a large area (figure 28).

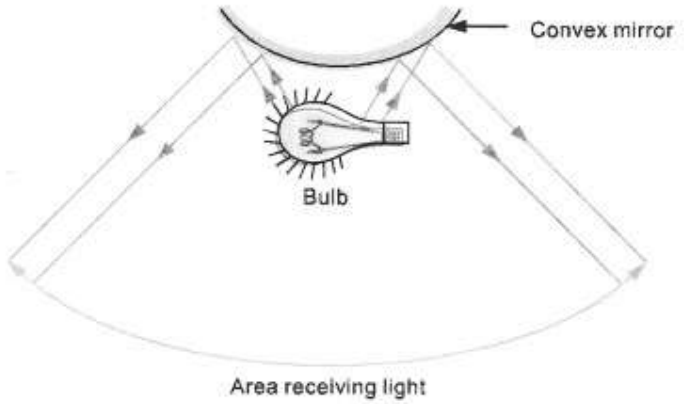
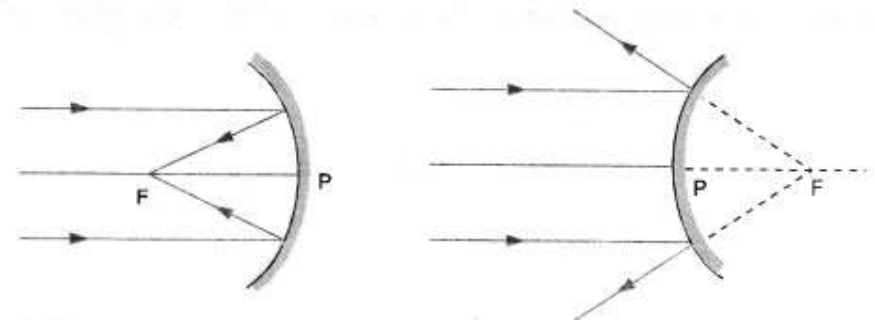


FIGURE 28

8. Answer:

(i) Reflected rays are shown in figures.



(ii) The point where the reflected rays of light meet or appear to meet on the principal axis is known as principal focus F of the concave mirror or convex mirror.

➢ Long Answers:

1. Answer:

(a)

- A converging or convex lens forms real and magnified image of an object, when the object is placed between F1 and 2F1
- A converging lens forms a virtual magnified image of an object, when the object is placed between the focus and optical center of the converging lens.

(b)

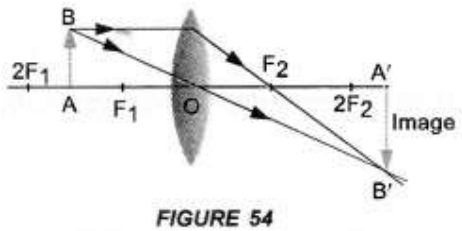


FIGURE 54

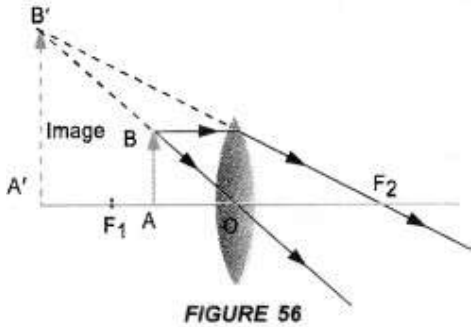
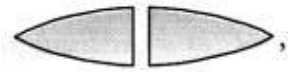


FIGURE 56

(c)

Focal length of each half will be equal to the focal length of the lens. If converging lens of focal length f is cut into two equal halves as shown in figure



then the focal length of each half = f.

Intensity of the image formed ∝ (aperture of the lens)2. Aperture of each cut half of the lens is ½ times aperture of the lens. Hence, intensity of the image formed by half lens will decrease.

2. Answer:

i. Concave mirror forms the image having same size as the object if object is placed at the center of curvature

of the mirror i.e. object distance = 2 f Therefore, for S.No. 3, concave mirror forms the required image.

ii. Concave mirror is used as a make-up mirror if the image of the face is magnified. This happens if the face or object is placed between F and 2 F. Therefore, for S. No. 2, concave mirror is used as a make-up mirror.

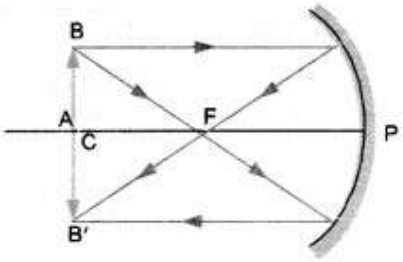


FIGURE 20

iii.

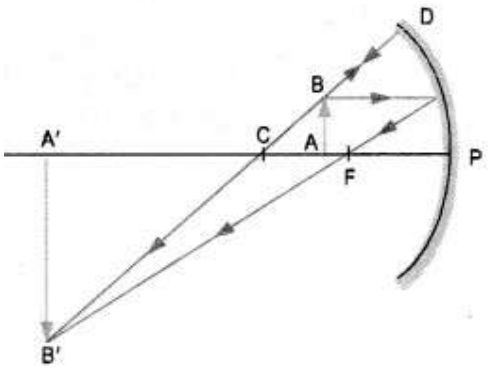


FIGURE 21

➢ Assertion Reason Answer:

1. (a) Both A and R are true, and R is correct explanation of the assertion.

Explanation:

The image formed in a plane mirror is at the same distance behind the mirror as the object is in the front of the mirror. Image and the object are at equal distances from a plane mirror.

2. (d) A is false, but R is true.

Explanation:

The size of the image does not affect the nature of the image, except that a bigger image as it gathers more tight rays due to wider aperture.

➢ Case Study Answer:

1. i (a) Towards the normal.

Explanation:

When, a ray of light travels from air to glass, it bends towards the normal.

ii. (c) 90º

Explanation:

No bending of light occurs when light is incident normally or perpendicularly on a boundary of two media since angle of incidence and angle of refraction both are zero.

iii. (c) Remains same

Explanation:

When light goes from one medium to other medium, its frequency does not change.

iv. (a) Increases.

Explanation:

The speed to light increases when light passes from glass to water as water is optically rarer medium.

v. (a) Shallower

Explanation:

The bottom of a pool of water appears to be less deep than it actually is due to refraction.

2. i (a) At focus

Explanation:

When an object is placed at infinity of convex lens, image will be formed at focus F.

ii. (b)Virtual and inverted

Explanation:

Virtual and inverted image is formed, when object is placed at focus of the concave lens.

iii. (c) Highly magnified

Explanation:

When object is placed at focus of a convex lens, highly enlarged or magnified image is formed.

iv. (b) At 2 F on the other side

Explanation:

When an object is placed at distance 2F in front of a convex lens, then the image formed is at a distance 2F on the other of the lens.

v. (a) Anywhere between centre and infinity

Explanation:

Image if formed between focus and optical centre when the object is placed anywhere between optical centre and infinity.

In text Questions:-

Q1. Define the principal focus of a concave mirror?

Ans:- A point on the principal axis where the parallel rays of light after reflecting from a concave mirror meet.

Q2. The radius of curvature of a spherical mirror is 20cm. What is focal length?

Ans:- Radius of curvature, R = 20cm.

$$\text{Focal length, } F = \frac{R}{2} = \frac{20}{2} = 10\text{cm.}$$

Q3. Name a mirror that can give an erect and magnified image of an object.

Ans: A concave mirror.

Q4. Why do we prefer a convex mirror as a rear-view mirror in vehicle?

Ans:- This is because a convex mirror forms an erect and diminished (small in size) images of the objects behind the vehicle and hence the field of view is increased.

Q5. Find the focal length of a convex mirror whose radius of curvature is 32 cm.

Ans:- R = + 32cm. Therefore, f = R/2 = + 32/2 =+ 16cm.
Thus, focal length of the convex mirror = + 16cm.

Q6. A concave mirror produces three times magnified (enlarged)real image of an object placed at 10 cm in front of it. Where is the image located?

Ans:- m = -3, But m = -v/u, so v = 3u
U = -10 cm
V = 3 (-10cm) = 30 cm
Thus, the Image is located of 30 cm to the left side of the concave mirror.

Q7. A ray of light traveling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?

Ans:- A ray of light bends towards the normal because the speed of light decreases when it goes from air (rarer medium) into water (denser medium).

Q8. Light enters from air to glass having refractive index 1.50. what is the speed of light in the glass? The speed of light in vacuum is 3×10^8 ms.

Ans:- $n = \frac{c}{V}$

$$V = \frac{c}{N} = \frac{3 \times 10^8 \text{ ms}^{-1}}{1.50} = 2 \times 10^8 \text{ ms}^{-1}$$

Thus, speed of light in glass = 2×10^8 ms^{-1}

Q9. You are given kerosene, turpentine and water. In which of these does the travel faster?

Ans:- We know, v = c Refractive (n) of water is 1.333, whereas refractive index of kerosene is 1.44 and that of turpentine is 1.47. As refractive index of water is least, so speed of light in water is more than in kerosene and turpentine. Hence light travels faster in water.

Q10. The refractive index of diamond is 2.42. What is the meaning of this statement?

Ans:- We know, $n = \frac{c}{v}$ or $\frac{v}{c} = \frac{1}{n} \times \frac{c}{2.42}$

Then, speed of light in diamond is ½.42 times the speed a light in vacuum

Q11. Define 1 dioptre of power of a lens.

Ans:- Power = 1/f (in m).

Power will be 1 dioptre if focal length of the lens is 1 metre or 100 cm.

Q12. A convex lens forms a real and inverted image of a distance of 50 cm form it. Where is the needle placed in front of the convex lens if the image is equal to the object? Also, find the power of the lens.

Ans:- (i) V = 50cm

$M = \frac{h}{H} = -1$ **Image is real and inverted**

Also, $m = \frac{v}{U}$

Or U = -v = - 50cm

Thus, needle is to be placed at 50 cm in front of the lens.

(ii) Using $\frac{1}{U} + \frac{1}{V} = \frac{1}{F}$ we get $\frac{1}{F} + \frac{1}{50} = \frac{1}{50} = \frac{2}{50} = \frac{1}{25}$ OR F = 25cm

$P = \frac{100}{F(\text{IN CM})} = \frac{100}{25} = +4D$

Q13. Find the power of a concave lens of focal length 2m.

Ans:- Here F = - 2m

P = 1/f = -1/2 = - 0.5D.

Class: 10th
English

Miracles (Walt Whitman)

Central Idea:-People generally wait for miracles to happen because they consider them unexpected and supernatural events. But the poet of the poem, Whitman presents altogether a different thought about miracles. He believes that miracles do happen all the time around us. He expresses his great surprise as why people feel excited about miracles and admire them. He draws his miracles from day to day life. He is of the opinion that the people and the city are full of miracles. According to his view point the nature itself is an emblem of miracles --- the creation and the activities of honeybees, animals, fish, rocks, the sun and the moon are all miracles.

Summary:-The poem, 'Miracles' has been pen-locked by 'Walt Whitman'. He uses free verse in his poems, as such is referred to as 'the father of free verse'.
In this poem, the poet wants to convey a message and says that miracles are not unexpected and extraordinary events we should feel excited about. In fact, they do happen every minute, every hour and every day around us, across the world and in the entire universe. He says that the routine life of people is itself filled with innumerable miracles. In fact, miracles can be seen in our day to day life. For him, walking down the streets of Manhattan (a populous American city) is a miracle. He ponders over the nature and says that the vast expanse of the sky, the soothing effects of the waves, watching stars in the moonlit sky, standing under the shade of the trees, watching the activities of honey bees during summer days, animals feeding themselves in the fields, feeling the sun on our faces and observing the fine, thin curve of the new moon in Spring are all miracles to him. The poet further says that having conversation with our beloved ones, eating dinner with our family members and looking at the strangers sitting opposite to us in the car are all miracles.
The poet finally winds up his count of miracles by saying that there are limitless miracles but all of them have specific importance at their respective places. From his point of view every hour of the day and night, every cubic inch of the world and space, every square yard of the earth, and every foot of the interior of the earth is dominated and crowded with miracles. The endless seas, the enormous fish, the beautiful rocks, the movement of the waves and the sailing of the ships with men are all marvellous and miraculous from the poet's point of view.

Q#1 The usual view of a miracle is that it seldom happens. What does Walt Whitman think about the miracles?

Ans. The usual view of a miracle is that it seldom happens. It is considered to be an unexpected or supernatural event. But according to Walt Whitman, miracles happen in everyday life. According to him, the people of city, various natural creatures and phenomenon are all miracles to him. All these things pass unnoticed by the busy people of world but, he ponders over them and concludes that every major and miniature thing of nature is a miracle.

Q#2 When you read the poem, you notice that some 'miracle' are from nature; other are connected with people and city life. Make lists of these. Notice how Whitman from on to another.

Ans. We notice many 'miracles' in this poem. The 'miracles' from nature are:- serenity of woods; honey bees busy in sucking nectar; animals feeding in the fields; sunset; shining of stars; thin curve of new moon; life in sea, fishes, motion of waves.
The 'miracles' concerned with people and city life are:-
Busy streets of Manhattan; multistoried buildings of Manhattan; moving along the beach; talking to one's beloved; dining with family; strangers riding in the cars and subway cars.

Q#3 What do the lines about Manhattan and the subway car tell us about Whitman's feeling for people?

Ans. The lines about Manhattan and subway cars tell us that Whitman is a great lover of human kind (Philanthropist). When he ponders over the huge constructions and the busy streets of Manhattan,

he gets thrilled and considers it a miracle. The subway cars which run underground carrying people also fascinate Whitman and his love for humanity increases many fold.

Q#4 Is there any rhyme scheme in the poem?

Ans. No, there is no rhyme or rhythm, the poem is written in free verse.

Q#5 What are the images that the poet has used?

Ans. The poet has used rich images in the poem. Some of them are as under:

1) Wade with naked feet along the beach.
2) Stand under trees in the woods.
3) Sit at the table with the rest.
4) Look at strangers opposite him riding in the car.
5) Animals grazing in the fields.

SOCIAL STUDIES

(HISTORY)

Chapter 1: Rise of Nationalism in Europe

Rise of Nationalism in Europe

Frederic Sorrieu was a French artist who in 1848 prepared a series of four prints visualising his dream of a world made up of 'Democratic and Social Republics'.

The Dream of Worldwide Democratic and Social Republics – The Pact Between Nations, a print prepared by Frédéric Sorrieu, 1848.

The features of FrédéricSorrieu's paintingswere:

- The people of Europe and America marching in a long line are paying homage to the Statue of Liberty. This shows that they wanted and appreciated the principles of liberty, equality andfraternity.
- On the foreground of the image lie the shatteredsymbols of monarchical regimes signifying the downfall of the monarchical and absolutists regimes.
- In this image, people are grouped as distinct nations identified by their flags and national costumes. This depict the rise of **nation states**in Europe and America.

A Nation State refers to a country with well-defined delineated boundaries, resided by people with asimilar culture, shared history and ethnic character. It is also supposed to have a government of its choice. The people in a Nation State are supposed to have unity, strength and cooperation.

The French Revolution and the Idea of the Nation

The French Revolution is regarded as one of the most important events in history. It not only gave a huge setback to monarchy but also gave the first clear expression to the idea of 'nationalism'. The French Revolution led to the transfer of sovereignty from monarchy to the French citizens. The Constitution in France came into existence and citizens were awarded with the rights of liberty and equality.

The French revolutionaries introduced various measures and practices to create a sense of collective identity amongst the French people. Thesewere:

- Theideasof *lapatrie*(thefatherland)and*lecitoyen*(thecitizen)wasintroduced.

- The Estates General was renamed the 'National Assembly'. Its members were elected by active citizens (citizens who paid taxes to thegovernment).
- The new French flag replaced the former royalstandard.
- Nation now became supreme. Hymns were composed and oaths were taken on the name of the nation. It was regarded as a'fatherland'.
- The administrative system was centralised, and uniform laws were formulated for allcitizens.
- A uniform system of weights and measures was adopted, and internal custom duties and dues wereabolished.
- The French language was made the common language of the people residing inFrance.
- The revolutionaries declared that their next motive is to help other people of Europe to become nations.

The French Revolution impacted the middle class including professionals and students in several countries such as Switzerland, Holland, Italy and Belgium. They also wanted to throw off the monarchies in their countries and become nations.

Napoleon – Child of the French Revolution

The rise of Napoleon marked the rise of monarchy in France. However, Napoleon implemented some revolutionary ideas and principles in France. He did this by taking the following steps:

- He introduced the Civil Code of 1804, also known as the Napoleonic Code. This Code instituted the principle of equality of all people before the law, right to property was established and all privileges enjoyed by the people of high birth and class wereabolished.
- This Code was also promulgated to other parts of Europe which were controlled byFrance.
- In many European countries such as Switzerland, Germany, Dutch RepublicandItaly,hesimplifiedtheadministrativemachinery,ended the feudal system and liberated the peasants from serfdom.
- In towns, restrictions imposed on guilds were removed, and transport and communication systems were improved. Businessmen, small industrialists and traders began to realise the importance and advantages of a uniform system of laws.
- People of other European countries initially welcomed the French armies but later began to oppose them because of increased taxation and censorship imposed onthem.

Napoleon Bonaparte is known as the 'Child of the French Revolution'.

The Beginning of Nationalism in Europe

During the mid-eighteenth century, there were no nation states in Europe. Italy, Germany and Switzerland were not one nation but were divided into various kingdoms. Central and eastern Europe was under absolute monarchies. Several factors led to the emergence of the idea of nationalism in the later half the eighteenth century. Some of these were the rise of the middle class, liberalism and the rise of a new conservatism after 1815 and its opposition by the people.

Rise of the new middle class: The aristocratic class in Europe was a dominant class, but it was comprised of only few people. Most of the people in Europe were peasants. The Industrial Revolution resulted in the emergence of the labour or working class. Many small industrialists, businessmen and professionals who formed the middle class gained prominence. These classes supported the abolition of aristocratic privileges, demanded equality and advocated the idea of nationalism.

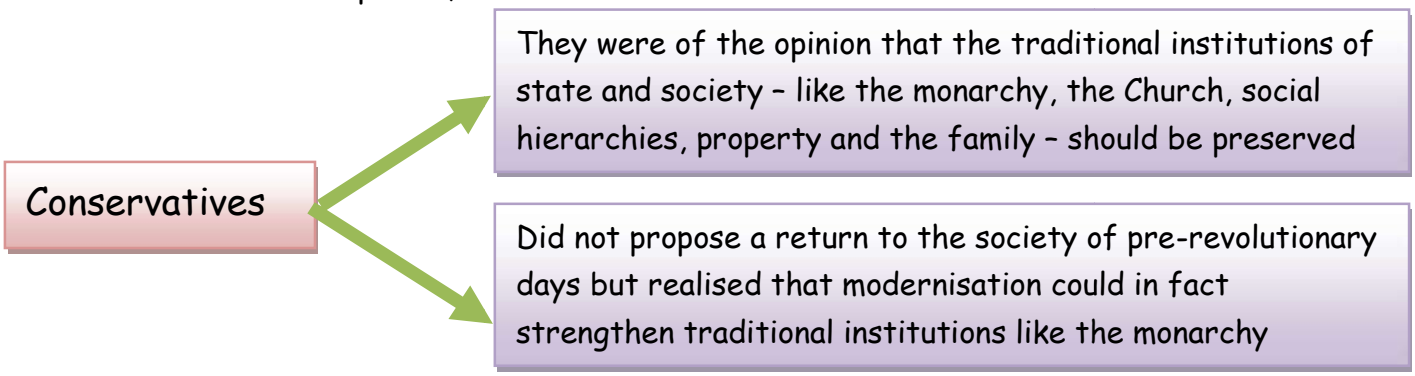
Liberalism: The middle class stood for 'liberalism'. Liberalism in political terms stood for equality, freedom, formation and working of government by consent. In the economic field, liberalism advocated the freedom of markets and the abolition of unjust duties on the movement of goods from one territory to the other. This led to the beginning of economic nationalism in Europe which contributed to the rise of nationalism. The new commercial class argued for the creation of a unified economic territory allowing the unhindered movement of goods, people and capital. Later, several measures were introduced. Some of thesewere

- In 1834, a customs union called 'zollverein' was formed at the initiative of Prussia. Several German states joined thisunion
- The union abolished tariff barriers and reduced the number of currencies from over thirty totwo.
- The introduction of railways created mobility leading to the nationalunification.
- The creation of a network of railways further stimulated mobility harnessing economic interests to nationalunification.

We find that a wave of economic nationalism strengthened the wider nationalist sentiments growing at the time.

Rise of New Conservatism and its opposition by the people

After the defeat of Napoleon, there was a rise of new conservatism.



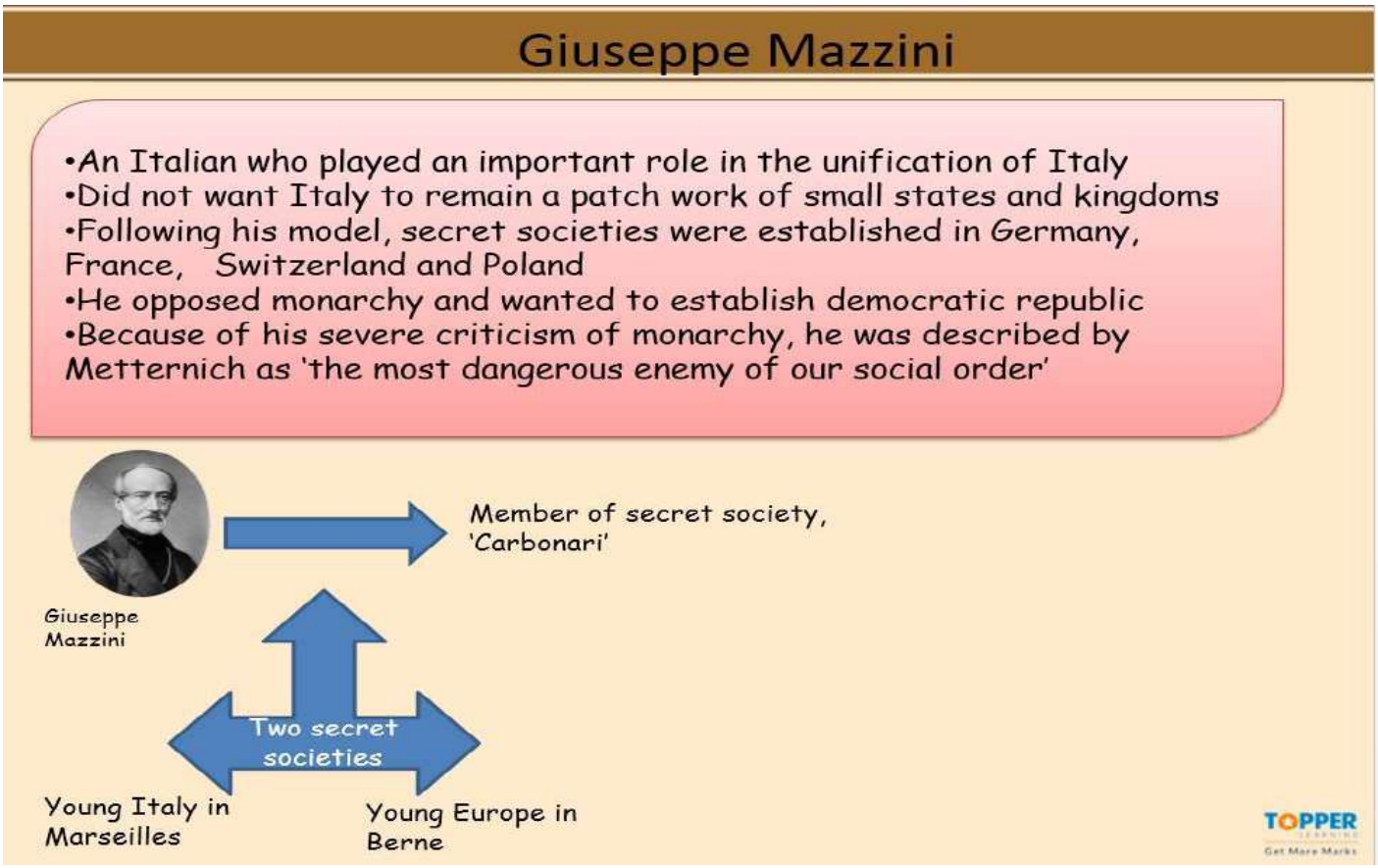
The Congress of Vienna was held in 1815 in which Britain, Russia, Prussia and Austria participated to draw up settlement for Europe. The Congress was hosted by the Austrian Chancellor Duke Metternich. Some results of the Congress of Vienna were:

- Monarchy was restored in France and strengthened in Prussia, Belgium and Austria. Autocratic governments were set up in thesecountries.
- A series of states were set up on the boundaries of France to prevent French expansion in future.

Conservative regimes set up in 1815 were autocratic. They did not tolerate dissent and imposed censorship on those materials and articles in newspapers, books, plays and songs that reflected the

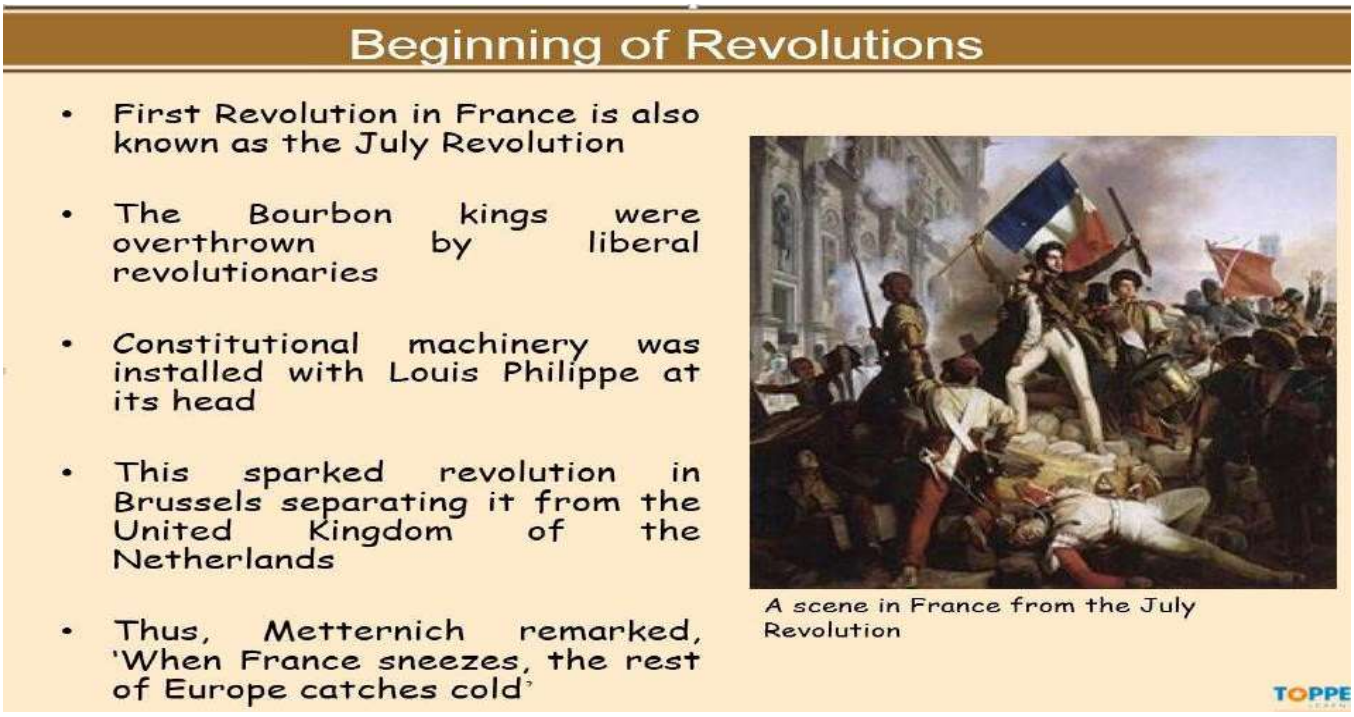
ideas of liberty and freedom.

These conservative ideas gave rise to liberal nationalists and revolutionaries. Liberals were opposed to monarchial governments. They advocated liberty and freedom and the creation of nation states. After 1815, many liberal nationalist went underground and established several secret societies.



The Age of Revolutions (1830-48)

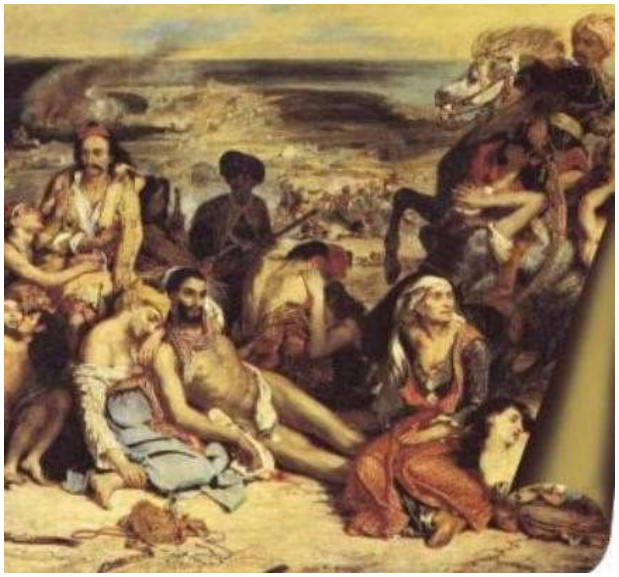
Nationalism emerged not only as a result of wars and battles. Culture played an important role in



creating the idea of the nation. Art, painting, poetry, stories and music played an important role in strengthening the feeling of nationalism.

Romanticism was a cultural movement in which the artists romanticised human feelings and emotions. This was done to create a common culturalpast as the basis of a nation. Stress was laid on vernacular languages and folklore. This gave communities who were living under the control of other powerful nations a cultural identity. For example, the people of Poland who were under Russian control defied the ban on speaking Polish. This was a kind of struggle to overthrow the Russian rule from their territory and to become an independent nation. Similarly, German philosopher Johann Gottfried Herder claimed that true German culture was to be discovered among the common people – 'dasvolk'.

The emphasis was laid on using vernacular language and the collection of local folklore not only to discover an ancient national spirit, but also to carry the message of modern nationalists to illiteratepeople.



A painting by a French painter Delacroix who depicts an incident in which 20,000 Greeks were said to have been killed by Turks on the island of Chios. Through this painting, he was trying to create sympathy for the Greeks.

Hunger, Hardships andRevolts

The 1830s were years of great economic hardship in Europe. It was because:

- During the 1830s, there was a large-scale unemployment in Europe. In most of the European countries, employment opportunities were less whereas job seekers weremany.
- Cities had come to be extremely overcrowded. As a result, slums had started coming up as more people migrated from the rural to urbanareas.
- Small producers in towns were often faced with stiff competition from the imports of cheap machine-made goods from England where industrialisation was more advanced, especially in textileproduction.
- Peasants struggled under the burden of feudal dues and obligations. The rise of food prices or a year of bad harvest led to widespread poverty in town andcountry.

The Revolutions of the Liberals

The year 1848 was a year of revolts. These revolts were led by the educated middle class.

- In the revolution of February 1848, the French monarch was dethroned and the country became a republic based on universal male suffrage (right to vote was given to allmen).
- In other parts of Europe nation-states did not yet exist such as Germany, Italy and Poland. The men and women of the liberal middle classes demanded constitutionalism with national unification
- In Germany, people of educated middle class came together and decided to vote for an all-German NationalAssembly.

- On 18May 1848, 831 elected representatives marched to take their places in the Frankfurt Parliament. They drafted a constitution for a German nation to be headed by a monarchy subjected to Parliamentarycontrol.
- The Prussian monarch Friedrich Wilhelm IV rejected the constitution. The German Parliament which resisted the demands of the workers and artisans lost their support. Later, the parliament led by the educated middle class was forced todisband.
- At this time, women all over Europe campaigned for securing votingrights.

Unification of Germany and Italy

Germany and Italy were European nations which were divided into various kingdoms. The unification of Germany and Italy were important events in world history.

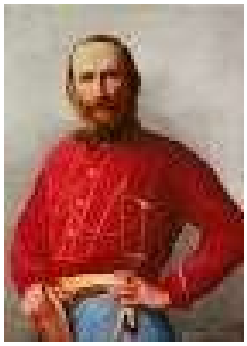
Unification of Germany

- The newly emerged middle class in Germany in 1848 tried to unite several German kingdoms which were suppressed by monarchies and large landowners into one nation state governed by an electedbody.
- Prussia, a German kingdom, took the leadership in uniting various German states. Otto von Bismarck, the Chief Minister of Prussia, aimed to achieve thegoal of unification with the help of the Prussian army and the bureaucracy.
- Spread over seven years, the Prussian army with the help of the Austrian, French and Danish armies fought three wars and successfully incorporated all the small German kingdoms. This marked the process of completion of German unification.
- In1871,WilliamIwasdeclaredastheemperorofGermanyatthePalaceof Versailles. The process of the unification of Germany exhibited the power of the Prussian state. Many new reforms were initiated in banking, currency, administration and judiciary in Germany.

Otto von Bismarck

Unification of Italy

- Italy was also politically fragmented into various small states which were ruled by monarchies.
- During the mid-nineteenth century, only the state of Sardinia-Piedmont was ruled by the Italian monarchy. The northern states were under the Austrian monarchy, Central Italy was under the control of the Pope and the states in the south were under the control of the Bourbon kings ofSpain.
- Giuseppe Mazzini was a revolutionary who actively supported the unification of the Italian states. For achieving this aim, he formed a secret society called 'Young Italy'.
- The state of Sardinia-Piedmont took the responsibility of fulfilling this taskafter



Giuseppe Garibaldi

the failed uprisings in 1831 and 1848. The king of Sardinia-Piedmont, Victor Emmanuel II, was actively helped by his Chief Minister Cavour. Cavour led the process of the unification of Italy.

- In 1859, the state of Sardinia-Piedmont defeated the Austrians. In 1860, the Italian forces helped by Giuseppe Garibaldi and his volunteers marched into southern Italy and unified it with Italy.
- King Victor Emmanuel II was proclaimed as the king of united Italy. The complete unification of Italy was achieved in1871.

Great Britain – A Nation State

- The transformation of Great Britain into a nation state was not a sudden process. There was no one British nation before the eighteenthcentury.
- People residing in the British Isles were mainly English, Welsh, Scots and Irish. These ethnic groups had distinct political and socialtraditions.
- As the English nation grew in wealth and power, it began to dominate the otherislands.
- In 1688, the English Parliament seized power from the monarchy. The Parliament passed the Act of Union, 1707, by which England and Scotland were unified resulting in the formation of the 'United Kingdom of GreatBritain'.
- The Parliament was dominated by the English, and the political and cultural identities of the Scots were systematically suppressed. The Catholics in Scotland were brutally suppressed whenever they wanted to regain theirindependence.
- Ireland was inhabited by the Protestants and the Catholics. The English supported the Protestants and established their rule with their help and support. Catholics, who constituted a majority in Ireland, revolted against the British on numerous occasions but weresuppressed.
- Ireland forcibly became a part of Britain in 1801. The English language dominated. Both Scotland and Ireland were subordinate toEngland.

The idea of a nation was expressed in various forms by artists and painters. Most of the nations were portrayed as female figures. The female figure became an allegory of the nation. 'Marianne' in France and 'Germania' in Germany became allegories of a nation.

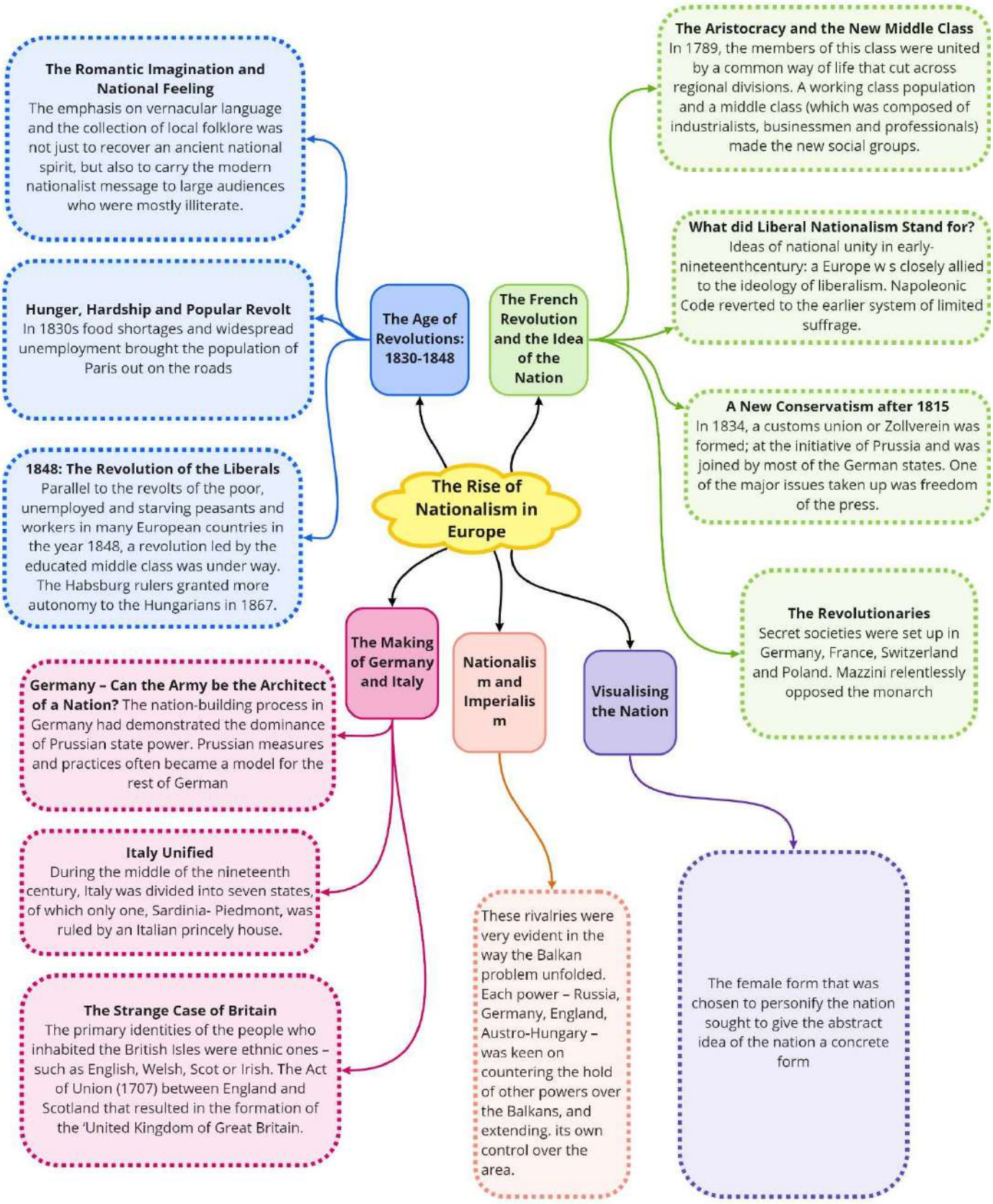
Allegory → An allegory is an abstract idea which is expressed through a person or a thing. It can be literal or symbolic.

'Germania' was an allegory of the German nation

Nationalism and Imperialism

- Nationalism which is the feeling of love for one's own nation became intense and narrow minded in the mid-nineteenth century. Many nations became intolerant of each other and competed with one another for the control ofterritories.
- Imperialism is territorial control of a region or a country by another country by using military control.
- This feeling of nationalism became intense in the Balkan region. The Balkan region formerly comprised the present-day territories of Romania, Bulgaria, Macedonia, Croatia, Greece, Bosnia- Herzegovina, Slovenia, Serbia and Montenegro. The people in these countries were calledSlavs.
- The disintegration of the Ottoman Empire in the region made the situation very explosive in the region as every state was jealous of one another and hoped to gain independence at the cost of theother.
- One by one, the European nationalities in the Balkan broke away from the control of the Ottoman Empire and declaredindependence.
- As the different Slavic nationalities struggled to define their identity and independence, the Balkan area became an area of intenseconflict.
- During this time, many powerful European nations such as England, France, Russia and Germany competed to gain control in the Balkan region. This competition for gaining prominence in the region finally led to the First World War in1914.
- Later, several Asian and African countries which were colonised by the European nations began toopposeimperialdomination.Anti-imperial movementsthatbeganincolonieswerenationalistin nature as people were fighting to form independent nationstates.

Class : 10th History
Chapter-1 : The Rise of Nationalism in Europe



Important Questions

Multiple Choice questions-

1. Elle, the measuring unit in Germany was used to measure:

(a) cloth
(b) thread
(c) land
(d) height

2. Zollevrein started in 1834 in Prussia refers to a:

(a) Trade Union
(b) Customs Union
(c) Labour Union
(d) Farmer's Union

3. What do the saints, angels and Christ symbolise in the Utopian vision?

(a) Equality among people
(b) Fraternity among nations
(c) Freedom of nations
(d) Resentment against nations

4. Who were the 'Junkers'?

(a) Soldiers
(b) Large landowners
(c) Aristocracy
(d) Weavers

5. Which treaty recognised Greece as an independent nation?

(a) Treaty of Constantinople, 1832
(b) Treaty of Vienna, 1815
(c) Treaty of Versailles, 1871
(d) None of these

6. Which treaty recognised Greece as an independent nation?

(a) Treaty of Constantinople, 1832
(b) Treaty of Vienna, 1815
(c) Treaty of Versailles, 1871
(d) None of these

7. Which of the following group of powers collectively defeated Napoleon?

(a) England, France, Italy, Russia
(b) England, Austria, Spain, Russia

(c) Austria, Prussia, Russia, Britain
(d) Britain, Prussia, Russia, Italy

8. Romanticism refers to a:

(a) cultural movement
(b) religious movement
(c) political movement
(d) literary movement

9. Which one of the following types of government was functioning in France before the revolution of 1789?

(a) Dictatorship
(b) Military
(c) Body of French Citizen
(d) Monarchy

10. Which of the following countries is considered as the 'cradle of European civilization'?

(a) England
(b) France
(c) Greece
(d) Russia

11. Choose the correct nationality of the artist Frederic Sorrieu who visualised in his painting a society made up of Democratic and Social Republic.

(a) German
(b) Swiss
(c) French
(d) American

12. 'Nationalism', which emerged as a force in the late 19th century, means

(a) strong devotion for one's own country and its history and culture.
(b) strong devotion for one's own country without appreciation for other nations.
(c) strong love for one's own country and hatred for others.
(d) equally strong devotion for all the countries of the world.

13. Match the term with the statements given below:

A 'Utopian Society' is

(i) a society under a benevolent monarchy
(ii) a society that is unlikely to ever exist
(iii) a society under the control of a chosen few wise men
(iv) a society under Parliamentary Democracy

(a) (i) and (ii)

(b) (ii) and (iii)
(c) (ii) only
(d) (iii) only

14. Pick out the correct definition to define the term 'Plebiscite'.

(a) Plebiscite is a direct vote by which only the female members of a region are asked to accept or reject a proposal.
(b) Plebiscite is a direct vote by the female members of a matriarchal system to accept or reject a proposal.
(c) Plebiscite is a direct vote by only a chosen few from the total population of a parti-cular region to accept or reject a proposal.
(d) Plebiscite is a direct vote by which all the citizens of a region are asked to accept or reject a proposal.

15. Ernst Renan believed that the existence of nations is a necessity because

(a) it ensures protection to all inhabitants.
(b) it ensures liberty to all inhabitant citizens.
(c) it ensures Parliamentary form of govern-ment to its inhabitants.
(d) it ensures jobs and good health to all its inhabitants.

Very Short:

1. Which French artist prepared a series of four prints visualising his dream of a world ?
2. What do you understand by 'absolutist' ?
3. What is a Utopian ?
4. What are advantages of a nation ? State one advantage.
5. What is Plebiscite ?
6. What political and constitutional changes did take place in the wake of the French Revolution in 1789 ?
7. State any one step that could create a sense of collective identity among the French people.
8. Which clubs were set up after the French Revolution and by whom ?
9. How the Napoleon code was implemented in the regions under French control ?
10. Why did the people in the conquered territories become hostile to Napoleon's rule ?

Short Questions:

1. What was said about Mazzini by Metternich ?
2. What Metternich remarked about events in France ?

3. Who was Lord Byron ? What was his contribution in the Greek war of independence ?
4. What was Romanticism ?
5. What was contribution of Karol Kurpinski in the freedom struggle of Poland ?
6. Give one reason for the great economic hardship in Europe in the 1830s.
7. Who were Grimm brothers ? Why did they collect folktales ?
8. What happened in 1848 revolution in France ?
9. Define feminist.
10. What is ideology ?

Long Questions:

1. **Question:** Describe the political condition of Europe in the mid-eighteenth century.
2. **Question:** Describe the condition of the aristocracy and peasantry in Europe in the mid-eighteenth century.
3. **Question:** When did industrialisation begin in Europe ? What were its consequences ?
4. **Question:** What do you understand by Liberalism ? Describe their ideas in the political, social and economic spheres.
5. **Question:** Who were granted the right to vote in France during the period of revolution ?

Assertion Reason Questions:

1. **DIRECTION:** Mark the option which is most suitable:
   a. If both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
   b. If both assertion (A) and reason (R) are true, but reason (R) is not the correct explanation of assertion (A).
   c. Assertion (A) is true, but reason (R) is false.
   d. Both assertion (A) and reason (R) are false.

Assertion (A): There was no British nation prior to the eighteenth century.

Reason (R): The primary identities of the people who inhabited the British Isles were ethnic ones – such as English, Welsh, Scot or Irish. All of these ethnic groups had their own cultural and political traditions.

2. **DIRECTION:** Mark the option which is most suitable:

a. If both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

b. If both assertion (A) and reason (R) are true, but reason (R) is not the correct explanation of assertion (A).

c. Assertion (A) is true, but reason (R) is false.

d. Both assertion (A) and reason (R) are false.

Assertion (A): The most serious source of nationalist tension in Europe after 1871 was the area called the Balkans.

Reason (R): A large part of the Balkans was under the control of the Ottoman Empire.

Case study Questions:

1. Read the source given below and answer the questions that follow:

   Socially and politically, a landed aristocracy was the dominant class on the continent. The members of this class were united by a common way of life that cut across regional divisions. They owned estates in the countryside and also townhouses. They spoke French for purposes of diplomacy and in high society. Their families were often connected by ties of marriage. This powerful aristocracy was, however, numerically a small group. The majority of the population was made up of the peasantry. To the west, the bulk of the land was farmed by tenants and small owners, while in Eastern and Central Europe the pattern of landholding was characterised by vast estates which were cultivated by serfs.

   Answer the following MCQs by choosing the most appropriate option:

   i. Which was the dominant class on the continent of Europe?

      a. Landed aristocracy.

      b. Tenants.

      c. Small owners.

      d. High class society.

   ii. What did the majority of population comprise of?

      a. Tenants.

      b. Small owners.

      c. Land holders.

      d. Peasantry.

   iii. The given passage describes the social and political life of this class.

      a. Serfs and peasants.

      b. Big landowners.

c. Aristocracy and middle class.

d. Peasants and small owners.

iv. Aristocratic class used to speak French for the purpose of:

a. Diplomacy and high society.

b. Farming on a big land.

c. Unity among the members.

d. Educing regional divisions.

2. Read the source given below and answer the questions that follow:

Artists in the eighteenth and nineteenth centuries found a way out by personifying a nation. In other words, they represented a country as if it were a person. Nations were then portrayed as female figures. The female form that was chosen to personify the nation did not stand for any particular woman in real life; rather it sought to give the abstract idea of the nation a concrete form. That is, the female figure became an allegory of the nation. During the French Revolution artists used the female allegory to portray ideas such as Liberty, Justice, and the Republic. These ideals were represented through specific objects or symbols. The attributes of Liberty are the red cap, or the broken chain, while Justice is generally a blindfolded woman carrying a pair of weighing scales. Female allegories were invented by artists in the nineteenth century to represent the nation. In France, she has christened Marianne, a popular Christian name, which underlined the idea of a people's nation. Her characteristics were drawn from those of Liberty and the Republic – the red cap, the tricolour, the cockade. Statues of Marianne were erected in public squares to remind the public of the national symbol of unity and to persuade them to identify with it. Marianne images were marked on coins and stamps. Similarly, Germania became the allegory of the German nation. In visual representations, Germania wears a crown of oak leaves, as the German oak stands for heroism.

Answer the following MCQs by choosing the most appropriate option:

i. Why were Female allegories invented by artists?

a. Representation of heroism.

b. Representation of Imperialism.

c. Representation of the modern state.

d. Representation of the nation.

ii. Which of the following is an allegory for 'liberty'?

a. Red Cap.

b. Crown of Oak.

c. Olive Branch.

d. Sword.

iii. What does a blindfolded woman carrying a pair of weighing scales symbolise?

a. Peace.

b. Equality.

c. Justice.

d. Liberty.

iv. Which of the following is not true with respect to "Allegory"?

a. It is a symbol representing an abstract idea.

b. Artist became an allegory of a nation.

c. It is an idea expressed through a person or a thing.

d. An allegorical story has two meanings, one literal and one symbolic.

ANSWER KEY

MCQ:

1. Answer: a
2. Answer: a
3. Answer: b
4. Answer: b
5. Answer: a
6. Answer: b
7. Answer: c
8. Answer: c
9. Answer: d
10. Answer: c
11. Answer: b
12. Answer: a
13. Answer: b
14. Answer: d
15. Answer: b

Very Short Answer:

1. Answer:

Frederic Sorrieu.

2. Answer:

Absolutist, literally a government or system of rule that has no restraints on the power exercised. In history, the term refers to a form of monarchical government that was centralised, militarised and repressive.

3. Answer:

Utopian is a vision of society that is so ideal that it is unlikely to actually exist.

4. Answer:

The existence of nations is a guarantee of liberty, which would be lost if the world had only one law and only one master.

5. Answer:

Plebiscite is a direct vote by which all the people of a region are asked to accept or reject a proposal.

6. Answer:

The French Revolution led to the transfer of sovereignty from the monarchy to a body of French citizens.

The revolution proclaimed that it was the people who would henceforth constitute the nation and shape its destiny.

7. Answer:

The French Revolution led to the transfer of sovereignty from the monarchy to a body of French citizens.

The revolution proclaimed that it was the people who would henceforth constitute the nation and shape its destiny.

8. Answer:

As the news of events in France reached the different cities of Europe, students and other members of educated middle classes began setting up Jacobin clubs.

9. Answer:

In the Dutch Republic, in Switzerland, in Italy and Germany, Napoleon simplified administrative divisions, abolished the feudal system and freed peasants from serfdom and manorial dues.

10.Answer:

The people became hostile due to increased taxation, censorship, forced conscription into the French armies required to conquer ihe rest of Europe. All these

seemed to outweigh the advantages of the administrative changes.

Short Answer:

1. **Answer:**

   Metternich described him as “the most dangerous enemy of our social order”.

2. **Answer:**

   Metternich once remarked, “When France sneezes, the rest of the Europe catches cold.”

3. **Answer:**

   I. Lord Byron was an English poet.

   II. He organised funds and later went to fight in the war, where he died of fever in 1824.

4. **Answer:** Romanticism was a cultural movement which sought to develop a particular form of nationalist sentiment. Romantic artists and poets generally criticised the glorification of reason and science and focused instead on emotions, intuition and mystical feelings.

5. **Answer:** Karol Kurpinski celebrated the national struggle through his operas and music, turning folk dances like the polonaise and mazurka into nationalist symbols.

6. **Answer:**

   I. There was enormous increase in population all over Europe.

   II. In most countries there were more seekers of jobs than employment.

7. **Answer:**

   I. The Grimm brothers were born in the German city of Hanau in 1785 and 1786 respectively.

   II. They collected folktales and considered their projects of collecting folk-tales and developing the German language as part of the wider effort to oppose French domination and create a German national identity.Answer:

8. **Answer:**

   I. Louis Philippe was forced to flee and

   II. National Assembly proclaimed a Republic.

   III. Suffrage was granted to all adult males above 21.

   IV. Right to work was guaranteed. National workshops to provide employment were set up.

9. **Answer:** Feminist means awareness of women’s rights and interests based on

the belief of the social, economic and political equality of the genders.

10. **Answer:** Ideology is a system of ideas reflecting a particular social and political vision.

Long Answer:

1. **Answer:**

The political condition of Europe in the mid-eighteenth century was as mentioned below :

(1) There were no nation states

(2) Germany, Italy and Switzerland were divided into kingdoms, duchies and cantons whose rulers had their autonomous territories.

(3) There were autocratic monarchies in Eastern and Central Europe.

(4) People spoke different languages and belonged to different ethnic groups,

I. For example, Habsburg Empire consisted of different regions and peoples.

II. They did not share a collective identity or a common culture,

III. It included German-speaking people of Bohemia as well as Italian-speaking people of Lombardy and Venetia.

IV. Half of the population of Hungary was Magyar,

V. Such differences did not promote a sense of political unity. The only tie binding diverse groups together was a common allegiance to the emperor.

2. **Answer:**

The condition of aristocracy and peasantry was as mentioned below :

(1) Landed aristocracy :

I. Socially and politically, ,a landed aristocracy was the dominant class on the continent.

II. They were united by a common way of life, such as owning large estates and town houses,use of French language for diplomacy and in high society.

III. They were also united with ties of marriage with each other. Thus, aristocracy was powerful but they were in minority.

(2) Peasantry :

I. The majority of the population was peasants.

II. To the west, most of the land was farmed by tenants and small owners.

III. In the Eastern and Central Europe, there were large estates which were cultivated by serfs.

3. Answer:

(1) Industrialisation : Industrialisation had begun in England in the second-half of the ' eighteenth century. However, it took place in France and parts of the German states during the nineteenth century.

(2) Its consequences were as mentioned below :

Growth of towns : Emergence of commercial classes – there was growth of towns and the emergence of commercial classes in Western and some parts of Eastern Europe. This was due to the growth of industrial production and trade. The existence of commercial classes was based on production for the market.

A new working class and middle classes consisting of industrialists, businessmen, professionals came into existence. It was among the educated, liberal middle classes that ideas of national unity following the abolition of aristocratic privileges gained popularity.

4. Answer:

(1) The term 'liberalism' is derived from the Latin word liber, meaning free. Thus, for the new middle classes, liberalism stood for freedom for the individual and equality of all before "law.

(2) Political and economic ideas supported by the liberals were as given below :

(1) Political ideas :

I. It emphasised the concept of government by consent.

II. Since the French Revolution, liberalism stood for the end of autocracy and clerical privileges, a constitution and representative government through parliament.

III. They did not necessarily stand for universal suffrage.

IV. In revolutionary France, which was the first example of liberal democracy, the right to vote and election was exclusively granted to property-owning men. Men without property and women were not granted political rights. Thus in the 19th and 20th centuries there were movements demanding equal political rights.

(2) Economic ideas : They supported freedom of markets and the abolition of state- imposed restrictions on the movement of goods and capital. During the 19th century this was a strong demand of the emerging middle classes. Also see Textbook Question 4.

5. Answer:

I. In France, the right to vote and election was granted only to property-owning men.

II. Men without property and all women were excluded from political rights.

III. During the period of Jacobins, all adult males were granted right to vote.

IV. The Napoleonic Code again granted limited right to vote. Women were reduced to the status of a minor, subject to the authority of fathers and husbands.

V. Women and non-propertied men organised opposition movements demanding equal political rights during the nineteenth and early twentieth centuries.

Assertion Reason Answer:

1. (a) If both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
2. (b) If both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion

Case Study Answer:

1. i (a)Landed aristocracy.
   i. (d) Peasantry.
   ii. (c) Aristocracy and middle class.
   iii. (a) Diplomacy and high society.

2. i (d) Representation of the nation.
   ii. (a) Red Cap.
   iii. (c) Justice.
   iv. (b) Artist became an allegory of a nation.

Write in Brief:

Q#1 Write a note on:

1. **Guissepe Mazzini:-** Mazzini was born in Genoa in 1807. Guiseppe Mazzine is known for his noble efforts to achieve the unification of Italy. He is regarded as the "spiritual force" behind the Italian unification. He started the movement known as the "Young Italy" with Garibaldi as his companion, to make efforts towards the unification of Italy. He inspired youths of not only Italy but of whole Europe to fight for freedom. In the revolution of 1848, he reached Rome to secure its freedom from the papal occupation. Such a thing encouraged all the countries of Europe to get rid of the papal or religious domination. Though Mazzini and his "Young Italy failed to achieve unification. Yet they had filled the minds of the people with such sentiments that Cavour was able to achieve the unification of Italy without much difficulty. By his efforts, he encouraged all the people of Europe to sacrifice all for the freedom of their own countries.
2. **The Greek War of Independence**:- The Greek war of Independence was fought from 1827 to 1829 between Turkey and Greece. Between the 15th and the 17th centuries, Turkey had established its control on many Balkan states that lay between the Adriatic and the Black sea. Greece was one of them. But due to various causes a war broke out between the Greeks and the Sultan of Turkey in 1827 A.D.

The Greeks, in order to cast off the slavery of the Sultan of Turkey, first of all revolted in 1821 A.D. At many places the Christians were brutally killed in large numbers which completely shook the whole of Europe. In such a state of affairs, England, France and Russia helped the Greeks in 1827 A.D. to defeat the sultan and forced him to sign the treaty of Adtianople in 1929 A.D. Turkey was thus forced to grant independence to Greece. Serbia also secured self rule.

Q#2 What steps did the French revolutionaries take to create a sense of collective identity among French people?

Ans. The French revolutionaries took the following steps to create a sense of collective identity among French people:

1. They introduced the ideas of la-patrie (the fatherland) and le-citoyen (the citizens). These ideas emphasized the notion of a united community enjoying equal rights under a constitution.
2. A new French flag, the tricolour, was chosen to replace the former royal standard.
3. The Estates General was renamed the National Assembly and was elected by a group of active citizens.
4. They established a centralized administrative system, which formulated uniform laws for all citizens.
5. They adopted a uniform system of weights and measures and abolished internal custom duties.
6. The regional dialects were discouraged and French, as it was spoken and written in Paris, became the common language of the nation.
7. They further declared that it was the mission and destiny of the French nation to liberate people of Europe from despotism, in other words to help other people of Europe to become nations.
8. They composed new hymns, took oaths and commemorated martyrs, all in the name of nation.

Q#3 Who were Marianne and Germania? What was the importance of the way in which they were portrayed?

Ans. The artists in the 18th centuries started representing the nations in human forms. The Nation was then portrayed as female figure. The female form did not stand for any particular woman in life; rather it became the allegory of the nation. Therefore, Marianne was the female allegory of the French nation and similarly, Germania was the female allegory of German nation.

They stood as personifications of ideals like, "Liberty and the Republic". They were portrayed in such a way that it sought to give an abstract idea of the nation in a concrete form and would instill a sense of nationality in the citizens of these countries.

(OR)

Ans. Marianne and Germania were the women allegories or symbols to represent the nations of France and Germany respectively. Marianne was a popular Christian name portrayed with red cap, tricolour and cockade. Germania was visualised as wearing a crown of oak leaves which stood for heroism. Both these allegories were invented by the artists and visualised to represent their nation. Their statues were erected in public squares to remind people about the national symbol. They stood for liberty and republican government. The peculiar way of their representation was meant to develop the sense of nationalism in the citizens.

Q#4 Briefly trace the process of German unification.

Ans. The different stages that led to the final unification of Germany are recounted as under and in all stages. Otto von Bismarck, the Prussian chancellor, played the important role:-

i. **The First Stage** :-To unite Germany and to frame constitution for the united Germany, a constituent Assembly met at Frankfurt. This assembly proposed the unification of Germany under the king of Prussia. The king of Prussia, however opposed the idea of becoming a constitutional monarch and declined the offer. Repression soon followed and thousands of German revolutionaries fled to live in exile. Thus ended the first phase of the unification of Germany.

Now, Germany was to be unified by the policy of 'blood and iron' as was pursued by Bismark, the Prussian chancellor. Bismark tried to achieve his aim by dint of his military power and astute diplomacy.

ii. **The second Stage**:- War against Denmark, 1864. Bismark picked up a quarrel with Denmark over the question of the control of two Duchies of Schlesueig and Holstein. In 1864 A.D. he fought a war against Denmark and took control of Schlesueig.

iii. **The Third stage**:- War against, 1866 Bismark wanted to complete the unification of Germany by ousting Austria from Germany. In 1866 A.D. Prussia defeated Austria and annexed the territories of Hanover Holstein, Luxumberg, Frankfurt at thereby dissolving the German confederation once for all. It paved the way for the subsequent unification of Germany. The Unification of Germany, 1789 – 1871

iv. **The fourth stage:-** War against France, 1870 – 1871. In 1870 A.D. Prussia defeated France in another war and occupied Alsace and Lorriane. The impact of Prussia's impressive victories was so great that the other German states also joined the German confederation which recognized the Prussian king as its hereditary head.

Q#5 What changes did Napoleon introduced to make the administrative system more efficient in the territories ruled by him?

Ans. Napoleon introduced the following changes to make the administrative system more efficient in the areas ruled by him:-

1. He established civil code in 1804 also known as the Napoleonic code. It did away with all privileges based on birth. It established equality before law and secured the right to property.
2. He simplified administrative divisions, abolished feudal system and freed peasants from serfdom and manorial dues.
3. In towns too, guild restrictions were removed.
4. Transport and communication systems were improved.
5. Peasants, artisans, businessman and workers enjoyed the new found freedom. Businessmen and small-scale producers realized that uniform laws, standardized weights and measures and common currency would facilitate the movement and exchange of goods and capital from one region to another.
6. The right to property was recognized.

Things to discuss:

Q#1 Explain what is meant by the 1848 revolution of the liberals. What were the political, social and economic ideas supported by the liberals?

Ans. The 1848 revolution of the liberals refers to the various national movements pioneered by educated middle class alongside the revolts of the poor, unemployed and starving peasants and workers in Europe. While in countries like France, food shortage and widespread unemployment during 1848 led to popular uprisings, in other parts of Europe such as Germany, Italy, Poland and the Astro-Hungarian Empire, men and women of the liberal middle classes came together to voice their demands for the creation of nation states based on parliamentary principles.

The political, social and economic ideas supported by the liberals were clearly based on democratic ideals. Politically, they demanded constitutionalism with national unification, i.e. a nation-state with a written constitution and parliamentary administration.

They wanted to get rid society of its class-based partialities and birth rights. Serfdom and bonded labour had to be abolished and economic equality had be pursued as a national goal. The right to property was also significant in the liberals' concept of a nation based on political, social and economic freedom.

Q#2 How was the history of nationalism in Britain unlike the rest of Europe?

Ans. The development of nationalism in Britain was totally different from the rest of Europe. The nationalism developed in Europe after the powerful revolutions, war and military campaigns, as was the case of the German and Italian unification. But Britain was an exception to this. There never occurred a war for nationalism.

Britain comprised ethnic groups such as- English, Scottish, Irish etc. Among them, English became powerful with time and began to dominate the other ethnic groups. First they united with Scottish and dominated them. The Act of Union (1707) between England and Scotland that resulted in the permission of the United Kingdom of Great Britain, meant, in effect, that England was able to impose its influence on Scotland. Then they began to control Irish people. Ireland was a country deeply divided between Catholics and Protestants. The English helped the Protestants of Ireland to establish their dominance over a largely Catholic country. Thus, Ireland was forcibly in-corporated into the United Kingdom in 1801. Thus, the United Kingdom of Great Britain

emerged without any kind of bloodshed.

Q#3 Why did nationalist tensions emerge in the Balkans?

Ans. Balkan states are the states between the Black Sea and the Adriatic Sea like the Bulgaria, Serbia, Bosnia, Herzegovina, Greece, etc. These states were a bone of contention between various European powers and Turkey, for a long time. Some of the major causes of the nationalist tensions in the Balkans were:-

1. Balkans was the region where many ethnic groups resided. The majority of the people of the Balkan states were Christians. The Muslims who were the ruling class oppressed them in many ways.
2. By the beginning of the 19th century, the Turkish Empire became very weak. So it came to be known as the "Sickman of Europe". This encouraged the Balkan People who were mostly Christians to claim for their independence and they used history to prove that they had once been independent but had subsequently subjugated by foreign powers.
3. The French Revolution and the Napoleonic wars inspired the feelings of nationalism for independence. Hence, the Balkans thought of their struggles as attempts to win back their long lost independence.
4. There was a clash of interests among the big powers in the Balkans. For instance, Rusia wanted to control the Black Sea but England could not tolerate it. On the other hand, Austria wanted to expand her empire by annexing the Balkan territories. Thus, all these problems in the Balkans states gave birth to many wars and finally the First World War.

Q#4 Choose three examples to show the contribution of culture to the growth of nationalism in Europe?

Ans. The development of nationalism did not come about only through wars and territorial aspirations at by many other factors as well.

i. The first example of the effect of Romanticism and culture in creating the idea of nationalism was set by a romantic German philosopher Johnn Gottpried Herder (1744-1800). He claimed that it was through folk songs, folk poetry, folk dances that the true spirit of the nation was popularized.

ii. The second example regarding the effect of culture in arousing national feeling was presented by a polish writer Karol Kuroinski. He through his operas and music and folk dances which he used as national symbols, roused the national emotions of the people against the partition of his country and among Poland the great powers – Russia, Prussia & Austria.

iii. The third example was presented by a French painter Delacroix. He through his paintings. The massacre of the chios" depicted an incident in which about 20,000 Greeks were said to have been killed by the Turks in the island of chios. By dramatizing the massacre, the painter sought to appeal to the emotions of the spectators for the cause of Greek independence.

Activity → P. No. 1 (Fig 1)

Q. In what way do you think this print depicts a Utopian vision?

Ans. In the print the French artist Frederic Sorrieu has very graphically visualized his dream of a world made up of democratic and social republic.

i. This print of the series shows the people of Europe and America of all ages and all social classes, marching in a long train and offering homage to the statue of liberty.

ii. Like other artists of the French Revolution of 1848 personified liberty as a female figure. She is shown as holding the torch of enlightenment in one hand and the charter of the rights in one hand and of the rights of man in the other.

iii. In the foreground of the image are shown the shattered remains of the symbols of absolutist institutions.

iv. In his Utopian (or Ideal) vision, the people of the world are shown as grouped as distinct nations, indentified through their flags and national costumes.

v. Leading the procession are the United States and Switzerland which had by them (in 1848) had become nation states. They are followed by different nations of the world, like France, Germany, Austria, Poland, England, Ireland, Hungry and Russia etc.

vi. From the heavens above the Christ, Saints and angels gaze upon the scene symbolizing fraternity among the different nations of the world.

Q#5 Through a focus on any two countries, explain how nations developed over the 19th century.

Ans. The making of nationalism in Germany and Italy:-

1. **Nation-building process in Germany:-** Germany was divided into a number of states like Bavaria, Saxony etc. in the 18th century, due to which the pace of economic growth was very slow. With the passage of time and the rise of national consciousness, the demand for a unified Germany became stronger in several states. In 1815 C.E., the rulers were forced to grant democratic constitutions. In 1848, a Constituent Assembly met in Frankfurt to unite Germany and to frame constitution for the United Germany. This assembly proposed the unification of Germany under the king of Prussia-Kaiser Wilhelm-IV, who opposed the idea of becoming a constitutional Monarch and declined the offer.

Bismarck, the Prussian Chancellor played a major role at this stage. He tried to achieve his aim of unification of Germany by the dint of his military power and astute diplomacy. For this, in 1864 C.E, he fought a war against Denmark and took control of Schleswig. In 1870 C.E, Prussia defeated France in another war and occupied Alsace and Lorraine. The impact of Prussia's impressive victories was so great that the other German states also joined the German Confederation.

On January 18, 1871 in the royal palace of Versailles, the king of Prussia- Kaiser William-I, was crowned as the German Emperor and the ceremony symbolized in the eyes of the world, the newly born unity of the German people.

2. **Nation- building process in Italy:-** Like Germany, Italy too had a long history of political fragmentation. The Italians were scattered over several dynastic states as well as the multi-national Habsburg Empire. During the middle of the 19th century, Italy was divided into seven states (Lombardy, Venetia, Kingdom of the two Sicilies (Sicily and Naples), Papal States, Sardinia, Tuscany, Parma and Modena).

The struggle for Italian independence and unification was organized by the two famous revolutionaries of Italy- Giuseppe Mazzini and Giuseppe Garibaldi. The movement led by them is known as the 'Young Italy' movement. But this movement failed to unite Italy.

After 1848, his Chief Minister, count Cavour, took the initiative of unifying Italy. Through a tactful diplomatic alliance with France engineered by Cavour, Sardinia- Piedmont succeeded in defeating the Austrian forces in 1859 C.E. In 1860 C.E., they marched into South Italy and the Kingdom of the two Sicilies and succeeded in winning the support of the local peasants in order to drive out the Spanish rulers. In 1861 C.E, Victor Emmanuel-II was proclaimed the king of united Italy.

In spite of the important role played by democratic and revolutionary leaders such as Mazzini and Garibaldi in the struggle for Italy's liberation and unification, Italy also, like Germany, became a monarchy.

ENGLISH

CHAPTER 7: THE NECKLACE

THE NECKLACE

~Summary~

-by Guy De Maupassant

Matilda Loisel and her Unhappiness –

Matilda Loisel, a middle class lady, desperately wished she were wealthy. She was very pretty and charming but had the bad luck to be born into a family of clerks and married to another clerk, M Loisel. Her husband worked as a clerk in the office of the Board of Education. Matilda was simple but she was unhappy. She was so convinced that she's meant to be rich that she detested her real life and spent all day dreaming and despairing about the fabulous life that she was not having.

M Loisel Brings an Invitation

One day, M Loisel brought an invitation to a fancy ball (party) organised by his boss, the Minister of Education. M Loisel thought that her wife would be delighted to read the invitation but she was not delighted to see the invitation. She told her husband that she did not have a good dress to wear to that occasion and asked him to give the invitation to his friend. Her husband M Loisel, told her that she could buy a new dress. He had saved four hundred francs to buy a gun to join some hunting parties. He said that he would give that money to her for buying a new dress.

Matilda Gets Necklace from Mme Forestier

Matilda brought a new dress but she was not happy. Her husband asked the reason of her sadness. She said that she would not go for the ball as she did not have jewellery to wear with the dress. He replied that she should wear some natural flowers, but she was not convinced. Then he advised her to borrow it from her friend, Mme Forestier. Next day, she went to her friend's house and borrowed a necklace for the ball.

Matilda at the Day of Ball

The night of the ball arrived and Matilda was happy at the occasion. She looked very beautiful in the dress. Everyone liked her and she was absolutely thrilled. She and her husband did not leave until 4 am. Then they caught a cab and returned home.

The Necklace was Lost

When she returned home and was changing her dress, Matilda wanted to see her beauty in final view before the mirror. Suddenly, she noticed that the necklace was not around her neck. She was shocked to see that her necklace had got lost. She cried out and informed her husband that she had lost the necklace. Her husband searched for the necklace on every place, where they went last night. He went to the police and the cab offices. He also put an advertisement in the newspapers, but the necklace was not found. So he advised her wife to write a letter to her friend telling her that she needed some time to get the necklace repaired.

Matilda Replace the Necklace

At last, Matilda decided to replace the necklace with a necklace that looked similar to it. Her husband gave her 18000 francs which his father had left for him. He took a loan of the remaining amount and purchased a diamond necklace for 36000 francs. She returned the necklace to her friend. Buying the necklace bought the Loisel in poverty. They lost their house, their maid, their comfortable lifestyle and on top of it all, Matilda lost her good-looking face.

The Truth Revealed Out

After ten years, all the debts were finally paid. One day Matilda was walking in the Champs-Elysees and saw Mme Forestier. She was looking charming and beautiful as she had looked ten years before. Now all the debts were paid off, Matilda decided to tell the story to Mme Forestier about her necklace. At this, Mme Forestier informed her that it was a fake necklace and the cost of it was only five hundred francs.

Conclusion of The Necklace

In the chapter – The Necklace focuses that one should be content and satisfied with their belongings and not crave for expensive items that are not within their economical capabilities. Extreme desire for lavish items leads to unhappiness and loss of peace of mind.

NCERT SOLUTION

Questions (Page No. 1)

(READ AND FIND OUT)

Question 1:What kind of a person is Mme Loisel — why is she always unhappy?

Answer:Mme Loisel was a young and pretty woman who led a simple yet unhappy life. She came from a poor family but always dreamt of riches and luxuries of life. She was always unhappy as she knew her dreams could never be fulfilled. She was aware that her meagre resources weren't enough to satisfy her expensive desires and all this made her unhappy and angry on her condition.

Question 2:What kind of a person is her husband?

Answer:Matilda's husband Monsieur Loisel was an ordinary and simple-hearted young man. He was a small clerk in the office of the Board of Education, but he was contented with his job. With great excitement, he brought a dinner invitation of a grand party for his wife. However poor he might be, he was a caring husband as he gave four hundred francs to his dear wife to buy a pretty dress for the party.

Questions (Page No. 41)

(READ AND FIND OUT)

Read and Find Out (Page 41)

Question 1:What fresh problem now disturbs Mme Loisel?

Answer:After spending four hundred francs in buying a beautiful dress, Mme Loisel was bothered by yet another fresh problem. She brooded over the fact that she did not have a beautiful jewel to pair with her pretty dress. Hearing this, her husband suggested her to wear some natural flowers as jewellery, but she refused stating that there was nothing more humiliating than to have a shabby air in the midst of rich women.

Question 2:How is the problem solved?

Answer:Mme Loisel's husband, Monsieur Loisel initially suggested her to wear some natural flowers as jewellery, but she refused the idea. Then, he advised her to request and borrow some jewels from her rich friend, Mme Forestier. Matilda uttered a cry of joy as she liked this wonderful idea. The next day she took herself to her friend's house and picked a superb necklace of diamonds that matched with her beautiful attire. Hence, her husband's timely suggestion solved her problem.

Questions (Page No. 42)

(READ AND FIND OUT)

Question 1:What do M. and Mme Loisel do next?

Answer:When the Loisels realised that the necklace went missing, they left no stone unturned and tried their best to locate the lost jewel, but couldn't find it. Monsieur Loisel even went back to the streets through which they returned home, in case it had accidently fallen on the road. When he couldn't find anything, he went to the police and cab offices and also put up an advertisement in the newspapers offering a reward to anyone who found the necklace. Soon after, he asked his wife to write a letter to her friend, Mme Forestier stating that the clasp of the necklace had broken and would return it once repaired. This would give them some more time to find the necklace. However, all their efforts went in vain. Eventually, they bought a new diamond necklace to replace the lost one.

Question 2:How do they replace the necklace?

Answer:After all their efforts went in vain, M. and Mme Loisel decided to buy a fresh new identical necklace to replace the lost necklace. M. Loisel possessed eighteen thousand francs of his inheritance and borrowed the rest of the money from usurers and the whole race of lenders by making ruinous promises. When they borrowed enough money, the couple went to the merchant and bought a new necklace for thirty six thousand francs and returned it to the rightful 0wner, Mme Forestier.

Questions (Page No. 46)

(THINK ABOUT IT)

Question 1:The course of the Loisels' life changed due to the necklace. Comment.

Answer:The Loisels' life took a major turn due to the necklace. It took them ten years to repay the loan that they had borrowed to buy the necklace. Their life turned upside down and everything changed for them to repay the debt. They changed their lodgings, sent away the maid and rented some rooms in an attic. Matilda did all the tedious work of the kitchen, washed dirty linen, bargained with the grocer and butcher to save every single sou for mere survival. Her husband worked until late evenings and took up odd jobs to repay their debt. The couple led a miserable life to sustain themselves and repay the frightful debt for buying the expensive jewel.

Question 2:What was the cause of Matilda's ruin? How could she have avoided it?

Answer:Matilda's materialistic aspirations and dissatisfaction was the ultimate cause of her ruin. She was always unhappy about her financial status and wished to be born in the midst of

riches and luxuries of life. She could have easily avoided her ruin by accepting her current situation and being content with her simple life with her loving husband.

Question 3:What would have happened to Matilda if she had confessed to her friend that she had lost her necklace?

Answer:If Matilda could have courageously confessed to her friend, Mme Forestier about the loss of the necklace, she could have saved herself from her doom. Her friend would have certainly got angry for the loss, but at least she would have come to know that it was a fake necklace that cost five hundred francs only. Had she known the real value of the necklace before, she would not have spent her husband's entire inheritance and borrowed eighteen thousand francs to buy a replacement for the lost necklace. Besides, she could have saved herself and her husband from ten long years of suffering, misery, crushing poverty and all the trouble that they had to face to repay the frightful debt.

Question 4:If you were caught in a situation like this, how would you have dealt with it?

Answer:If I had been caught in a similar situation, I would have tried my best not to become a victim of greed and unrealistic aspirations. Had I lost a friend's necklace, I would have revealed the truth about the loss and be ready to face the consequences. I would have maintained honesty to come out of the problem and that would have definitely paved a way out for me.

Questions (Page No. 46)

(TALK ABOUT IT)

Question 1:The characters in this story speak in English. Do you think this is their language? What clues are there in the story about the language its characters must be speaking in?

Answer:Although the characters in the story speak in English, it was probably not their language. Guy De Maupassant, the writer wrote the story in French and it was later translated into English. There are ample pointers in the text that indicate the French origin of the characters such as the salutations used before the surnames of characters such 'Monsieur and Mme Loisel', 'Mme Forestier' and 'George Ramponneau', the minister's name. Besides, the words used to denote currency such as 'Franc' and 'Sou'. Then, the location of the shop was at 'Palais Royal' and 'Champs Elysees' that point out the French origin and history of the characters in the story.

Question 2:Honesty is the best policy.

Answer:Honesty is indeed the best policy. We all know that hypocrisy and pride seem very rewarding and attractive initially. But, a person who follows the path of falsehood is likely to lead a life of misery, suffering and utter gloom. On the contrary, an honest person might face difficulties in life at the beginning but it ultimately gives him/her all the happiness that he/she

rightfully deserves. Therefore, honesty is the ultimate choice to lead a life of contentment, harmony and eternal happiness.

Question 3:We should be content with what life gives us.

Answer:Yes, we should be at peace and contented with what life gives us. Every person in this world is born in different conditions and his/her entire life package is a great mystery. Some people are born with all riches, luxury, name and fame. On the other hand, there are some who are born in suffering and crushing poverty which makes it difficult for them to survive. Hence, there is a famous adage which says, “Cut your coat according to your cloth”. This means that one must learn to live within one’s capacity and be content with what one has. A person can try to improve his/her financial position through honest means and eventually can be happy with how he/she manages his/her life peacefully.

MATHEMATICS

Chapter 3: Pair of Linear Equations in Two Variables

Pair of Linear Equations in Two Variables

1. **A pair of Linear Equations in two variables:**

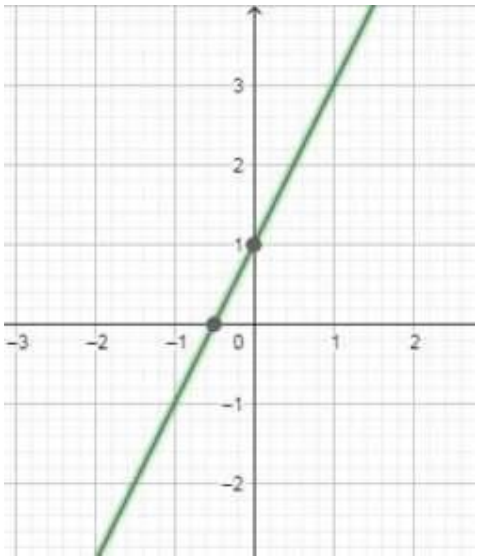
   - An equation of the form ax + by + c = 0, where a, b and c are real numbers, such that a and bare not both zero, is called a **linear equation in twovariables**.
   - Two linear equations in same two variables x and y are called **pair of linearequations in two variables**.

   Geometrical Representation of a Linear Equation

   Geometrically, a linear equation in two variables can be represented as a straight line.

   2x – y + 1 = 0

   ⇒ y = 2x + 1



   Graph of y = 2x+1

   Plotting a Straight Line

   The graph of a linear equation in two variables is a straight line. We plot the straight line as follows:

   - Take any value for one of the variables($x_1 = 0$) and substitute it in the equation to get the corresponding value of the other variable (y_1).
   - Repeat this again (put $y_2 = 0$, *get* x_2) to get two pairs of values for the variables which represent two points on the Cartesian plane. Draw a line through the two points.

2. **Types of Polynomials based on Degree**

   Linear Polynomial

   A polynomial whose degree is one is called a linear polynomial.

   For example, 2x+1 is a linear polynomial.

Quadratic Polynomial

A polynomial of degree two is called a quadratic polynomial.

For example, $3x^2+8x+5$ is a quadratic polynomial.

Cubic Polynomial

A polynomial of degree three is called a cubic polynomial.

For example, $2x^3+5x^2+9x+15$ is a cubic polynomial.

3. **Graph of the polynomial x^n**

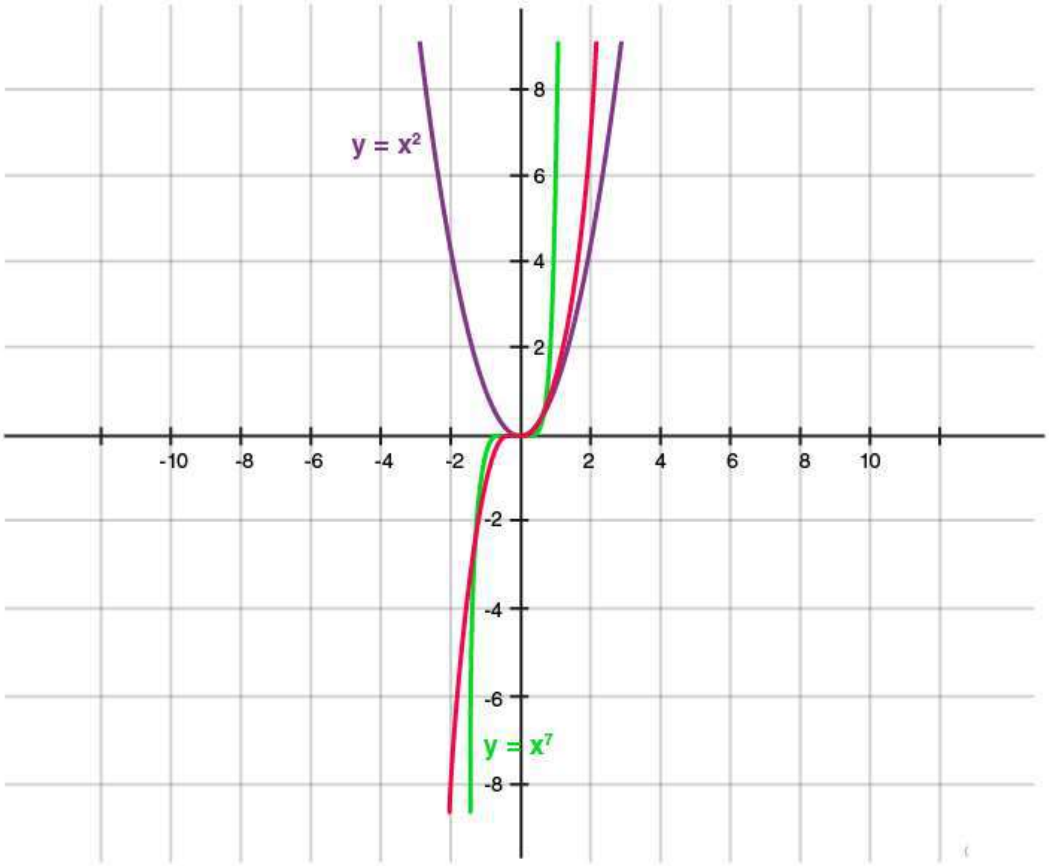
For a polynomial of the form $y=x^n$ where n is a whole number:

as n increases, the graph becomes steeper or draws closer to the Y-axis

If n is odd, the graph lies in the first and third quadrants

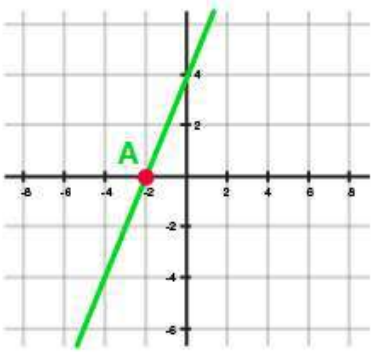
If n is even, the graph lies in the first and second quadrants

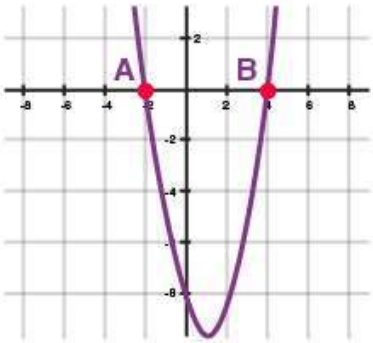
The graph of $y=-x^n$ is the reflection of the graph of $y=x^n$ on the x-axis

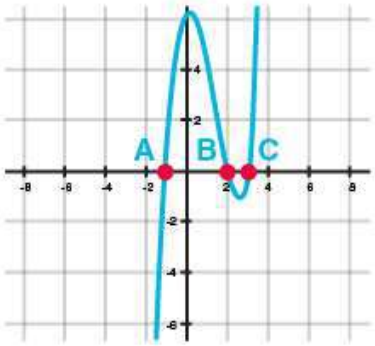


4. **Geometrical Meaning of Zeros of a Polynomial**

Geometrically, zeros of a polynomial are the points where its graph cuts the x-axis.







(i) One zero(ii) Two zeros (iii) Three zeros

Here A, B and C correspond to the zeros of the polynomial represented by the graphs.

Number of Zeros

In general, a polynomial of degree n has at most n zeros.

- A linear polynomial has one zero,
- A quadratic polynomial has at most two zeros.
- A cubic polynomial has at most 3 zeros.

5. The **general form** of a pair of linear equations in two variablesis

$a_1x + b_1y + c_1=0$

$a_2x + b_2y + c_2= 0$

where a_1, a_2, b_1, b_2, $c_1$and $c_2$are real numbers, such that

6. A system of linear equations in two variables represents two lines in a plane. For two given lines ina plane there could be three possiblecases:

i. The two lines are intersecting, i. e., they **intersect at onepoint**.

ii. The two lines are **parallel**, i.e., they do not intersect at any realpoint.

iii. The two lines are **coincident** lines, i.e., one line overlaps the otherline.

7. A system of simultaneous linear equations is said tobe

- **Consistent**, if it has **at least onesolution.**
- **In-consistent**, if it has **nosolution.**

8. If thelines

i. Intersect at a point, then that point gives the **unique solution** of the system of equations. In this case system of equations is said to be**consistent**.

ii. Coincide (overlap), then the pair of equations will have **infinitely many solutions**. System of equations is said to be**consistent.**

iii. are parallel, then the pair of equations has **no solution**. In this case pair of

equations is said tobe**inconsistent.**

9. Solution of a pair of Linear Equations in twovariable:

System of equations can be solved using **Algebraic** and **Graphical Methods.**

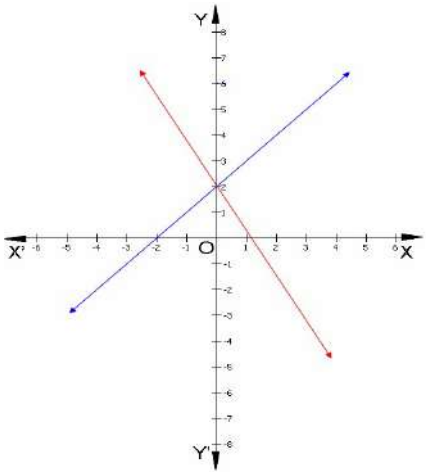
10. GraphicalMethod:

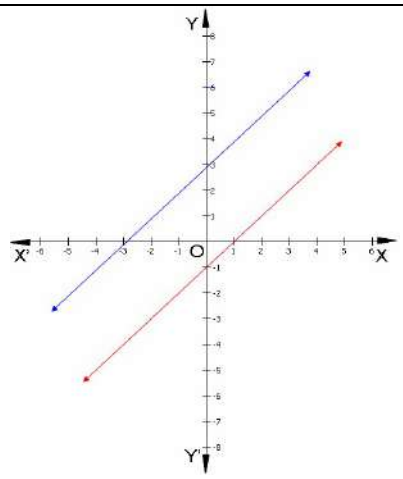
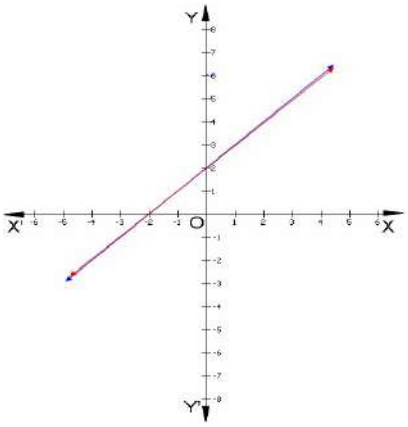
- A linear equation in two variables is represented geometrically by a **straightline**.
- The graph of a pair of linear equations in two variables is represented by twolines. Steps:

i. Draw the graphs of both the equations by finding two solutions foreach.

ii. Plot the points and draw the lines passing through them to represent theequations.

iii. The behaviour of lines representing a pair of linear equations in two variables and the existence of solutions can be summarised asfollows:

Ratio of Coefficients	**Graphical Representation**	**Nature of Solution**	**Defined as**
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Lines are intersecting 	Unique solution	Consistent pair of equations
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Lines are parallel	No solution	Inconsistent pair of equations

			
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Lines are coincident 	Infinitely many solutions	Dependent (consistent) pair of equations

11. Algebraic Method:

The most commonly used **Algebraic Methods** to solve a pair of linear equations in two variables are:

i. Substitutionmethod

ii. Eliminationmethod

iii. Cross-multiplicationmethod

12. SubstitutionMethod:

Steps followed for solving linear equations in two variables,using**substitutionmethod**:

Step 1: Express the value of one variable, say y in terms of other variable x from either equation, whichever is convenient.

Step 2: Substitute the value of y in other equation and reduce it to an equation in one variable, i.e. in terms of x. There will be three possibilities:

a. If reduced equation is linear in x, then solve it for x to get **a uniquesolution.**

b. If reduced equation is a true statement without x, then system has **infinitesolutions.**

c. If reduced equation is a false statement without x, then system has **nosolution.**

Step 3: Substitute the value of x obtained in step 2, in the equation used in step 1, to obtain the value of y.

Step 4: The values of x and y so obtained is the coordinates of the solution of system of equations.

13. Elimination Method:

Steps followed for solving linear equations in two variables, by **elimination Method**:

Step 1: Multiply both the equations by some suitable non-zero constants to make the coefficients of variable x (or y) equal.

Step 2: Add or subtract both the equations to eliminate the variable whose coefficients are equal.

a. If an equation in one variable y (or x) is obtained, solve it for variable y (orx).

b. If a true statement involving no variable is obtained then the system has **infinitesolutions**.

c. If a false statement involving no variable is obtained then the system has **nosolution**.

Step 3: Substitute the value of variable y (or x) in either of the equation to get the value of other variable**.**

14. Cross MultiplicationMethod:

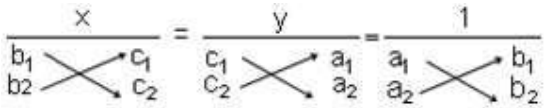
Steps followed for solving linear equations in two variables, by **cross multiplication method**:

Step 1: Write the equations in the general form.

$a_1x + b_1y + c_1 = 0$

$a_2x + b_2y + c_2 = 0$

Step 2: Arrange these in the following manner.



Here, the arrows between two numbers (coefficients) mean that they are to be multiplied and the second product is to be subtracted from the first product.

Step 3: Cross multiply:

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{y}{a_2c_1 - a_1c_2} = \frac{1}{a_1b_2 - a_2b_1}$$

a. Comparing (1) and (3), we get the value ofx

$$x = \frac{b_1c_2 - b_2c_1}{a_1b_2 - a_2b_1}$$

b. Comparing (2) and (3), we get the value ofy

$$y = \frac{a_2c_1 - a_1c_2}{a_1b_2 - a_2b_1}$$

From the above equations, obtain the value of x and y provided $a_1b_2 - a_2b_1 \neq 0$.

15. Equations which are not linear but can be reduced to linear form by some suitable substitutions are called equations reducible to linearform.

Reduced equation can be solved by any of the algebraic method (substitution, elimination or cross multiplication) of solving linear equation.

16. While solving problems based on time, distance and speed; following knowledge may be useful:

If speed of a boat in still water = ukm/hr,

Speed of the current = v km/hr Then,

Speed upstream = (u - v) km/hr

Speed downstream = (u + v) km/hr

17.Factorization of Polynomials

Quadratic polynomials can be factorized by splitting the middle term.

For example, consider the polynomial $2x^2-5x+3$

Splitting the middle term:

The middle term in the polynomial 2x2−5x+3 is -5x. This must be expressed as a sum of two terms such that the product of their coefficients is equal to the product of 2 and 3 (coefficient of x^2 and the constant term)

−5 can be expressed as (−2)+(−3), as −2×−3=6=2×3

Thus, $2x^2-5x+3=2x^2-2x-3x+3$

Now, identify the common factors in individual groups

$2x^2-2x-3x+3=2x(x-1) - 3(x-1)$

Taking (x−1) as the common factor, this can be expressed as:

2x(x−1)−3(x−1)=(x−1)(2x−3)

18.Relationship between Zeroes and Coefficients of a Polynomial

For Quadratic Polynomial:

If α and β are the roots of a quadratic polynomial ax2+bx+c, then,

$\alpha + \beta = -b/a$

Sum of zeroes = -coefficient of x /coefficient of x2

$\alpha\beta = c/a$

Product of zeroes = constant term / coefficient of x2

For Cubic Polynomial

If α,β and γ are the roots of a cubic polynomial ax3+bx2+cx+d, then

$\alpha+\beta+\gamma = -b/a$

$\alpha\beta +\beta\gamma +\gamma\alpha = c/a$

$\alpha\beta\gamma = -d/a$

19.Division Algorithm

To divide one polynomial by another, follow the steps given below.

Step 1: arrange the terms of the dividend and the divisor in the decreasing order of their degrees.

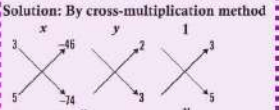
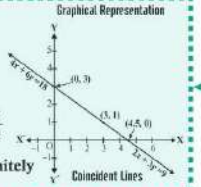
Step 2: To obtain the first term of the quotient, divide the highest degree term of the dividend by the highest degree term of the divisor Then carry out the division process.

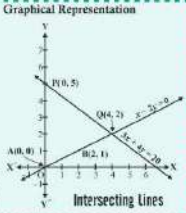
Step 3: The remainder from the previous division becomes the dividend for the next step. Repeat this process until the degree of the remainder is less than the degree of the divisor.

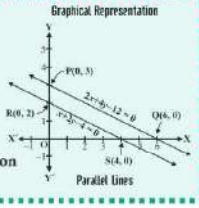
$$
\begin{array}{r}
x-2 \\
-x^2+x-1\,\overline{)\,-x^3+3x^2-3x+5} \\
-x^3+x^2-x \\
+\quad -\quad + \\
\hline
2x^2-2x+5 \\
2x^2-2x+2 \\
-\quad +\quad - \\
\hline
3
\end{array}
$$

Class : 10th mathematics
Chapter- 3: Pair of Linear Equations in Two Variables

Pair of Linear Equations in Two Variables

- Algebraic Methods
  - **Substitution**
    Solve: $7x-15y=2$ –(i)
    $x+2y=3$ –(ii)
    Solution: From equation (ii), $x=3-2y$
    substitute value of x in eq. (i)
    $7(3-2y)-15y=2$
    $-29y=-19 \Leftrightarrow y=\frac{19}{29}$
    Now, from $x=3-2y$
    $x=3-2\left(\frac{19}{29}\right)=\left(\frac{49}{29}\right)$
  - **By Elimination**
    Solve: $x+3y=6$ – (i)
    $2x+3y=12$ – (ii)
    Now, Adding equation (i) and (ii)
    $3x=18$ or $x=6$
    Again, from (i) $\times 2$– (ii)
    $3y=0$ or, $y=0$
    Hence, $x=6$, $y=0$
  - **By Cross Multiplication**
    Solve: $2x+3y-46=0$ –(i)
    $3x+5y-74=0$ –(ii)
    Solution: By cross-multiplication method
    
    Then, $\frac{x}{3(-74)-5(-46)}=\frac{y}{(-46)(3)-(-74)(2)}$
    $=\frac{1}{2(5)-3(3)}$
    $\frac{x}{-222+230}=\frac{y}{-138+148}=\frac{1}{10-9}$
    $\frac{x}{8}=\frac{y}{10}=\frac{1}{1} \Leftrightarrow \frac{x}{8}=\frac{1}{1}$ and $\frac{y}{10}=\frac{1}{1}$
    i.e. $x=8$ and $y=10$
- General Form
  $a_1x+b_1y+c_1=0$
  $a_2x+b_2y+c_2=0$
  $a_1, b_1, c_1, a_2, b_2, c_2$, – Real numbers
- Solution Graphically
  Each solution (x, y), corresponds to a point on the line representing the equation and vice-versa
- Graphically Presentation
  - Pair of Lines = $2x+3y-9=0$
    $4x+6y-18=0$
    $\frac{a_1}{a_2}=\frac{2}{4}, \frac{b_1}{b_2}=\frac{3}{6}, \frac{c_1}{c_2}=\frac{-3}{-18}$
    Compare the Ratios $=\frac{a}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$
    Algebraic Interpretation = Infinitely many solutions – Dependent
    Graphical Representation
    

  - Pair of Lines = $x-2y=0$
    $3x+4y-20=0$
    $\frac{a_1}{a_2}=\frac{1}{3}, \frac{b_1}{b_2}=\frac{-2}{4}, \frac{c_1}{c_2}=\frac{0}{-20}$
    Compare the Ratios $=\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
    Algebraic Interpretation : Exactly one solution – consistent (unique)
    Graphical Representation
    

  - Pair of Lines = $x+2y-4=0$
    $2x+4y-12=0$
    $\frac{a_1}{a_2}=\frac{1}{2}, \frac{b_1}{b_2}=\frac{2}{4}, \frac{c_1}{c_2}=\frac{-4}{-12}$
    Compare the Ratios $=\frac{a_1}{a_2}=\frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
    Algebraic Interpretation : No solution – Inconsistent
    Graphical Representation
    

Important Questions

Multiple Choice questions-

1. Graphically, the pair of equations 7x – y = 5; 21x – 3y = 10 represents two lines which are

(a) intersecting at one point

(b) parallel

(c) intersecting at two points

(d) coincident

2. The pair of equations 3x – 5y = 7 and – 6x + 10y = 7 have

(a) a unique solution

(b) infinitely many solutions

(c) no solution

(d) two solutions

3. If a pair of linear equations is consistent, then the lines will be

(a) always coincident

(b) parallel

(c) always intersecting

(d) intersecting or coincident

4. The pair of equations x = 0 and x = 5 has

(a) no solution

(b) unique/one solution

(c) two solutions

(d) infinitely many solutions

5. The pair of equation x = – 4 and y = – 5 graphically represents lines which are

(a) intersecting at (- 5, – 4)

(b) intersecting at (- 4, – 5)

(c) intersecting at (5, 4)

(d) intersecting at (4, 5)

6. One equation of a pair of dependent linear equations is 2x + 5y = 3. The second equation will be

(a) 2x + 5y = 6

(b) 3x + 5y = 3

(c) -10x – 25y + 15 = 0

(d) 10x + 25y = 15

7.If x = a, y = b is the solution of the equations x + y = 5 and 2x – 3y = 4, then the values of a and b are respectively

(a) 6, -1

(b) 2, 3

(c) 1, 4

(d) 19/5, 6/5

8. The graph of x = -2 is a line parallel to the

(a) x-axis

(b) y-axis

(c) both x- and y-axis

(d) none of these

9. The graph of y = 4x is a line

(a) parallel to x-axis

(b) parallel to y-axis

(c) perpendicular to y-axis

(d) passing through the origin

10. The graph of y = 5 is a line parallel to the

(a) x-axis

(b) y-axis

(c) both axis

(d) none of these

Very Short Questions:

1. If the lines given by 3x + 2ky = 2 and 2x + 5y + 1 = 0 are parallel, then find value of k.

2. Find the value of c for which the pair of equations cx – y = 2 and 6x – 2y = 3 will have infinitely many solutions.

3. Do the equations 4x + 3y – 1 = 5 and 12x + 9y = 15 represent a pair of coincident lines?

4. Find the co-ordinate where the line x – y = 8 will intersect y-axis.

5. Write the number of solutions of the following pair of linear equations:

x + 2y – 8 = 0, 2x + 4y = 16

6. Is the following pair of linear equations consistent? Justify your answer.

2ax + by = a, 4ax + 2by – 2a = 0; a, b≠ 0

7. For all real values of c, the pair of equations

x – 2y = 8, 5x + 10y = c

have a unique solution. Justify whether it is true or false.

8. Does the following pair of equations represent a pair of coincident lines? Justify your answer.

$$\frac{x}{2} + y + \frac{2}{5} = 0, 4x + 8y + \frac{5}{16} = 0.$$

9. If x = a, y = b is the solution of the pair of equation x – y = 2 and x + y = 4, then find the value of a and b.

10. $\frac{3}{2}x + \frac{5}{3}y = 7$

$9x - 10y = 14$

Short Questions :

1. Solve: ax + by = a – b and bx – ay = a + b

2. Solve the following linear equations:

152x – 378y = -74 and -378x + 152y = -604

3. Solve for x and y

$$\frac{b}{a}x + \frac{a}{b}y = a^2 + b^2; \quad x + y = 2ab$$

4. (i) For which values of a and b does the following pair of linear equations have an infinite number of solutions?

2x + 3y = 7

(a – b)x + (a + b)y = 3a + b – 2

(ii) for which value of k will the following pair of linear equations have no solution?

3x + y = 1

(2k – 1)x + (k – 1)y = 2k + 1

5. Find whether the following pair of linear equations has a unique solution. If yes, find the

7x – 4y = 49 and 5x – y = 57

6. Solve for x and y.

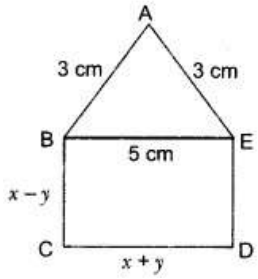
$$\frac{6}{x-1} - \frac{3}{y-2} = 1; \quad \frac{5}{x-1} + \frac{1}{y-2} = 2 \text{ where } x \neq 1, y \neq 2$$

7. Solve the following pair of equations for x and y.

$$\frac{a^2}{x} - \frac{b^2}{y} = 0; \quad \frac{a^2 b}{x} + \frac{b^2 a}{y} = a + b, \; x \neq 0, y \neq 0.$$

8. In ΔABC, LA = x, ∠B = 3x, and ∠C = y if 3y – 5x = 30°, show that triangle is right angled.

9. In Fig. 3.1, ABCDE is a pentagon with BE|CD and BC||DE. BC is perpendicular to CD. If the perimeter of ABCDE is 21 cm. Find the value of x and y.



10. Five years ago, A was thrice as old as B and ten years later, A shall be twice as old as B. What are the present ages of A and B?

Long Questions :

1. Form the pair of linear equations in this problem and find its solution graphically: 10 students of Class X took part in a Mathematics quiz. If the number of girls is 4 more than the number of boys, find the number of boys and girls who took part in the quiz.

2. Show graphically the given system of equations

2x + 4y = 10 and 3x + 6y = 12 has no solution.

3. Solve the following pairs of linear equations by the elimination method and the substitution method:

(i) 3x – 5y – 4 = 0 and 9x = 2y + 7

(ii) $\frac{x}{2} + \frac{2y}{3} = -1$ and $x - \frac{y}{3} = 3$

4. Draw the graph of the equations x – y + 1 = 0 and 3x + 2y – 12 = 0. Determine the coordinates of the vertices of the triangle formed by these lines and the x-axis, and shade the triangular region.

5. A part of monthly hostel charges is fixed and the remaining depends on the number of days one has taken food in the mess. When a student A takes food for 20 days, she has to pay 31000 as hostel charges whereas a student B, who takes food for 26 days, pays 1180 as hostel charges. Find the fixed charges and the cost of food per day.

6. Yash scored 40 marks in a test, getting 3 marks for each right answer and

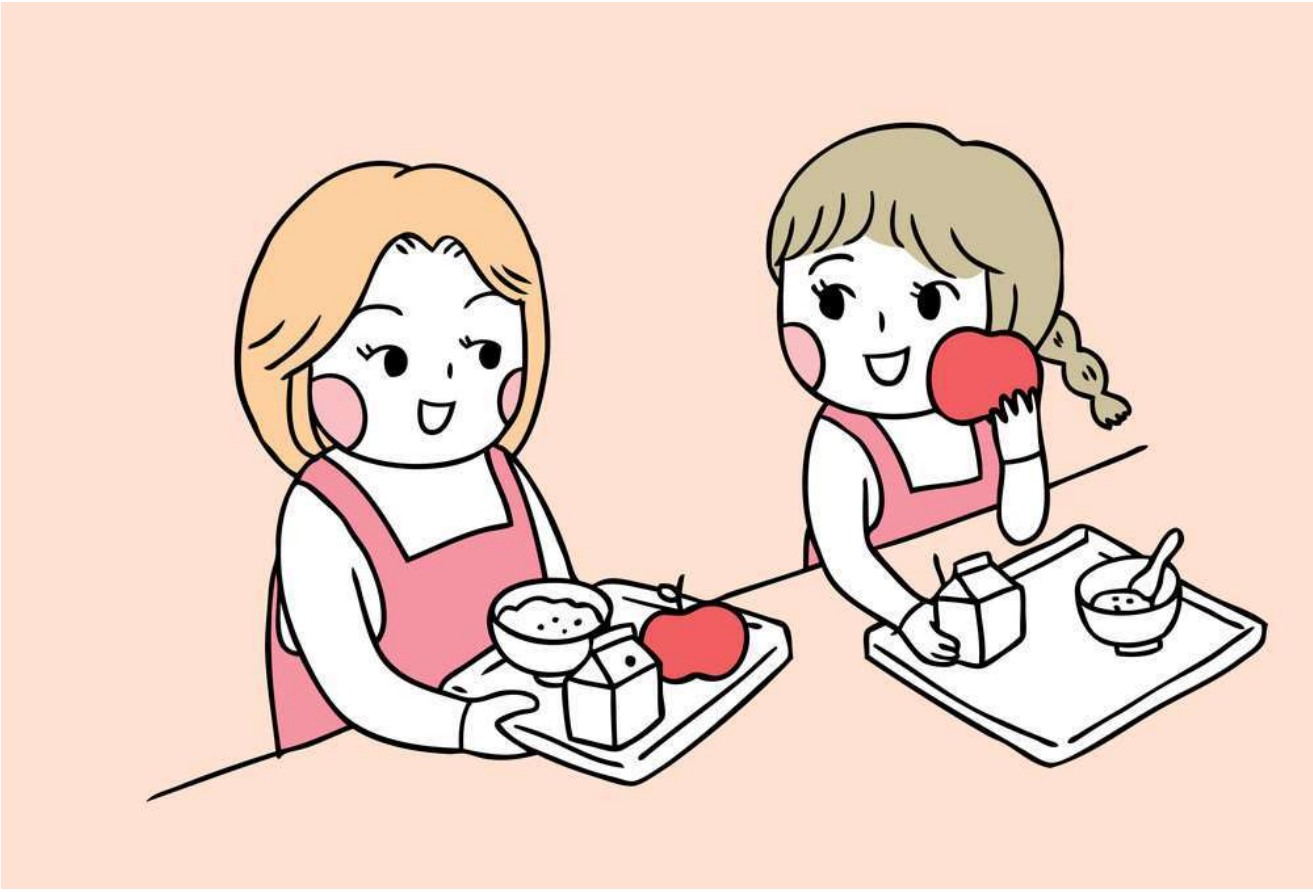
losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deduced for each incorrect answer, then Yash would have scored 50 marks. How many questions were there in the test?

7. 8 men and 12 boys can finish a piece of work in 10 days while 6 men and 8 boys can finish it in 14 days. Find the time taken by one man alone and that by one boy alone to finish the work.

8. A boat covers 25 km upstream and 44 km downstream in 9 hours. Also, it covers 15 km upstream and 22 km downstream in 5 hours. Find the speed of the boat in still water and that of the stream.

Case Study Questions:

1. A part of monthly hostel charges in a college is fixed and the remaining depends on the number of days one has taken food in the mess. When a student Anu takes food for 25 days, she has to pay ₹ 4500 as hostel charges, whereas another student Bindu who takes food for 30 days, has to pay ₹ 5200 as hostel charges.



Considering the fixed charges per month by ₹ x and the cost of food per day by ₹ y, then answer the following questions.

i. Represent algebraically the situation faced by both Anu and Bindu.

a. $x + 25y = 4500, x + 30y = 5200$
b. $25x + y = 4500, 30x + y = 5200$
c. $x - 25y = 4500, x - 30y = 5200$
d. $25x - y = 4500, 30x - y = 5200$

ii. The system of linear equations, represented by above situations has.

a. No solution.
b. Unique solution.
c. Infinitely many solutions.
d. None of these.

iii. The cost of food per day is:

a. ₹ 120
b. ₹ 130
c. ₹ 140
d. ₹ 1300

iv. The fixed charges per month for the hostel is:

a. ₹ 1500
b. ₹ 1200
c. ₹ 1000
d. ₹ 1300

v. If Bindu takes food for 20 days, then what amount she has to pay?

a. ₹ 4000
b. ₹ 3500
c. ₹ 3600
d. ₹ 3800

2. From Bengaluru bus stand, if Riddhima buys 2 tickets to Malleswaram and 3 tickets to Yeswanthpur, then total cost is ₹ 46; but if she buys 3 tickets to Malleswaram and 5 tickets to Yeswanthpur, then total cost is ₹ 74.

Consider the fares from Bengaluru to Malleswaram and that to Yeswanthpur as ₹ x and ₹ y respectively and answer the following questions.

i. 1st situation can be represented algebraically as:

   a. 3x - 5y = 74
   b. 2x + 5y = 74
   c. 2x - 3y = 46
   d. 2x + 3y = 46

ii. 2nd situation can be represented algebraically as:

   a. 5x + 3y = 74
   b. 5x - 3y = 74
   c. 3x + 5y = 74
   d. 3x - 5y = 74

iii. Fare from Bengaluru to Malleswaram is:

   a. ₹ 6
   b. ₹ 8
   c. ₹ 10
   d. ₹ 2

iv. Fare from Bengaluru to Yeswanthpur is:

   a. ₹ 10
   b. ₹ 12

c. ₹ 14
d. ₹ 16

v. The system of linear equations represented by both situations has:

a. Infinitely many solutions.
b. No solution.
c. Unique solution.
d. None of these.

Assertion reason questions-

1. ***Directions:*** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

a. Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

b. (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

c. (C) Assertion (A) is true but reason (R) is false.

d. (d) Assertion (A) is false but reason (R) is true.

Assertion: The graph of the linear equations 3x+2y=12 and 5x-2y=4 gives a pair of intersecting lines.

Reason: The graph of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ gives a pair of intersecting lines if $a_1/a_2 \neq b_1/b_2$

2. ***Directions:*** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

a. Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

b. Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

c. Assertion (A) is true but reason (R) is false.

d. Assertion (A) is false but reason (R) is true.

Assertion: If the pair of lines are coincident, then we say that pair of lines is consistent and it has a unique solution.

Reason: If the pair of lines are parallel, then the pairs has no solution and is called inconsistent pair of equations.

Answer Key-

Multiple Choice questions-

1. (b) -10
2. (d) a – 0, b = -6
3. (d) more than 3
4. (a) b – a + 1
5. (b) both negative
6. (a) cannot both be positive
7. (c) c and a have the same sign
8. (a) has no linear term and the constant term is negative.
9. (d) more than 4
10. (b) $x^2 + 9x + 20$
11. (a) both negative

Very Short Answer :

1. Since the given lines are parallel

$$\therefore \frac{3}{2} = \frac{2k}{5} \neq \frac{-2}{1} \qquad i.e.,\ k = \frac{15}{4}.$$

2. The given system of equations will have infinitely many solutions if $\frac{c}{6} = \frac{-1}{-2} = \frac{2}{3}$ which is not possible

∴ For no value of c, the given system of equations have infinitely many solutions.

3.

$$\text{Here,} \quad \frac{4}{12} = \frac{3}{9} \neq \frac{6}{15} \qquad i.e., \quad \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

Given equations do not represent a pair of coincident lines.

4. The given line will intersect y-axis when x = 0.

$\therefore 0 - y = 8 \Rightarrow y = -8$

Required coordinate is (0, -8).

5.

Here, $\frac{a_1}{a_2} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{2}{4} = \frac{1}{2}, \frac{c_1}{c_2} = \frac{-8}{-16} = \frac{1}{2}$

Since $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\therefore$The given pair of linear equations has infinitely many solutions.

6. Yes,

Here, $\frac{a_1}{a_2} = \frac{2a}{4a} = \frac{1}{2}, \quad \frac{b_1}{b_2} = \frac{b}{2b} = \frac{1}{2}, \quad \frac{c_1}{c_2} = \frac{-a}{-2a} = \frac{1}{2}$

$\because \quad \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\therefore$ The given system of equations is consistent.

7.

Here, $\frac{a_1}{a_2} = \frac{1}{5}, \frac{b_1}{b_2} = \frac{-2}{+10} = \frac{-1}{5}, \frac{c_1}{c_2} = \frac{8}{c}$

Since $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

8.

Here, $a_1 = \frac{1}{2}, \quad b_1 = 1, \quad c_1 = \frac{2}{5}$ and $a_2 = 4, \quad b_2 = 8, \quad c_2 = \frac{5}{16}$

$\frac{a_1}{a_2} = \frac{\frac{1}{2}}{4} = \frac{1}{8}, \quad \frac{b_1}{b_2} = \frac{1}{8}, \quad \frac{c_1}{c_2} = \frac{\frac{2}{5}}{\frac{5}{16}} = \frac{32}{25}$

$\because \quad \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\therefore$ The given system does not represent a pair of coincident lines.

$x - y = 2$ ... (i)

x + y = 4 ... (ii)

9. On adding (i) and (ii), we get 2x = 6 or x = 3

From (i), 3 – y ⇒ 2 = y = 1

a = 3, b = 1.

On comparing the ratios $\frac{a_1}{a_2}, \frac{b_1}{b_2}$, and, $\frac{c_1}{c_2}$ find out whether the following pair of linear equations consistent or inconsistent. is consistent or inconsistent.

10.

We have, $\frac{3}{2}x + \frac{5}{3}y = 7$ ...(i)

$9x - 10y = 14$ ...(ii)

Here, $a_1 = \frac{3}{2}, \quad b_1 = \frac{5}{3}, \quad c_1 = 7$

$a_2 = 9, \quad b_2 = -10, \quad c_2 = 14$

Thus, $\frac{a_1}{a_2} = \frac{3}{2\times 9} = \frac{1}{6}, \quad \frac{b_1}{b_2} = \frac{5}{3\times(-10)} = -\frac{1}{6}$

Hence, $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$. So, it has unique solution and it is consistent.

Short Answer :

1. The given system of equations may be written as

ax + by – (a – b) = 0

bx – ay – (a + b) = 0

By cross-multiplication, we have

$$\frac{x}{b \quad -(a-b)} = \frac{-y}{a \quad -(a-b)} = \frac{1}{a \quad b}$$
$$-a \quad -(a+b) \qquad b \quad -(a+b) \qquad b \quad -a$$

$$\Rightarrow \quad \frac{x}{b\times-(a+b)-(-a)\times-(a-b)} = \frac{-y}{a\times-(a+b)-b\times-(a-b)} = \frac{1}{-a^2-b^2}$$

$$\Rightarrow \quad \frac{x}{-b(a+b)-a(a-b)} = \frac{-y}{-a(a+b)+b(a-b)} = \frac{1}{-(a^2+b^2)}$$

$$\Rightarrow \quad \frac{x}{-b^2-a^2} = \frac{-y}{-a^2-b^2} = \frac{1}{-(a^2+b^2)}$$

$$\Rightarrow \quad \frac{x}{-(a^2+b^2)} = \frac{y}{(a^2+b^2)} = \frac{1}{-(a^2+b^2)}$$

$$\Rightarrow \quad x = -\frac{(a^2+b^2)}{-(a^2+b^2)} = 1 \quad \text{and} \quad y = \frac{(a^2+b^2)}{-(a^2+b^2)} = -1$$

Hence, the solution of the given system of equations is x = 1, y = -1

2. We have, 152x – 378y = -74 …(i)

-378x + 152y = -604 ……(ii)

Adding equation (*i*) and (*ii*), we get

$$\begin{array}{r} 152x - 378y = -74 \\ -378x + 152y = -604 \\ \hline -226x - 226y = -678 \end{array}$$

$$\Rightarrow \quad -226(x+y) = -678$$

$$\Rightarrow \quad x + y = \frac{-678}{-226}$$

$$\Rightarrow \quad x + y = 3 \qquad \ldots(iii)$$

Subtracting equation (*ii*) from (*i*), we get

$$\begin{array}{r} 152x - 378y = -74 \\ -378x + 152y = -604 \\ + \quad - \quad + \\ \hline 530x - 530y = 530 \end{array}$$

$$\Rightarrow \quad x - y = 1 \qquad \ldots(iv)$$

Adding equations (*iii*) and (*iv*), we get

$$\begin{array}{r} x + y = 3 \\ x - y = 1 \\ \hline 2x = 4 \end{array} \qquad \Rightarrow \quad x = 2$$

Putting the value of x in (iii), we get

2 + y = 3 ⇒ y = 1

Hence, the solution of given system of equations is x = 2, y = 1.

3.

We have, $\frac{b}{a}x + \frac{a}{b}y = a^2 + b^2$ …(*i*)

$x + y = 2ab$ …(*ii*)

Multiplying (*ii*) by b/a, we get

$$\frac{b}{a}x + \frac{b}{a}y = 2b^2 \qquad \ldots(iii)$$

Subtracting (*iii*) from (*i*), we get

$$\left(\frac{a}{b}-\frac{b}{a}\right)y = a^2+b^2-2b^2 \quad \Rightarrow \quad \left(\frac{a^2-b^2}{ab}\right)y = (a^2-b^2)$$

$$\Rightarrow \quad y = (a^2-b^2)\times\frac{ab}{(a^2-b^2)} \quad \Rightarrow \quad y = ab$$

4. (i) We have, 2x + 3y = 7

(a – b) x + (a + b) y = 3a + b – 2 … (ii)

Here, $a_1 = 2$, $b_1 = 3$, $c_1 = 7$ and

$a_2 = a - b$, $b_2 = a + b$, $c_2 = 3a + b - 2$

For infinite number of solutions, we have

$$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2} \quad \Rightarrow \quad \frac{2}{a-b}=\frac{3}{a+b}=\frac{7}{3a+b-2}$$

Now, $\frac{2}{a-b}=\frac{3}{a+b}$

$\Rightarrow \quad 2a + 2b = 3a - 3b \quad \Rightarrow \quad 2a - 3a = -3b - 2b$

$\Rightarrow \quad -a = -5b \quad \ldots(iii)$

$\therefore \quad a = 5b$

Again, we have

$$\frac{3}{a+b}=\frac{7}{3a+b-2} \quad \Rightarrow \quad 9a + 3b - 6 = 7a + 7b$$

⇒ 9a – 7a + 3b – 75 -6 = 0 ⇒ 2a – 45 – 6 = 0 => 2a – 4b = 6

⇒ a – 2b = 3 …(iv)

Putting a = 5b in equation (iv), we get

56 – 2b = 3 or 3b = 3 i.e., b = $\frac{3}{3}$ =1

Putting the value of b in equation (ii), we get a = 5(1) = 5

Hence, the given system of equations will have an infinite number of solutions for a = 5 and b = 1.

(ii) We have, 3x + y = 1, 3x + y − 1 = 0 …(i)

(2k – 1) x + (k – 1) y = 2k + 1

$\Rightarrow (2k-1)x + (k-1)y - (2k+1) = 0$ .....(ii)

Here, $a_1 = 3$, $b_1 = 1$, $C_1 = -1$

$a_2 = 2k-1$, $b_2 = k-1$, $C_2 = -(2k+1)$

For no solution, we must have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \quad \Rightarrow \quad \frac{3}{2k-1} = \frac{1}{k-1} \neq \frac{1}{2k+1}$$

Now, $\quad \frac{3}{2k-1} = \frac{1}{k-1} \quad \Rightarrow \quad 3k - 3 = 2k - 1$

$\Rightarrow 3k - 2k = 3 - 1 \Rightarrow k = 2$

5. Hence, the given system of equations will have no solutions for k = 2.

We have, $7x - 4y = 49$ .....(i)

and $5x - 6y = 57$ .....(ii)

Here, $a_1 = 7,\ b_1 = -4,\ c_1 = 49$

$a_2 = 5,\ b_2 = -6,\ c_2 = 57$

So, $\quad \frac{a_1}{a_2} = \frac{7}{5},\ \frac{b_1}{b_2} = \frac{-4}{-6} = \frac{2}{3}$

Since, $\quad \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

So, system has a unique solution.

Multiply equation (i) by 5 and equation (ii) by 7 and subtract

$$\begin{array}{r} 35x - 20y = 245 \\ -35x \mp 42y = -399 \\ \hline 22y = -154 \end{array} \quad \Rightarrow \quad y = -7$$

Put y = -7 in equation (ii)

$5x - 6(-7)57 \Rightarrow 5x = 57 - 42 \Rightarrow x = 3$

hence, x = 3 and y = -7.

6.

Let $\frac{1}{x-1} = p$ and $\frac{1}{y-2} = q$

The given equations become

$6p - 3q = 1$ ...(i)

$5p + q = 2$ ...(ii)

Multiply equation (ii) by 3 and add in equation (i)

$$\begin{array}{r} 15p + 3q = 6 \\ 6p - 3q = 1 \\ \hline 21p \quad\quad = 7 \end{array} \quad \Rightarrow \quad p = \frac{7}{21} = \frac{1}{3}$$

Putting this value in equation (i) we get

$$6 \times \frac{1}{3} - 3q = 1 \quad \Rightarrow \quad 2 - 3q = 1 \quad \Rightarrow \quad 3q = 1, \quad \Rightarrow \quad q = \frac{1}{3}$$

Now, $\frac{1}{x-1} = p = \frac{1}{3} \quad \Rightarrow \quad x - 1 = 3 \quad \Rightarrow \quad x = 4$

$\frac{1}{y-2} = q = \frac{1}{3} \quad \Rightarrow \quad y - 2 = 3 \quad \Rightarrow \quad y = 5$

Hence, $x = 4$ and $y = 5$.

7.

$$\frac{a^2 b}{x} + \frac{b^2 a}{y} = a + b \qquad \ldots(ii)$$

Multiply equation (i) by a and adding to equation (ii)

$$\frac{a^2 a}{x} - \frac{b^2 a}{y} + \frac{a^2 b}{x} + \frac{b^2 a}{y} = 0 + (a + b)$$

$$\Rightarrow \quad \frac{a^3}{x} + \frac{a^2 b}{x} = a + b \quad \Rightarrow \quad \frac{a^2}{x}(a + b) = a + b \Rightarrow x = \frac{a^2(a+b)}{a+b} = a^2$$

Putting the value of x in equation (i), we get

$$\frac{a^2}{a^2} - \frac{b^2}{y} = 0 \quad \Rightarrow \quad 1 - \frac{b^2}{y} = 0 \quad \Rightarrow \quad \frac{b^2}{y} = 1 \quad \Rightarrow \quad y = b^2$$

Hence, $x = a^2, y = b^2$.

8. $\angle A + 2B + \angle C = 180°$

(Sum of interior angles of A ABC) $x + 3x + y = 180°$

$4x + y = 180°$ ...(i)

3y – 5x = 30° (Given) …(ii) Multiply equation (i) by 3 and subtracting from eq. (ii), we get

-17x = – 510 = x = 910 = 30°

17 then _A = x = 30° and 2B = 3x = 3 X 30o = 90°

∠C = y = 180°– (∠A + ∠B) = 180°– 120° = 60°

∠A = 30°, ∠B = 90°, ∠C = 60° Hence ΔABC is right triangle right angled at B.

9. Since BC||DE and BE||CD with BC||CD.

BCDE is a rectangle.

Opposite sides are equal BE = CD

∴ x + y = 5 …… (i)

DE = BC = x – y

Since perimeter of ABCDE is 21 cm.

AB + BC + CD + DE + EA = 21

3 + x – y + x + y + x – y + 3 = 21 ⇒ 6 + 3x – y = 21

3x – y = 15 ….. (iii)

Adding (i) and (ii), we get

4x = 20 ⇒ x = 5

On putting the value of x in (i), we get y = 0

Hence, x = 5 and y = 0.

10. Let the present ages of B and A be x years and y years respectively. Then

B's age 5 years ago = (x – 5) years

and A's age 5 years ago = (- 5) years

(-5) = 3 (x – 5) = 3x – y = 10 …….(i)

B's age 10 years hence = (x + 10) years

A's age 10 years hence = (y + 10) years

y + 10 = 2 (x + 10) = 2x – y = -10 …….. (ii)

On subtracting (ii) from (i) we get x = 20

Putting x = 20 in (i) we get

$(3 \times 20) - y = 10 \Rightarrow y = 50$

$\therefore$ x = 20 and y = 50

Hence, B's present age = 20 years and A's present age = 50 years.

Long Answer :

1. Let x be the number of girls and y be the number of boys.

According to question, we have

x = y + 4

$\Rightarrow$ x – y = 4 ……(i)

Again, total number of students = 10

Therefore, x + y = 10 …(ii)

Hence, we have following system of equations

x – y = 4

and x + y = 10

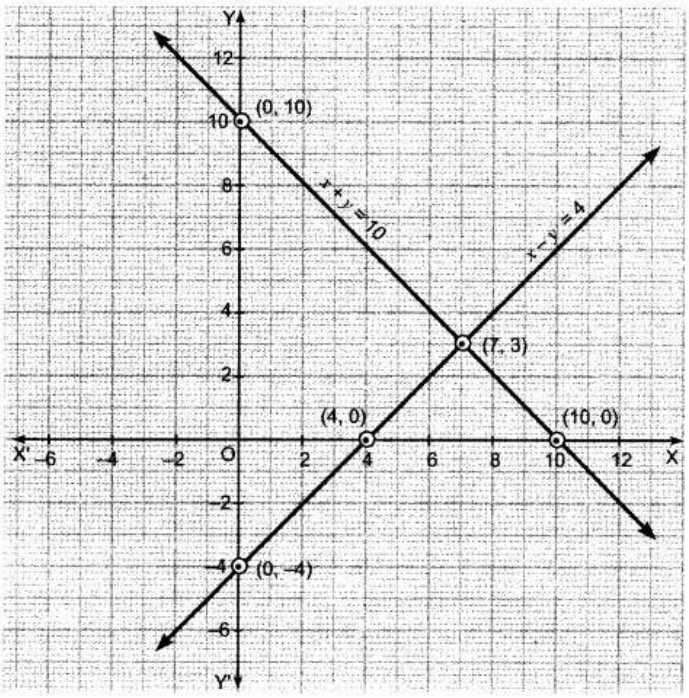
From equation (i), we have the following table:

x	0	4	7
y	– 4	0	3

From equation (ii), we have the following table:

x	0	10	7
y	10	0	3

Plotting this, we have



Here, the two lines intersect at point (7,3) i.e., x = 7, y = 3.

So, the number of girls = 7

and number of boys = 3.

2. We have, 2x + 4y = 10

$\Rightarrow$ 4y = 10 – 2x $\Rightarrow y = \frac{5-x}{2}$

Thus, we have the following table:

x	1	3	5
y	2	1	0

Plot the points A (1, 2), B (3, 1) and C (5,0) on the graph paper. Join A, B and C and extend it on both sides to obtain the graph of the equation 2x + 4y = 10.

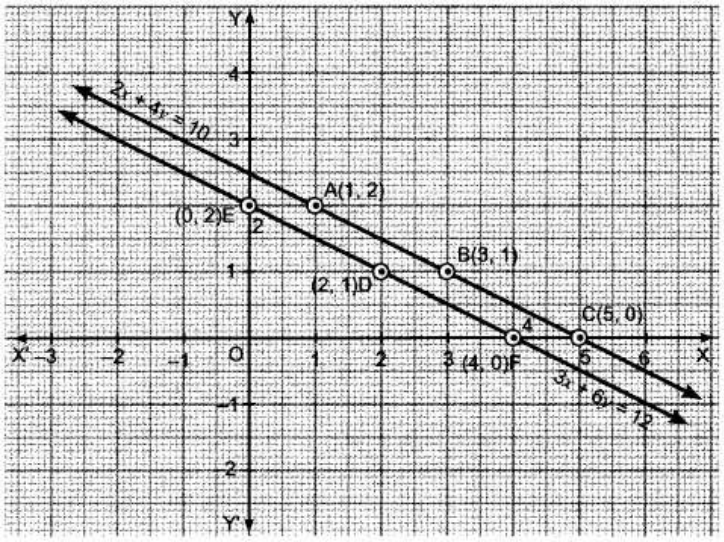
We have, 3x + 6y = 12

$\Rightarrow$ 6y = 12 – 3x $\Rightarrow y = \frac{4-x}{2}$

Thus, we have the following table :

x	2	0	4
y	1	2	0

Plot the points D (2, 1), E (0, 2) and F (4,0) on the same graph paper. Join D, E and F and extend it on both sides to obtain the graph of the equation 3x + 6y = 12.



We find that the lines represented by equations 2x + 4y = 10 and 3x + y = 12 are parallel. So, the two lines have no common point. Hence, the given system of equations has no solution.

3. (i) We have, 3x – 5y – 4 = 0

⇒ 3x – 5y = 4 …….(i)

Again, 9x = 2y + 7

9x – 2y = 7 …(ii)

By Elimination Method:

Multiplying equation (i) by 3, we get

9x – 15y = 12 … (iii)

Subtracting (ii) from (iii), we get

$$\begin{array}{rrr} 9x & -15y & = 12 \\ 9x & -2y & = 7 \\ - & + & - \\ \hline & -13y & = 5 \end{array}$$

$\Rightarrow \quad y = -\frac{5}{13}$

Putting the value of y in equation (ii), we have

$$9x - 2\left(-\frac{5}{13}\right) = 7 \quad \Rightarrow \quad 9x + \frac{10}{13} = 7 \quad \Rightarrow \quad 9x = 7 - \frac{10}{13}$$

$$\Rightarrow \quad 9x = \frac{91 - 10}{13} \quad \Rightarrow \quad 9x = \frac{81}{13} \quad \Rightarrow \quad x = \frac{9}{13}$$

Hence, the required solution is $x = \frac{9}{13}, \quad y = -\frac{5}{13}$

By Substitution Method:

Expressing x in terms of y from equation (i), we have

$$x = \frac{4 + 5y}{3}$$

Substituting the value of x in equation (ii), we have

$$9 \times \left(\frac{4 + 5y}{3}\right) - 2y = 7$$

$$\Rightarrow \quad 3 \times (4 + 5y) - 2y = 7$$

$$\Rightarrow \quad 12 + 15y - 2y = 7 \quad \Rightarrow \quad 13y = 7 - 12$$

$$\therefore \quad y = -\frac{5}{13}$$

Putting the value of y in equation (i), we have

$$3x - 5 \times \left(-\frac{5}{13}\right) = 4 \quad \Rightarrow \quad 3x + \frac{25}{13} = 4$$

$$\Rightarrow \quad 3x = 4 - \frac{25}{13} \quad \Rightarrow \quad 3x = \frac{27}{13}$$

$$\therefore \quad x = \frac{9}{13}$$

Hence, the required solution is $x = \frac{9}{13}, \quad y = -\frac{5}{13}$.

(ii) We have, $\frac{x}{2} + \frac{2y}{3} = -1 \quad \Rightarrow \quad \frac{3x + 4y}{6} = -1$

$$\therefore \quad 3x + 4y = -6 \qquad \ldots(i)$$

and $\quad x - \frac{y}{3} = 3 \quad \Rightarrow \quad \frac{3x - y}{3} = 3$

$$\therefore \quad 3x - y = 9 \qquad \ldots(ii)$$

By Elimination Method:

Subtracting (ii) from (i), we have

5y = – 15 or y = – 55 = -3

Putting the value of y in equation (i), we have

3x + 4 × (-3) = -6 ⇒ 3x = – 6 + 12

∴ 3x – 12 = -6 ⇒ 3x = 6

∴ x = 63 = 2

Hence, solution is x = 2, y = -3.

By Substitution Method:

Expressing x in terms of y from equation (i), we have

$3 \times \left(\frac{-6-4y}{3}\right) - y = 9 \Rightarrow -6 - 4y - y = 9 \Rightarrow -6 - 5y = 9$

Substituting the value of x in equation (ii), we have

∴ -5y = 9 + 6 = 15

$y = -\frac{15}{5} = -3$

Putting the value of y in equation (i), we have

3x + 4 × (-3) = -6 ⇒ 3x – 12 = -6

∴ 3x = 12 – 6 = 6

∴ x = $\frac{6}{3}$ = 2

Hence, the required solution is x = 2, y = – 3.

4. We have,' x – y + 1 = 0 and 3x + 2y – 12 = 0

Thus, x – y = -1 => x = y – 1 …(i)

3x + 2y = 12 =>$x = \frac{12-2y}{3}$ … (ii)

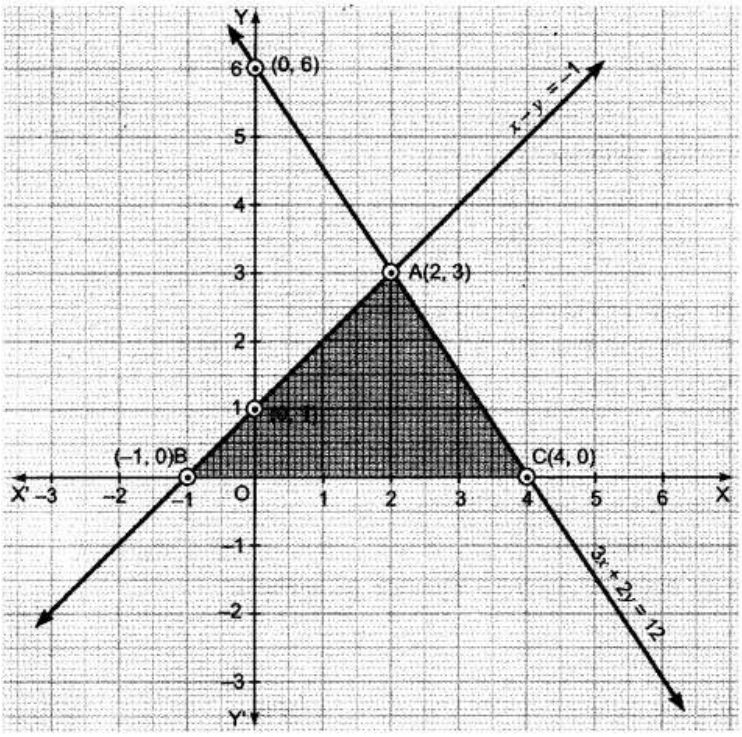
From equation (i), we have

x	– 1	0	2
y	0	1	3

From equation (ii), we have

x	0	4	2
y	6	0	3

Plotting this, we have



ABC is the required (shaded) region and point of intersection is (2, 3).

∴ The vertices of the triangle are (-1, 0), (4, 0), (2, 3).

5. Let the fixed charge be *x and the cost of food per day be by.

Therefore, according to question,

x + 20y = 1000 …(i)

x + 26y = 1180 …(ii)

Now, subtracting equation (ii) from (i), we have

$$\begin{array}{r} x + 20y = 1000 \\ \underline{-\ x + 26y = 1180} \\ -6y = -180 \end{array}$$

$$\therefore \quad y = \frac{-180}{-6} = 30$$

Putting the value of y in equation (i), we have

$x + 20 \times 30 = 1000 \Rightarrow x + 600 = 1000 \Rightarrow x = 1000 - 600 = 400$

Hence, fixed charge is ₹400 and cost of food per day is ₹30.

6. Let x be the number of questions of right answer and y be the number of questions of wrong answer.

According to question,

$3x - y = 40$ … (i)

and $4x - 2y = 50$

or $2x - y = 25$ …(ii)

Subtracting (ii) from (i), we have

$$\begin{array}{r} 3x - y = 40 \\ 2x - y = 25 \\ - \quad + \quad - \\ \hline x = 15 \end{array}$$

Putting the value of x in equation (i), we have

$3 \times 15 - y = 40 \Rightarrow 45 - y = 40$

$\therefore y = 45 - 40 = 5$

Hence, total number of questions is x + i.e.., 5 + 15 = 20.

7. Let one man alone can finish the work in x days and one boy alone can finish the work in y days

$$\text{Then, One day work of one man} = \frac{1}{x}, \text{One day work of one boy } \frac{1}{y}$$

$$\therefore \quad \text{One day work of 8 men} = \frac{8}{x}, \text{One day work of 12 boys} = \frac{12}{y}$$

Since 8 men and 12 boys can finish the work in 10 days

$$10\left(\frac{8}{x}+\frac{12}{y}\right)=1 \Rightarrow \frac{80x}{x}+\frac{120}{y}=1 \quad \ldots(i)$$

Again, 6 men and 8 boys can finish the work in 14 days

$$\therefore \quad 14\left(\frac{6}{x}+\frac{8}{y}\right)=1 \Rightarrow \frac{84}{x}+\frac{112}{y}=1 \quad \ldots(ii)$$

Put $\frac{1}{x}=u$ and $\frac{1}{y}=v$ in equations (i) and (ii), we get

$$80u + 120v - 1 = 0 \quad \text{and} \quad 84u + 112v - 1 = 0$$

By using cross-multiplication, we have

$$\frac{u}{120\times-1-112\times-1}=\frac{-v}{80\times-1-84\times\cdot\cdot1}=\frac{1}{80\times112-84\times120}$$

$$\Rightarrow \quad \frac{u}{-120+112}=\frac{-v}{-80+84}=\frac{1}{8960-10080}$$

$$\Rightarrow \quad \frac{u}{-8}=\frac{-v}{4}=\frac{1}{-1120}$$

Hence, one man alone can finish the work in 140 days and one boy alone can finish the work in 280 days.

8. Let the speed of the boat in still water be x km/h and that of the stream be y km/h. Then,

Speed upstream (x – y) km/h

Speed downstream (x + y) km/h

Now, time taken to cover 25 km upstream $=\frac{25}{x-y}$ hours

Time taken to cover 44 km downstream $=\frac{44}{x+y}$ hours

The total time of journey is 9 hours

$$\frac{25}{x-y}+\frac{44}{x+y}=9 \quad \ldots(i)$$

Time taken to cover 15 km upstream $=\frac{15}{x-y}$

Time taken to cover 22 km downstream $=\frac{22}{x+y}$

In this case, total time of journey is 5 hours.

$$\therefore \quad \frac{15}{x-y}+\frac{22}{x+y}=5 \qquad \ldots(ii)$$

Put $\frac{1}{x-y}=u$ and $\frac{1}{x+y}=v$ in equations (i) and (ii), we get

$25u + 44v = 9 \Rightarrow 25u + 44v - 9 = 0$ ...(iii)

$15u + 22v = 5 \Rightarrow 15u + 22v - 5 = 0$ ...(iv)

By cross-multiplication, we have

$$\Rightarrow \quad u=\frac{22}{110}=\frac{1}{5} \text{ and } v=\frac{1}{11}$$

$$\text{We have, } u=\frac{1}{5} \Rightarrow \frac{1}{x-y}=\frac{1}{5} \Rightarrow x-y=5 \qquad \ldots(v)$$

$$\text{and } v=\frac{1}{11} \Rightarrow \frac{1}{x+y}=\frac{1}{11} \Rightarrow x+y=11 \qquad \ldots(vi)$$

$$\Rightarrow \quad u=\frac{22}{110}=\frac{1}{5} \text{ and } v=\frac{1}{11}$$

$$\text{We have, } u=\frac{1}{5} \Rightarrow \frac{1}{x-y}=\frac{1}{5} \Rightarrow x-y=5 \qquad \ldots(v)$$

$$\text{and } v=\frac{1}{11} \Rightarrow \frac{1}{x+y}=\frac{1}{11} \Rightarrow x+y=11 \qquad \ldots(vi)$$

Solving equations (v) and (vi), we get x = 8 and y = 3.

Hence, speed of the boat in still water is 8 km/h and speed of the stream is 3 km/h.

Case Study Answers:

1. Answer :

i. (a) x + 25y = 4500, x + 30y = 5200

Solution:

For student Anu:

Fixed charge + cost of food for 25 days = ₹ 4500

i.e., x + 25y = 4500

For student Bindu:

Fixed charges + cost of food for 30 days = ₹ 5200

i.e., x + 30y = 5200

ii. (b) Unique solution.

Solution:

From above, we have $a_1 = 1$, $b_1 = 25$

$c_1 = -4500$ and $a_2 = 1$, $b_2 = 30$, $c_2 = -5200$

$$\therefore \frac{a_1}{a_2} = 1, \frac{b_1}{b_2} = \frac{25}{30} = \frac{5}{6}, \frac{c_1}{c_2} = \frac{-4500}{-5200} = \frac{45}{52}$$

$$\Rightarrow \frac{a_1}{a_2} \neq \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

Thus, system of linear equations has unique solution.

iii. (c) ₹ 140

Solution:

We have, x + 25y = 4500

and x + 30y = 5200

Subtracting (i) from (ii), we get

5y = 700 ⇒ y = 140

∴ Cost of food per day is ₹ 140

iv. (c) ₹ 1000

Solution:

We have, x + 25y = 4500

⇒ x = 4500 - 25 × 140

⇒ x = 4500 - 3500 = 1000

∴ Fixed charges per month for the hostel is ₹ 100

v. (d) ₹ 3800

Solution:

We have, x = 1000, y = 140 and Bindu takes food for 20 days.

∴ Amount that Bindu has to pay = ₹ (1000 + 20 × 140) = ₹ 3800

2. Answer :

i. (d) 2x + 3y = 46

Solution:

1st situationcan berepresented algebraically as.

2x + 3y = 46

ii. (c) 3x + 5y = 74

Solution:

2nd situation can be represented algebraically as:

3x + 5y = 74

iii. (b) ₹ 8

Solution:

We have, 2x + 3y = 46.....(i)

3x + 5y = 74.....(ii)

Multiplying (i) by 5 and (ii) by 3 and then subtracting, we get

10x - 9x = 230 - 222 ⇒ x = 8

∴ Fare from Bengaluru to Malleswaram is ₹ 8.

iv. (a) ₹ 10

Solution:

Putting the value of x in equation (i), we g

$3y = 46 - 2 \times 8 = 30 \Rightarrow y = 10$

∴ Fare from Bengaluru to Yeswanthpur is ₹ 10

v. (c) Unique solution.

Solution:

We have, $a_1 = 2$, $b_1 = 3$, $c_1 = -46$ and

$a_2 = 3$, $b_2 = 5$, $C_2 = -74$

$$\therefore \frac{a_1}{a_2} = \frac{2}{3}, \frac{b_1}{b_2} = \frac{3}{5}, \frac{c_1}{c_2} = \frac{-46}{-74} = \frac{23}{37}$$

$$\therefore \frac{a_1}{a_2} \neq \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

Thus system of linear equations has unique solution.

Assertion reason Answer-

1. (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
2. (d) Assertion (A) is true but reason (R) is false.

MATHEMATICS

Chapter 2: Polynomials

Polynomials

1. **What is a polynomial?**

   A **polynomial** p(x) in one variable x is an algebraic expression in x of the formP(x) = a_nx^n + a_n-$1x^{n-1}$+ $a_{n-2}x^{n-2}$ + ……. +a_2x^2 + a_1x + a_0, wherex is avariable

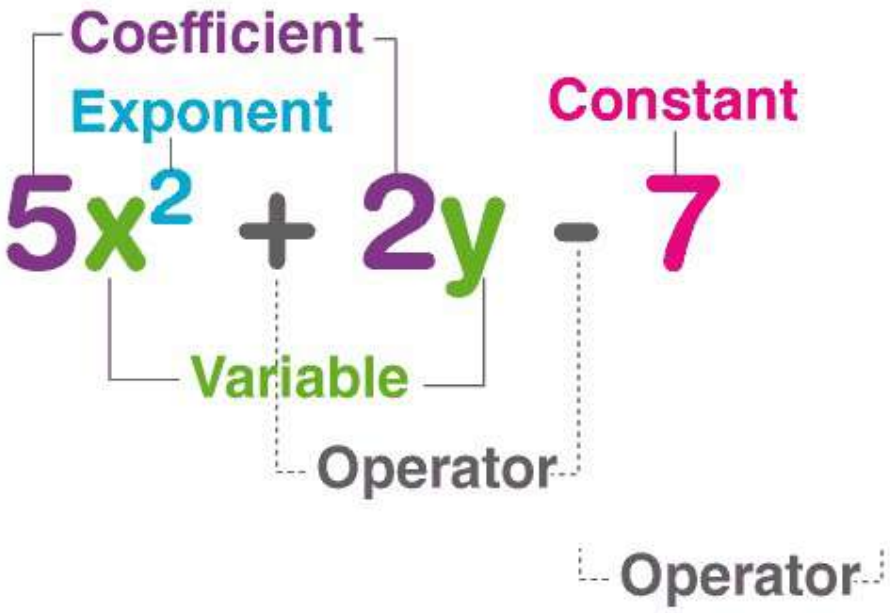
   i. a0, a1, a2 .....na are respectively the coefficients of x0, x1, x2, x3, …… xn.

   ii. Each of a_nx^n, $a_{n-1}x^{n-1}$, $a_{n-2}x^{n-2}$, …… a_2x^2, a_1x, a_0,with $a_n \neq 0$, is called the term of apolynomial.

2. The highest exponent of the variable in a polynomial determines the **degree** of thepolynomial.

3. Polynomials are algebraic expressions that consist of variables and coefficients. Variables are also sometimes called indeterminates. We can perform arithmetic operations such as addition, subtraction, multiplication and also positive integer exponents for polynomial expressions but not division by variable. An example of a polynomial with one variable is x^2+x-12. In this example, there are three terms: x2, x and -12.

   The word polynomial is derived from the Greek words 'poly' means 'many' and 'nominal' means 'terms', so altogether it said "many terms". A polynomial can have any number of terms but not infinite. Learn about degree, terms, types, properties, polynomial functions in this article.



4. **Types ofpolynomials**

   i. A polynomial of degree zero is called a **constant polynomial**. Examples: $-9x^0$ $\frac{8}{14}$

ii. A polynomial of degree one is called a **linear polynomial**. It is of the form ax +b.

Examples: x – 2, 4y + 89, 3x –z.

iii. A polynomial of degree two is called a **quadratic polynomial**. It is of the form ax^2 + bx + c,where a, b, c are real numbers and a ≠0.

Examples: x^2 - 2x + 5, x^2 – 3x etc.

iv. A polynomial of degree 3 is called a **cubic polynomial** and has the general form $ax^3 + bx^2 + cx+d$.

For example:$x^3 + 2x^2$- 2x + 5etc.

Monomial:A monomial is an expression which contains only one term. For an expression to be a monomial, the single term should be a non-zero term. A few examples of monomials are:

- 5x
- 3
- $6a^4$
- -3xy

Binomial: A binomial is a polynomial expression which contains exactly two terms. A binomial can be considered as a sum or difference between two or more monomials. A few examples of binomials are:

- - 5x+3,
- $6a^4$ + 17x
- xy^2+xy

Trinomial

A trinomial is an expression which is composed of exactly three terms. A few examples of trinomial expressions are:

- - $8a^4$+2x+7
- $4x^2$ + 9x + 7

5. **Value of thepolynomial**

If p(x) is a polynomial in x, and k is a real number then the value obtained after replacing x by k in p(x) is called the value of p(x) at x = k which is denoted by p(k).

6. **Zero of apolynomial**

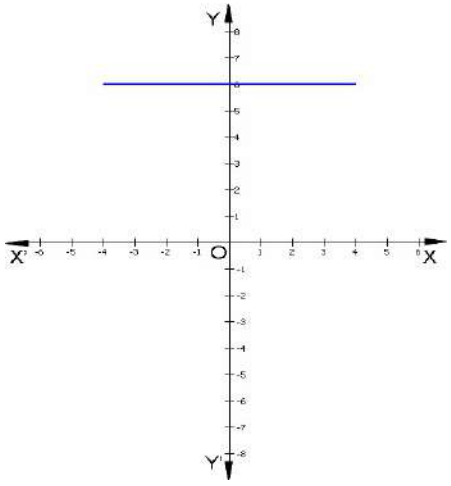
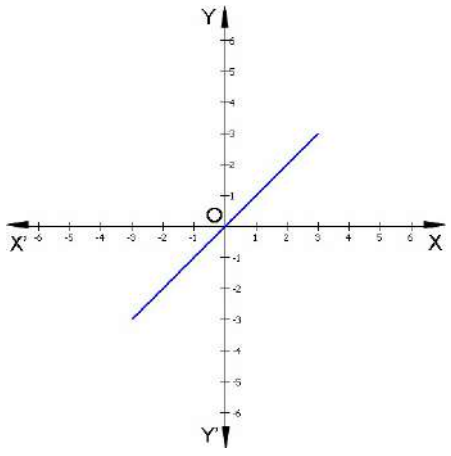
- A real number k is said to be the **zero** of the polynomial p(x), if p(k) =0.
- Zeroes of the polynomial can be obtained by solving the equation p(x) =0.

- It is possible that a polynomial may not have a real zero atall.
- For any linear polynomial ax + b, the zero is given by the expression (-b/a) = -(constant term)/(Coefficient ofx).

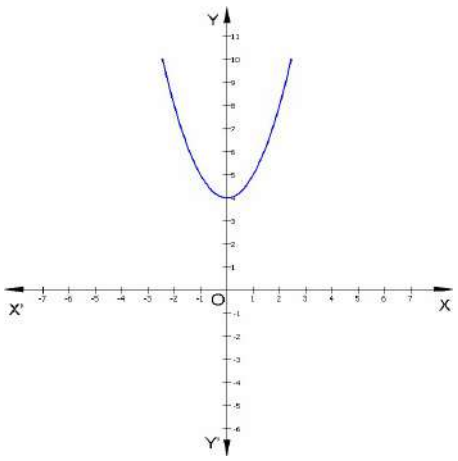
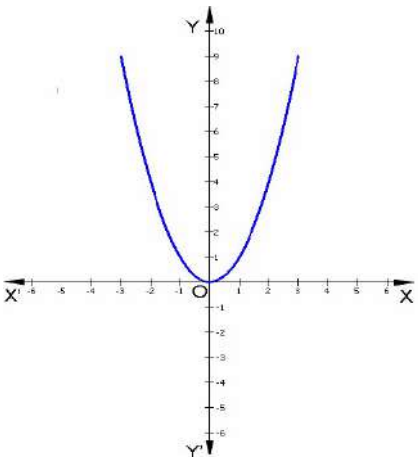
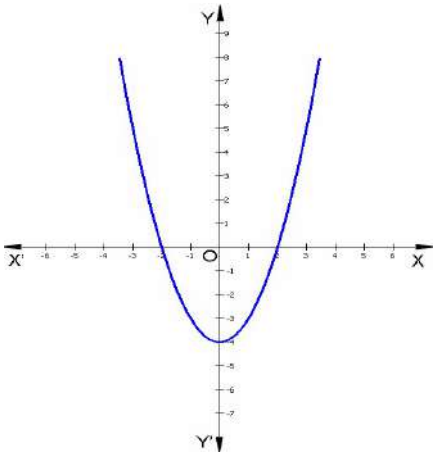
7. **Number of zeroes of apolynomial**

- The number of real zeros of the polynomial is the number of times its graph touches or intersects x- axis.
- The graph of a polynomial p(x) of degree n intersects or touches the x-axis at at most npoints.
- A polynomial of degree n has at most **n distinct realzeroes.**

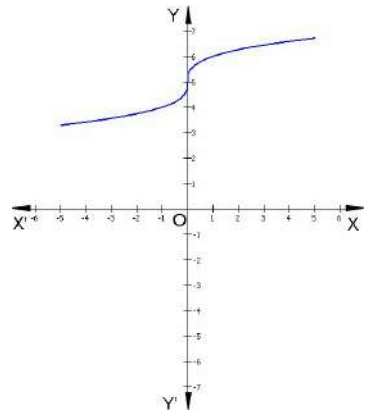
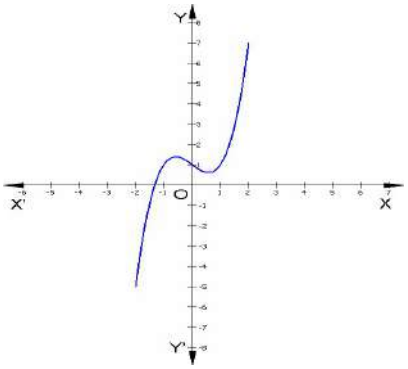
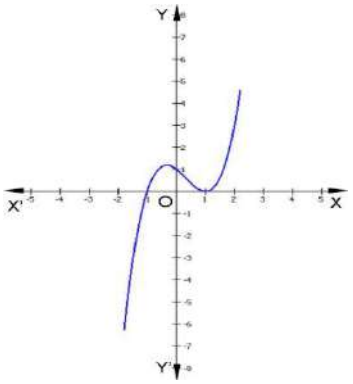
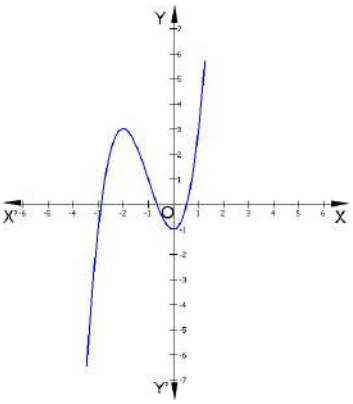
8. **A linear polynomial has at most one real zero**.

Linear Polynomial having **no zero**.	
Linear Polynomial having **one zero**.	

9. **A quadratic polynomial has at most two real zeroes.**

Quadratic Polynomial having no zeroes.	
Quadratic Polynomial having one zero.	
Quadratic Polynomial having two zeroes.	

10. **A cubic polynomial has at most three real zeroes.**

Cubic Polynomial having no zeroes.	
Cubic Polynomial having one zero.	
Cubic Polynomial having one zeroes.	
Cubic Polynomial having three zeroes.	

11. **Relationship between zeroes and coefficients** of apolynomial:

i. For a linear polynomial ax + b, a ≠ 0, the zero is $x = \frac{-b}{a}$.It can be observedthat:

$$\frac{-b}{a} = -\frac{\text{constant term}}{\text{Coefficient of x}}$$

ii. For a **quadratic polynomial** $ax^2 + bx + c$, a ≠ 0,

$$\text{Sum of the zeroes} = -\frac{b}{a} = -\frac{\text{Coefficient of x}}{\text{Coefficient of x}^2}$$

$$\text{Product of the zeroes} = -\frac{c}{a} = \frac{\text{constant term}}{\text{CCoefficient of x}^2}$$

iii. For a **cubic polynomial** $ax^3 + bx^2 + cx + d = 0$, a ≠0,

$$\text{Sum of zeroes} = \frac{-b}{a} = -\frac{\text{Coefficient of x}^2}{\text{Coefficient of x}^3}$$

$$\text{Sum of the product of zeroes taken two at a time} = \frac{c}{a} = \frac{\text{Coefficient of x}}{\text{Coefficient of x}^3}$$

$$\text{Product of zeroes} = -\frac{d}{a} = -\frac{\text{Constant term}}{\text{Coefficient of x}^3}$$

12. Thequadratic**polynomial**whosesumofthezeroes= $(\alpha + \beta)$andproductofzeroes= $(\alpha\beta)$isgivenby:k [x^2 - $(\alpha + \beta)$x + $(\alpha\beta)$], where k is real.

    If a, b and g are the zeroes of a cubic polynomial f (x)= $ax^3 + bx^2 + cx + d$, $a^1 0$, then

    f(x)= k (x -a)(x–b) (x–g)

    f (x)= k {x^3 -(a + b + g)x^2 + (ab + bg + ga)x -abg},where k is any non-zero real number.

13. Process of **dividing** a polynomial f(x) by another polynomial g(x) is asfollows:

    Step 1: To obtain the first term of the quotient, divide the highest degree term of the dividend by the highest degree term of the divisor. Then carry out the division process.

    Step 2: To obtain the second term of the quotient, divide the highest degree term of the new dividend by the highest degree term of the divisor. Then again carry out the division process

    Step 3: Continue the process till the degree of the new dividend is less that the degree of the divisor. This will be called the remainder.

14. **Division Algorithm for polynomials:** If f(x) and g(x) are any two polynomials, where g(x) ≠ 0, then there exists the polynomials q(x) and r(x) such that f(x) = g(x) q(x) + r(x), where r(x) = 0 or degree of r(x) < degree ofg(x)

    So, q(x) is the quotient and r(x) is the remainder obtained when the polynomial f(x) is divided by the polynomial g(x).

15. **Factor** of thepolynomial

If f(x) = g(x) q(x) + r(x) and r(x) = 0, then polynomial g(x) is a **factor of the polynomial** f(x).

16. **Finding** zeroes of a polynomial using divisionalgorithm

Division algorithm can also be used to find the **zeroes of a polynomial**. For example, if 'a' and 'b' are two zeroes of a fourth degree polynomial f(x), then other two zeroes can be found out by dividing f(x) by (x-a)(x-b).

17. **Properties**

Some of the important properties of polynomials along with some important polynomial theorems are as follows:

Property 1: Division Algorithm

If a polynomial P(x) is divided by a polynomial G(x) results in quotient Q(x) with remainder R(x), then,

$$\mathbf{P(x) = G(x) \bullet Q(x) + R(x)}$$

Property 2: Bezout's Theorem

Polynomial P(x) is divisible by binomial (x – a) if and only if P(a) = 0.

Property 3: Remainder Theorem

If P(x) is divided by (x – a) with remainder r, then P(a) = r.

Property 4: Factor Theorem

A polynomial P(x) divided by Q(x) results in R(x) with zero remainders if and only if Q(x) is a factor of P(x).

Property 5: Intermediate Value Theorem

If P(x) is a polynomial, and P(x) ≠ P(y) for (x < y), then P(x) takes every value from P(x) to P(y) in the closed interval [x, y].

Property 6

The addition, subtraction and multiplication of polynomials P and Q result in a polynomial where,

$$\mathbf{Degree\ (P \pm Q) \leq Degree\ (P \text{ or } Q)}$$

$$\mathbf{Degree\ (P \times Q) = Degree\ (P) + Degree(Q)}$$

Property 7

If a polynomial P is divisible by a polynomial Q, then every zero of Q is also a zero of P.

Property 8

If a polynomial P is divisible by two coprime polynomials Q and R, then it is divisible by (Q • R).

Class : 10th mathematics
Chapter-2 : Polynomials

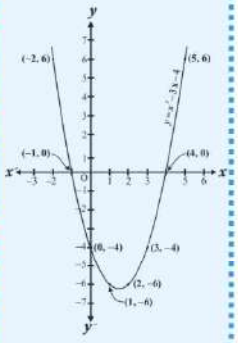
Polynomials

Division Algorithm

If $p(x)$ and $g(x)$ are two polynomials with $g(x) \neq 0$, then –
$p(x) = g(x) \times q(x) + r(x)$
where, $r(x) = 0$ or degree of $r(x)$ < degree of $g(x)$

Graphical Representation Quadratic Polynomials

Parabola



$y = x^2 - 3x - 4$

Relationship-Zeroes and Coefficient of Polynomials

Quadratic

α and β are zeroes of Quadratic Polynomial

$ax^2 + bx + c$

Then, Sum of zeroes,

$\alpha + \beta = -\frac{b}{a}$

Product of zeroes

$\alpha\beta = \frac{c}{a}$

Cubic

α, β and γ are zeroes of Cubic Polynomial

$ax^3 + bx^2 + cx + d$

Sum of zeroes,

$\alpha + \beta + \gamma = -\frac{b}{a}$

Sum of products of the zeroes taken two at a time

$\alpha + \beta + \gamma = -\frac{b}{a}$

Sum of products of the zeroes taken two at a time

$\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a}$

Product of zeroes

$\alpha\beta\gamma = -\frac{d}{a}$

Degree of Polynomials

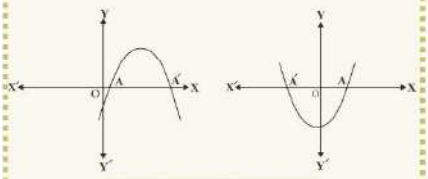
Highest power of x in Polynomial, $p(x)$

Types

Polynomial	Degree	General Form
Linear	1	$ax+b$
Quadratic	2	ax^2+bx+c $a \neq 0$
Cubic	3	ax^3+bx^2+cx+d $a \neq 0$

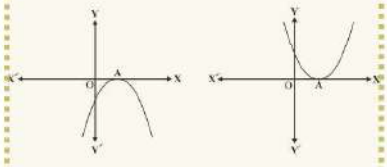
Zeroes of Polynomial Graphically

Case 1 - Graph cuts x-axis at 2 points



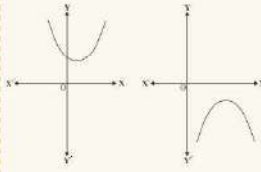
Numbers of Zeroes 2

Case 2 - Graph cuts x-axis at exactly one point



Numbers of Zeroes 1

Case 3 - Graph does not cut x-axis



Numbers of Zeroes 0

Important Questions

Multiple Choice questions-

1. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is

(a) 10

(b) -10

(c) 5

(d) -5

2. If the zeroes of the quadratic polynomial $x^2 + (a + 1) x + b$ are 2 and -3, then

(a) a = -7, b = -1

(b) a = 5, b = -1

(c) a = 2, b = -6

(d) a – 0, b = -6

3. The number of polynomials having zeroes as -2 and 5 is

(a) 1

(b) 2

(c) 3

(d) more than 3

4. If one of the zeroes of the cubic polynomial $x3 + ax^2 + bx + c$ is -1, then the product of the other two zeroes is

(a) b – a + 1

(b) b – a – 1

(c) a – b + 1

(d) a – b – 1

5. The zeroes of the quadratic polynomial $x^2 + 99x + 127$ are

(a) both positive

(b) both negative

(c) one positive and one negative

(d) both equal

5. The zeroes of the quadratic polynomial $x^2 + kx + k$, k? 0,

(a) cannot both be positive

(b) cannot both be negative

(c) are always unequal

(d) are always equal

6. If the zeroes of the quadratic polynomial $ax^2 + bx + c$, c # 0 are equal, then

(a) c and a have opposite signs

(b) c and b have opposite signs

(c) c and a have the same sign

(d) c and b have the same sign

7. If one of the zeroes of a quadratic polynomial of the form $x^2 + ax + b$ is the negative of the other, then it

(a) has no linear term and the constant term is negative.

(b) has no linear term and the constant term is positive.

(c) can have a linear term but the constant term is negative.

(d) can have a linear term but the constant term is positive.

8. The number of polynomials having zeroes as 4 and 7 is

(a) 2

(b) 3

(c) 4

(d) more than 4

9. A quadratic polynomial, whose zeores are -4 and -5, is

(a) x^2-9x + 20

(b) $x^2 + 9x + 20$

(c) $x^2-9x- 20$

(d) $x^2 + 9x- 20$

10. The zeroes of the quadratic polynomial $x^2 + 1750x + 175000$ are

(a) both negative

(b) one positive and one negative

(c) both positive

(d) both equal

Very Short Questions:

1. What will the quotient and remainder be on division of $ax^2 + bx + c$ by $px^2 + qx^2 + rx + 5$, $p \neq 0$?

2. If on division of a polynomial p(x) by a polynomial g(x), the quotient is zero, what is the relation between the degrees of p(x) and g(x)?

3. Can $x – 2$ be the remainder on division of a polynomial p(x) by $x + 3$?

4. Find the quadratic polynomial whose zeros are -3 and 4.

5. If one zero of the quadratic polynomial $x^2 – 5x – 6$ is 6 then find the other zero.

6. If both the zeros of the quadratic polynomial $ax^2 + bx + c$ are equal and opposite in sign, then find the value of b.

7. What number should be added to the polynomial $x^2 – 5x + 4$, so that 3 is the zero of the polynomial?

8. Can a quadratic polynomial $x^2 + kx + k$ have equal zeros for some odd integer $k > 1$?

9. If the zeros of a quadratic polynomial $ax^2 + bx + c$ are both negative, then can we say a, b and c all have the same sign? Justify your answer.

10. If the graph of a polynomial intersects the x-axis at only one point, can it be a quadratic polynomial?

11. If the graph of a polynomial intersects the x-axis at exactly two points, is it necessarily a quadratic polynomial?

Short Questions :

1. If one of the zeros of the quadratic polynomial $f(x) = 4x^2 – 8kx – 9$ is equal in magnitude but opposite in sign of the other, find the value of k.

2. If one of the zeros of the quadratic polynomial $(k – 1)x^2 + kx + 1$ is -3 then find the value of k.

3. If 1 is a zero of the polynomial $p(x) = ax^2 – 3(a – 1)x -1$, then find the value of a.

4. If α and β are zeros of polynomial $p(x) = x^2 – 5x + 6$, then find the value of α + B – 3aß.

5. Find the zeros of the polynomial $p(x) = 4x^2 – 12x + 9$.

6. What must be subtracted from $p(x) = 8x^4 + 14x^3 – 2x^2 + 7x – 8$ so that the resulting polynomial is exactly divisible by $g(x) = 4x^2 + 3x – 2$?

7. What must be added to $f(x) = 4x^4 + 2x^3 – 2x^2 + x – 1$ so that the resulting polynomial is divisible by $g(x) = x^2 + 2x – 3$?

8. Obtain the zeros of quadratic polynomial $3x^2 – 8x + 4√3$ and verify the relation between its zeros and coefficients.

9. If α and β are the zeros of the polynomial 6y2 – 7y + 2, find a quadratic polynomial whose zeros are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

10. If one zero of the polynomial $3x^2 – 8x + 2k + 1$ is seven times the other, find the value of k.

Long Questions :

1. Verify that the numbers given alongside the cubic polynomial below are their zeros. Also verify the relationship between the zeros and the coefficients.

   $x^3 – 4x^2 + 5x – 2$; 2,1,1

2. Find a cubic polynomial with the sum of the zeros, sum of the products of its zeros taken two at a time, and the product of its zeros as 2, -7, -14 respectively.

3. Find the zeros of the polynomial $f(x) = x3 – 5x^2 – 2x + 24$, if it is given that the product of its two zeros is 12.

4. If the remainder on division of $x^3 – kx^2 + 13x – 21$ by $2x – 1$ is -21, find the quotient and the value of k. Hence, find the zeros of the cubic polynomial $x^3 –$

5. Obtain all other zeros of $3x^4 + 6x^3 - 2x^2 - 10x - 5$, if two of its zeros are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$.

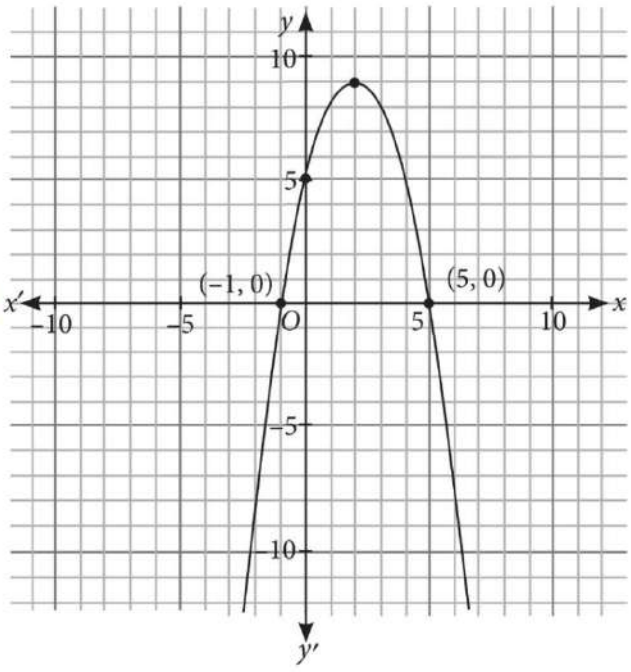
6. Given that √2 is a zero of the cubic polynomial $6x^3 + \sqrt{2}x^2 - 10x - 4\sqrt{2}$, find its other zeros.

7. If α, β, γ bezerosofpo1ynomial $6x^3 + 3x^2 - 5x + 1$, then find die value of α-1 + β-1 + γ-1.

8. Find the zeros of the polynomial $f(x) = -12x^2 + 39x - 28$, if it is given that the zeros are in AP.

Case Study Questions:

1. ABC construction company got the contract of making speed humps on roads. Speed humps are parabolic in shape and prevents overspeeding, minimise accidents and gives a chance for pedestrians to cross the road. The mathematical representation of a speed hump is shown in the given graph.



Based on the above information, answer the following questions.

i. The polynomial represented by the graph can be ____ polynomial.

   a. Linear
   b. Quadratic

c. Cubic
d. Zero

ii. The zeroes of the polynomial represented by the graph are:

a. 1, 5
b. 1, -5
c. -1, 5
d. -1, -5

iii. Sum of zeroes of the polynomial represented by the graph are:

a. 4
b. 5
c. 6
d. 7

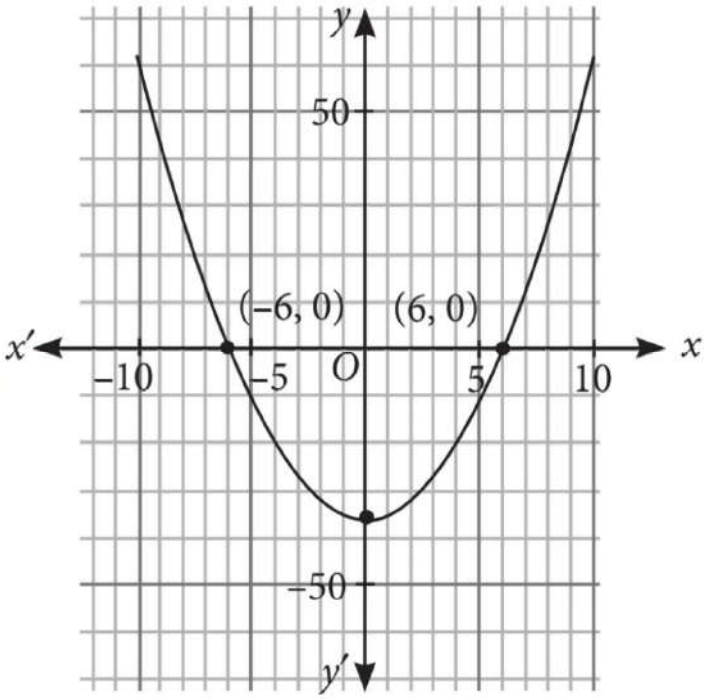
iv. If α and β are the zeroes of the polynomial represented by the graph such that β $>\alpha$, β $>\alpha$, then $|8\alpha + \beta| = |8\alpha + \beta| =$

a. 1
b. 2
c. 3
d. 4

v. The expression of the polynomial represented by the graph is:

a. $x^2 - 4x - 5$
b. $x^2 + 4x + 5$
c. $x^2 + 4x - 5$
d. $-x^2 + 4x + 5$

2. While playing in garden, Sahiba saw a honeycomb and asked her mother what is that. She replied that it's a honeycomb made by honey bees to store honey. Also, she told her that the shape of the honeycomb formed is parabolic. The mathematical representation of the honeycomb structure is shown in the graph .



Based on the above information, answer the following questions.

i. Graph of a quadratic polynomial is _____ in shape.

a. Straight line.
b. Parabolic.
c. Circular.
d. None of these.

ii. The expression of the polynomial represented by the graph is:

a. $x^2 - 49$
b. $x^2 - 64$
c. $x^2 - 36$
d. $x^2 - 81$

iii. Find the value of the polynomial represented by the graph when x = 6.

a. -2
b. -1
c. 2
d. 1

iv. The sum of zeroes of the polynomial $x^2 + 2x - 3$ is:

a. -1
b. -2

c. 2
d. 1

v. If the sum of zeroes of polynomial $at^2 + 5t + 3a$ is equal to their product, then find the value of a.

a. -5
b. -3
c. 5353
d. −53−53

Assertion reason questions-

1. ***Directions:*** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Assertion: $x^2 + 7x + 12$ has no real zeroes.

Reason: A quadratic polynomial can have at the most two zeroes.

2. ***Directions:*** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Assertion: If the sum of the zeroes of the quadratic polynomial $x^2-2kx+8$ is 2 then value of k is 1.
Reason: Sum of zeroes of a quadratic polynomial ax^2+bx+c is -b/a

Answer Key-

Multiple Choice questions-

1. (b) -10

2. (d) a – 0, b = -6

3. (d) more than 3

4. (a) b – a + 1

5. (b) both negative

6. (a) cannot both be positive

7. (c) c and a have the same sign

8. (a) has no linear term and the constant term is negative.

9. (d) more than 4

10. (b) $x^2 + 9x + 20$

11. (a) both negative

Very Short Answer :

1. 0, $ax^2 + bx + C$.

2. Since the quotient is zero, therefore

deg p(x) < deg g(x)

3. No, as degree (x – 2) = degree (x + 3)

4. Sum of zeros = -3 + 4 = 1,

Product of zeros = – 3 x 4 = -12

∴ Required polynomial = $x^2 – x – 12$

5. Let α,6 be the zeros of given polynomial.

Then α + 6 = 5 3 ⇒α = -1

6. Let α and -α be the roots of given polynomial.

Then $\alpha + (-\alpha) = 0 \Rightarrow -\frac{b}{a} = 0 \Rightarrow b = 0$.

7. Let $f(x) = x^2 – 5x + 4$

Then $f(3) = 3^2 – 5 \times 3 + 4 = -2$

For f(3) = 0, 2 must be added to f(x).

8. No, for equal zeros, k = 0, 4 ⇒ k should be even.

9. Yes, because $-\frac{b}{a}$ = sum of zeros < 0, so that $\frac{b}{a}$ = 0 > 0. Also the product of the zeros = $\frac{c}{a}$= 0 > 0.

10. Yes, because every quadratic polynomial has at the most two zeros.

11. No, $x^4 - 1$ is a polynomial intersecting the x-axis at exactly two points.

Short Answer :

1. Let one root of the given polynomial be α.

Then the other root = -α

Sum of the roots = (-α) + α = 0

$$\Rightarrow -\frac{b}{a} = 0 \text{ or } -\frac{8k}{4} = 0 \text{ or } k = 0$$

2. Since – 3 is a zero of the given polynomial

∴ $(k - 1)(-3)^2 + k(-3) + 1 = 0$:

⇒ 9k – 9 – 3k + 1 = 0 ⇒ k = 4/3.

3. Put x = 1 in p(x)

∴ $p(1) = a(1)^2 - 3(a - 1) \times 1 - 1 = 0$

⇒ a – 3a + 3 – 1 = 0 ⇒ 2a = -2 ⇒ a = 1

4. Here, α + β = 5, αβ = 6

= α + β – 3αβ = 5 – 3 x 6 = -13

5. $p(x) = 4x^2 - 12x + 9 = (2x - 3)+$

For zeros, p(x) = 0

⇒ (2x – 3)(2x – 3) = 0 ⇒ $x = \frac{3}{2}$

6. Let y be subtracted from polynomial p(x)

: $8x^4 + 14x^3 - 2x^2 + 7x - 8 - y$ is exactly divisible by g(x)

Now,

$$
\begin{array}{r}
2x^2 + 2x - 1 \\
4x^2 + 3x - 2 \overline{)\, 8x^4 + 14x^3 - 2x^2 + 7x - 8 - y} \\
\underline{-\,8x^4 \pm 6x^3 \mp 4x^2} \\
8x^3 + 2x^2 + 7x - 8 - y \\
\underline{-\,8x^3 \pm 6x^2 \mp 4x} \\
-4x^2 + 11x - 8 - y \\
\underline{\mp 4x^2 \mp 3x \pm 2} \\
14x - 10 - y
\end{array}
$$

$\because$ Remainder should be 0.

$\therefore$ 14x – 10 – y = 0 or 14x – 10 = y or y = 14x – 10

$\therefore$ (14x – 10) should be subtracted from p(x) so that it will be exactly divisible by g(x)

7. By division algorithm, we have

f(x) = g(x) × q(x) + r(x)

= f(x) – r(x) = g(x) × q(x) $\Rightarrow$ f(x) + {-r(x)} = g(x) × q(x)

Clearly, RHS is divisible by g(x). Therefore, LHS is also divisible by g(x). Thus, if we add –r(x) to f(x), then the resulting polynomial is divisible by g(x). Let us now find the remainder when f(x) is divided by g(x).

$$
\begin{array}{r}
4x^2 - 6x + 22 \\
x^2 + 2x - 3 \overline{)\, 4x^4 + 2x^3 - 2x^2 + x - 1} \\
\underline{-\,4x^4 \pm 8x^3 \mp 12x^2} \\
-6x^3 + 10x^2 + x - 1 \\
\underline{\mp 6x^3 \mp 12x^2 \pm 18x} \\
22x^2 - 17x - 1 \\
\underline{-\,22x^2 \pm 44x \mp 66} \\
-61x + 65
\end{array}
$$

$\therefore$ r(x) = -61x + 65 or -r(x) = 61x – 65

Hence, we should add –r(x) = 61x – 65 to f(x) so that the resulting polynomial is divisible by g(x).

8. We have,

$$\alpha+\beta=-\left(\frac{-7}{6}\right)=\frac{7}{6};\quad \alpha\beta=\frac{2}{6}=\frac{1}{3}$$

9. Let $p(y) = 6y^2 - 7y + 2$

Now, $\frac{1}{\alpha}+\frac{1}{\beta}=\frac{\alpha+\beta}{\alpha\beta}=\frac{7}{6\times\frac{1}{3}}=\frac{7}{2}$

$$\frac{1}{\alpha}\times\frac{1}{\beta}=\frac{1}{\alpha\beta}=\frac{1}{\frac{1}{3}}=3$$

The required polynomial $= y^2-\frac{7}{2}y+3=\frac{1}{2}(2y^2-7y+6)$

10. Let α and β be the zeros of the polynomial. Then as per question $\beta = 7\alpha$

Now sum of zeros $= \alpha+\beta=\alpha+7\alpha=-\left(\frac{-8}{3}\right)$

$\Rightarrow \quad 8\alpha=\frac{8}{3}$ or $\alpha=\frac{1}{3}$

and $\alpha\times\beta=\alpha\times7\alpha=\frac{2k+1}{3}$

$\Rightarrow \quad 7\alpha^2=\frac{2k+1}{3} \Rightarrow 7\left(\frac{1}{3}\right)^2=\frac{2k+1}{3} \quad \left(\because \alpha=\frac{1}{3}\right)$

$\Rightarrow \quad \frac{7}{9}=\frac{2k+1}{3} \Rightarrow \frac{7}{3}=2k+1$

$\Rightarrow \quad \frac{7}{3}-1=2k \Rightarrow k=\frac{2}{3}$

Long Answer :

1. Let $p(x) = x^3 - 4x^2 + 5x - 2$

On comparing with general polynomial px) $ax^3 + bx^2 + cx + d$, we get a = 1, b = -4, c = 5 and d = -2

Given zeros 2, 1, 1.

$\therefore p(2) = (2)^3 - 4(2)^2 + 5(2) - 2 = 8 - 16 + 10 - 2 = 0$

and $p(1) = (1)^3 - 4(1)^2 + 5(1) - 2 = 1 - 4 + 5 - 2 = 0$

Hence, 2, 1 and I are the zeros of the given cubic polynomial.

Again, consider α = 2, β = 1, γ = 1

$\therefore \alpha + 13 + \gamma = 2 + 1 + 1 = 4$

and $\alpha + \beta + \gamma = \dfrac{-(\text{Coefficient of } x^2)}{\text{Coefficient of } x^3} = \dfrac{-b}{a} = \dfrac{-(-4)}{1} = 4$

$\alpha\beta + \beta\gamma + \gamma\alpha = (2)(1) + (1)(1) + (1)(2) = 2 + 1 + 2 = 5$

and $\alpha\beta + \beta\gamma + \gamma\alpha = \dfrac{\text{Coefficient of } x}{\text{Coefficient of } x^3} = \dfrac{c}{a} = \dfrac{5}{1} = 5$

$\alpha\beta\gamma = (2)(1)(1) = 2$

and $\alpha\beta\gamma = \dfrac{-(\text{Constant term})}{\text{Coefficient of } x^3} = \dfrac{-d}{a} = \dfrac{-(-2)}{1} = 2$

2. Let the cubic polynomial be $p(x) = ax^3 + bx^2 + cx + d$. Then

Sum of zeros $= \dfrac{-b}{a} = 2$

Sum of the products of zeros taken two at a time $= \dfrac{c}{a} = -7$

and product of the zeros $= \dfrac{-d}{a} = -14$

$\Rightarrow \quad \dfrac{b}{a} = -2, \quad \dfrac{c}{a} = -7, \quad -\dfrac{d}{a} = -14 \quad \text{or} \quad \dfrac{d}{a} = 14$

$\therefore \quad p(x) = ax^3 + bx^2 + cx + d \quad \Rightarrow \quad p(x) = a\left[x^3 + \dfrac{b}{a}x^2 + \dfrac{c}{a}x + \dfrac{d}{a}\right]$

$p(x) = a[x^3 + (-2)x^2 + (-7)x + 14] \Rightarrow p(x) = a[x^3 - 2x^2 - 7x + 14]$

For real value of $a = 1$, $p(x) = x^3 - 2x^2 - 7x + 14$

3. Let α, β and γ be the zeros of polynomial (fx) such that $\alpha\beta = 12$.

We have, $\alpha + \beta + \gamma = \dfrac{-b}{a} = \dfrac{-(-5)}{1} = 5$

$\alpha\beta + \beta\gamma + \gamma\alpha = \dfrac{c}{a} = \dfrac{-2}{1} = -2 \quad \text{and} \quad \alpha\beta\gamma = \dfrac{-d}{a} = \dfrac{-24}{1} = -24$

Putting $\alpha\beta = 12$ in $\alpha\beta\gamma = -24$, we get

$12\gamma = -24 \quad \Rightarrow \quad \gamma = -\dfrac{24}{12} = -2$

Now, $\alpha + \beta + \gamma = 5$ $\alpha + \beta - 2 = 5$

$= \alpha + \beta = 7$ $a = 7 - \beta$

$= (7 - \beta)\beta = 12 \Rightarrow 7\beta - \beta^2 - 12$

$= \beta^2 + 7\beta + 12 = 0 \Rightarrow \beta^2 - 3\beta - 4\beta + 12 = O$

$\beta = 4$ or $\beta = 3$

$\therefore \alpha = 3$ or $\alpha = 4$

4. Let $f(x) = x^3 - kx^2 + 13x - 21$

Then, $f\left(\frac{1}{2}\right) = -21 \Rightarrow \left(\frac{1}{2}\right)^3 - k\left(\frac{1}{2}\right)^2 + 13\left(\frac{1}{2}\right) - 21 = -21$

or $\frac{1}{8} - \frac{1}{4}k + \frac{13}{2} - 21 + 21 = 0$ or $\frac{k}{4} = \frac{53}{8} \Rightarrow k = \frac{53}{2}$

$\therefore f(x) = x^3 - \frac{53}{2}x^2 + 13x - 21$

Now, $f(x) = q(x)(2x - 1) - 21$

$\Rightarrow x^3 - \frac{53}{2}x^2 + 13x - 21 = q(x)(2x - 1) - 21$

$\Rightarrow \left(x^3 - \frac{53}{2}x^2 + 13x\right) \div (2x - 1) = q(x)$

$$
\begin{array}{r|l}
 & \frac{1}{2}x^2 - 13x \\
\hline
2x - 1 & x^3 - \frac{53}{2}x^2 + 13x \\
 & \underline{-x^3 \mp \frac{1}{2}x^2} \\
 & -26x^2 + 13x \\
 & \underline{\mp 26x^2 \pm 13x} \\
 & 0
\end{array}
$$

i.e., $x^3 - \frac{53}{2}x^2 + 13x = (2x - 1)\left(\frac{1}{2}x^2 - 13x\right) = \frac{1}{2}x(2x - 1)(x - 26)$

For zeros, $x^3 - \frac{53}{2}x^2 + 13x = 0 \Rightarrow \frac{1}{2}x(2x - 1)(x - 26) = 0 \Rightarrow x = 0, \frac{1}{2}, 26$

5.

Since two zeros are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$, so $\left(x-\sqrt{\frac{5}{3}}\right)\left(x+\sqrt{\frac{5}{3}}\right)=x^2-\frac{5}{3}$ is a factor of the given polynomial.

Now, we divide the given polynomial by $\left(x^2-\frac{5}{3}\right)$ to obtain other zeros.

$$
\begin{array}{r|l}
x^2-\frac{5}{3} & 3x^2+6x+3 \\
\hline
 & 3x^4+6x^3-2x^2-10x-5 \\
 & \underline{-3x^4 \quad \mp 5x^2} \\
 & 6x^3+3x^2-10x \\
 & \underline{-6x^3 \quad \mp 10x} \\
 & 3x^2-5 \\
 & \underline{-3x^2 \mp 5} \\
 & 0
\end{array}
$$

So, $3x^4+6x^3-2x^2-10x-5=\left(x^2-\frac{5}{3}\right)(3x^2+6x+3)$

Now, $3x^2+6x+3=3(x^2+2x+1)=3(x+1)^2=3(x+1)(x+1)$

So its zeros are $-1, -1$.

Thus, all the zeros of given polynomial are $\sqrt{5/3}, -\sqrt{5/3}, -1$ and -1.

6. The given polynomial is $f(x) = (6x^3 + \sqrt{2}x^2 - 10x - 4\sqrt{2})$. Since $\sqrt{2}$ is the zero of $f(x)$, it follows that $(x - \sqrt{2})$ is a factor of $f(x)$.

On dividing $f(x)$ by $(x - \sqrt{2})$, we get

$$
\begin{array}{r|l}
x-\sqrt{2} & 6x^2+7\sqrt{2}x+4 \\
\hline
 & 6x^3+\sqrt{2}x^2-10x-4\sqrt{2} \\
 & \underline{-6x^3 \pm 6\sqrt{2}x^2} \\
 & 7\sqrt{2}x^2-10x \\
 & \underline{-7\sqrt{2}x^2 \pm 14x} \\
 & 4x-4\sqrt{2} \\
 & \underline{\pm 4x \pm 4\sqrt{2}} \\
 & 0
\end{array}
$$

$\therefore \quad f(x)=0 \Rightarrow (x-\sqrt{2})(6x^2+7\sqrt{2}x+4)=0 \Rightarrow (x-\sqrt{2})(3\sqrt{2}x+4)(\sqrt{2}x+1)=0$

$x-\sqrt{2}=0, \quad 3\sqrt{2}x+4=0, \quad \sqrt{2}x+1=0$

Hence, $x=\sqrt{2}, x=-\frac{2\sqrt{2}}{3}, x=\frac{-\sqrt{2}}{2}$ and All zeros of $f(x)$ are $\sqrt{2}, \frac{-2\sqrt{2}}{3}, \frac{-\sqrt{2}}{2}$.

7. ∵ p(x) = 6x3 + 3x2 – 5x + 1 so a = 6, b = 3, c = -5, d = 1

∴ α, β and γ are zeros of the polynomial p(x)

$$\therefore \quad \alpha+\beta+\gamma=\frac{-b}{a}=\frac{-3}{6}=\frac{-1}{2}$$

$$\alpha\beta+\alpha\gamma+\beta\gamma=\frac{c}{a}=\frac{-5}{6} \quad \text{and} \quad \alpha\beta\gamma=\frac{-d}{a}=\frac{-1}{6}$$

$$\text{Now} \quad \alpha^{-1}+\beta^{-1}+\gamma^{-1}=\frac{1}{\alpha}+\frac{1}{\beta}+\frac{1}{\gamma}=\frac{\beta\gamma+\alpha\gamma+\alpha\beta}{\alpha\beta\gamma}=\frac{-5/6}{-1/6}=5$$

8. If α, β, γ are in AP., then,

$\beta-\alpha=\gamma+\beta \Rightarrow 2\beta=\alpha+\gamma$

$\alpha+\beta+\gamma=-\frac{b}{a}=\frac{-(-12)}{1}=12 \Rightarrow \alpha+\gamma=12-\beta$..... (i)

From (i) and (ii)

$2\beta=12-\beta$ or $3\beta=12$ or $\beta=4$

Putting the value of β in (i), we have

$8=a+\gamma$

$\alpha\beta\gamma=-\frac{d}{a}=\frac{-(-28)}{1}=28$ ..... (iii)

$(\alpha\gamma)\,4=28$ or $\alpha\gamma=7$ or $\gamma=7\alpha$ ..... (iv)

Putting the value of $\gamma=7\alpha$ in (iii), we get

$\Rightarrow 8=\alpha+\frac{7}{\alpha} \Rightarrow 8\alpha=\alpha^2+7$

$\Rightarrow \alpha^2-8\alpha+7=0 \Rightarrow \alpha^2-7\alpha-1\alpha+7=0$

$\Rightarrow \alpha(\alpha-7)-1(\alpha-7)=0 \Rightarrow (\alpha-1)(\alpha-7)=0$

$\Rightarrow \alpha=1$ or $\alpha=7$

Putting $\alpha=1$ in (*iv*), we get		Putting $\alpha=7$ in (*iv*), we get	
	$\gamma=\frac{7}{1}$		; $\gamma=\frac{7}{7}$
or	$\gamma=7$	or	$\gamma=1$
and	$\beta=4$	and	$\beta=4$
$\therefore$	zeros are 1, 7, 4.	$\therefore$	zeros are 7, 4, 1.

Case Study Answers:

1. **Answer :**

i. (b) Quadratic

Solution:

Since, the given graph is parabolic is shape, therefore it will represent a quadratic polynomial.

[∵ Graph of quadratic polynomial is parabolic in shape)

ii. (c) -1, 5

Solution:

Since, the graph cuts the x-axis at -1, 5. So the polynomial has 2 zeroes i.e., -1 and 5.

iii. (a) 4

Solution:

Sum of zeroes = -1 + 5 = 4

iv. (c) 3

Solution:

Since α and β are zeroes of the given polynomial and β > α, β > α,

∴ α = -1 ∴ α = -1 and β = 5β = 5

∴ |8α + β| = |8(-1) + 5| = | -8 + 5| = |-3| = 3.

∴|8α + β|=|8(−1)+5|=|−8+5|=|−3|=3.

v. (d) $-x^2 + 4x + 5$

Solution:

Since the zeroes of the given polynomial are -1 and 5.

∴ Required polynomial p(x)

$= k^2 \{x^2 - (-1 + 5)x + (-1)(5)\} = k(x^2 - 4x - 5)$

For k = -1, we get,

$p(x) = -x^2 + 4x + 5$, which is the required polynomial.

2. Answer :

i. (b) Parabolic.

Solution:

Graph of a quadratic polynomial is a parabolic in shape.

ii. (c) $x^2 - 36$

Solution:

Since the graph of the polynomial cuts the x-axis at (-6, 0) and (6, 0). So, the zeroes of polynomial are -6 and 6.

∴ Required polynomial is

$p(x) = x^2 - (-6 + 6)x + (-6)(6) = x^2 - 36$

iii. (c) 2

Solution:

We have, $p(x) = x^2 - 36$

Now, $p(6) = 6^2 - 36 = 36 - 36 = 0$

iv. (b) -2

Solution:

Let $f(x) = x^2 + 2x - 3$. Then,

$$\text{Sum of zeroes} = -\frac{\text{coefficient of x}}{\text{coefficient of x}^2}$$

$$= -\frac{(2)}{1} = -2$$

v. (d) −53−53

Solution:

The given polynomial is $at^2 + 5t + 3a$

Given, sum of zeroes = product of zeroes

$$\Rightarrow \frac{-5}{a} = \frac{3a}{a}$$

$$\Rightarrow a = \frac{-5}{3}$$

Assertion Reason Answer-

1. (d) Assertion (A) is false but reason (R) is true.
2. (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Social Studies

(Civics)

Chapter 1: Power Sharing

10th

Power Sharing

INTRODUCTION:-

Power sharing is a strategy wherein all the major segments of the society are provided with a permanent share of power in the governance of the country. It is a means for sharing practices and established rules and roles to facilitate broad based decision making controlling and leading.

It is a potential tool for solving disputes in the society divided by deep ethnic, cultural or racial differences by giving the parties involved the wide rage of power sharing to ameliorate the tensions through concensus oriented government.

Power sharing refers to the sharing or division of power between various political parties and various sections of society.

Power Sharing in Belgium and Sri Lanka

Belgium

Belgium, a small European country, has Dutch-, French- and German-speaking populations. While 59% of the total population of the country live in the Flemish region and speak Dutch, the other 40% of the people live in the Wallonia region and speak French. In Brussels, the capital of Belgium, about 80% of the people speak French, while the remaining 20% speak Dutch.

Communities and regions of Belgium

The minority French-speaking population was rich and powerful. This was resented by the Dutch- speaking population as they received the benefits of education quite late. This sparked tension between the two communities. However, this problem was solved by the political leaders of Belgium who wanted the people to coexist peacefully with one another.

Accommodation in Belgium

In Belgium, the government handled the community difference very well. Between 1970 and 1993, Belgian leaders amended their constitution four times and came up with a new model to run the government.

Here are some of the elements of the Belgian model.

- The Constitution prescribes that the number of Dutch and French-speaking ministers shall be equal in the Central Government. Some special laws require the support of the majority of members from each linguistic group. Thus, no single community can make decisions unilaterally.
- The state governments are not subordinate to the Central Government.
- Brussels has a separate government in which both communities have equal representation.
- Apart from the Central and the State Government, there is a third kind of government. This 'community government' is elected by people belonging to one language community – Dutch, French and German-speaking – no matter where they live. This government has the power regarding cultural, educational and language-related issues.

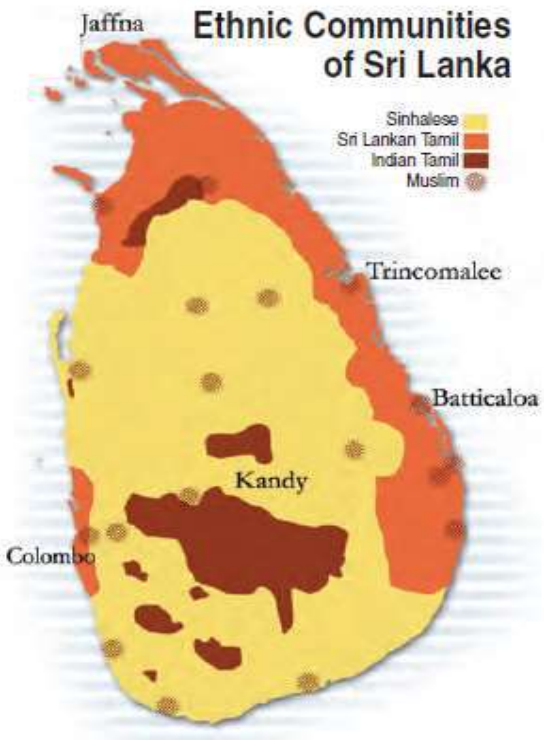
These arrangements in Belgium were successful and avoided any kind of tension between the two linguistic communities. This also negated any possibilities of the division of the country on linguistic lines.

Sri Lanka

It is an island nation having a population of 2 crores, about the same as in Haryana. Sri Lanka has a diverse population. The major social groups are the Sinhala-speakers (74%) and the Tamil-speakers (18%). Among Tamils, there are two subgroups, "Sri Lankan Tamils" and "Indian Tamils".

- Sri Lankan Tamils (13 percent) – Tamil natives of the country
- Indian Tamils (5 percent) – came from India during the colonial period as plantation workers.

You can see the map (right) to know the population distribution of different communities of Sri Lanka.



Majoritarianism in Sri Lanka

- Sri Lanka became independent of colonial rule in 1948. There were two major communities—Sinhalese and Tamilians. The Sinhalese were in majority, and hence, after being elected to power, the Sinhalese leaders followed a series of majoritarian policies in order to ascertain the supremacy of their community.
- By an Act passed in 1956, Sinhala was recognised as the only official language of the country. Preferential positions in government jobs were given to theSinhalese.
- All these measures led to dissent among the Tamilian community which finally culminated into a civil war, with the Tamilians demanding the formation of an independent Tamil state in the northern and eastern parts of Sri Lanka. Thousands of people were killed in the civilwar.

We find that both Belgium and Sri Lanka dealt with the issue of power sharing differently. In Belgium, the leaders respected the interests of both linguistic groups and avoided any possibilities of clashes among the Dutch- and French-speaking communities. In Sri Lanka, however, the assertive policies of the majority community led to a civil war threatening the unity and integrity of thecountry.

Need for Power Sharing

Power sharing is desirable because of two main reasons. They are

- **Prudential reason:**It reduces any chances of conflicts between social groups. By avoiding conflicts, political stability and unity of the country can be maintained. Dictatorship of the majority community can be oppressive for the minority and can even wreck the majority community aswell.
- **Moral reason:** Power sharing is the true spirit of democracy. Every section of community has the right to be consulted on how they are to be governed. Governance should be carried out keeping in mind the larger interests of each section of thecommunity.

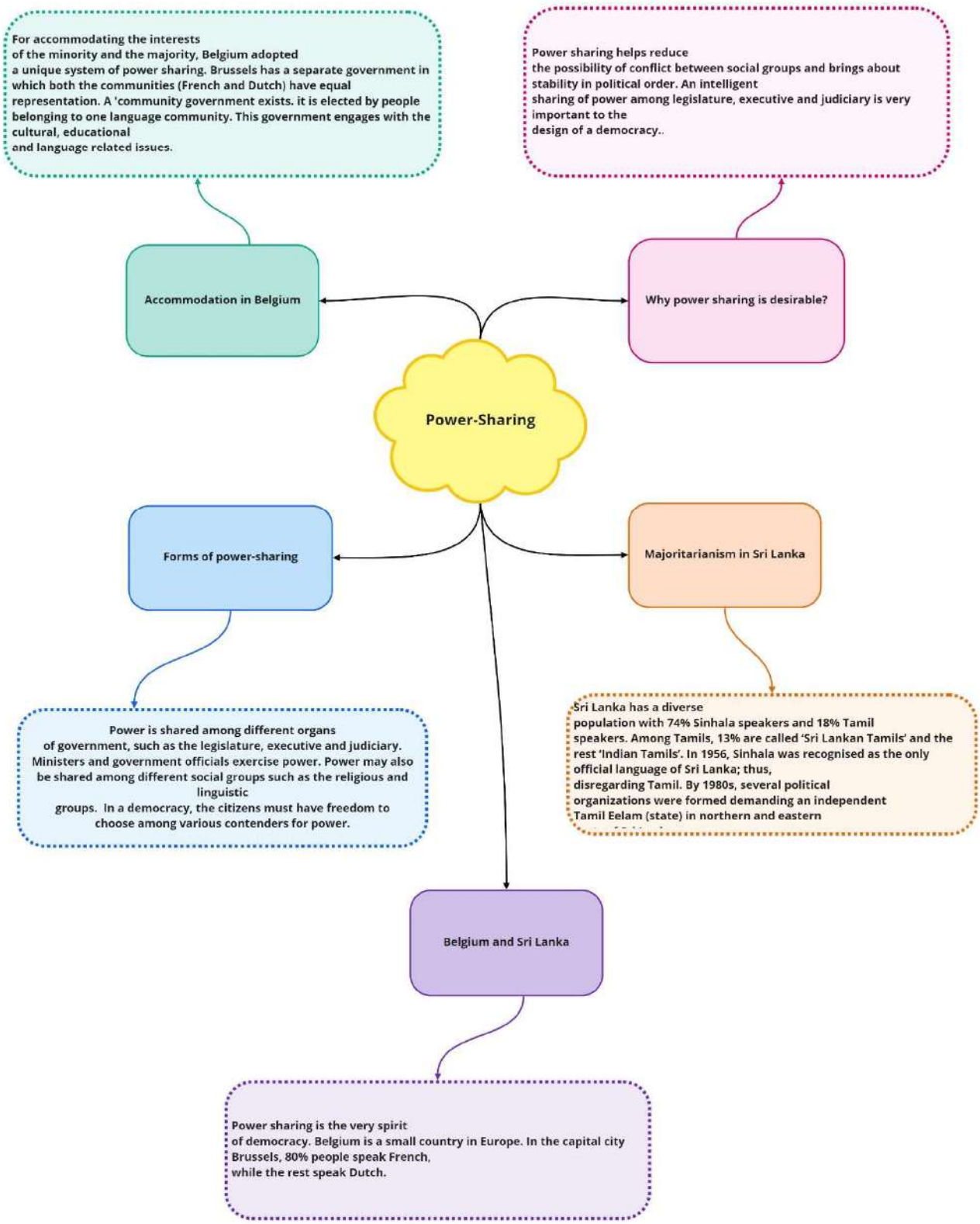
Different Forms of Power Sharing

In democracies, power is shared in various ways. These are

1. **Sharing of power among different organs ofgovernment**
   - A government has three organs-legislature, executive and judiciary. Separation or division of power among the three organs ensures that no organ becomes toopowerful.
   - In such a system, one organ also keeps a check on the other organ of the government. This results in maintaining balance ofpower.
   - For example, judges who are appointed by the executive can check the functioning of the executive or the legislature. The ministers are also responsible to the Parliament. This is called a system of checks andbalances.
2. **Power sharing among different levels ofgovernment**
   - In a federal government, there are two main levels of government-the Union or the Central Government and the StateGovernment.
   - While the Central Government looks after the administration and law and order of the entire country as a whole, the State Governments look after the administration and law and order in their ownstates.
   - Municipal corporations and village panchayats are the local units ofadministration.
3. **Sharing of power among different socialgroups**
   - Sharing of power among various social, linguistic or ethnic communities is another form of power sharing.
   - Representation given to the weaker sections of society and religious minorities in the Government ensure the diversity and unity of thecountry.
   - In India, the system of reserved constituencies in the assemblies and in the Parliament is an example of power sharing among different social and ethnicgroups.
4. **Power sharing among political parties, pressure groups andmovements**
   - In a democracy, more than one political party exists. People have the freedom to vote for any political party. Such competition among various political parties guarantees that power is not concentrated in the hands of one political partyonly.
   - Sometimes, an alliance of one or more political parties is voted to power. This is known as a coalitiongovernment.
   - Many sections of society such as traders, farmers and workers may form their own interest groups and can influence the decision-making body of the Government. This ensures that voices of each section of society areheard.

Thus we find that power sharing is an important requirement and feature of democratic societies.

Class : 10th Political Science
Chapter-1 : Power-Sharing



Important Questions

Multiple Choice questions-

1. Which of the following is an example of horizontal sharing of power? [CBSE 2011]

(a) Power sharing between different states.
(b) Power sharing between different organs of the government.
(c) Power sharing between different levels of the government.
(d) Power sharing between different political parties.

2. Who elects the community government in Belgium? [CBSE 2011]

(a) People belonging to one language community only.
(b) By the leader of Belgium.
(c) The citizens of the whole country.
(d) The community leaders of Belgium.

3. The Community Government signifies:

(a) The powers of government regarding community development.
(b) The powers of the government regarding law making for the community.
(c) The powers of the government regarding cultural, educational and language related issues.
(d) The government enjoys privileges to safeguard the interest of a particular community.

4. The word 'ethnic' signifies:

(a) different religions.
(b) social division on shared culture.
(c) a violent conflict between opposite groups.
(d) a careful calculation of gains and losses.

5. Power sharing is:

(a) the very spirit of democracy
(b) separation of powers at different levels.
(c) system of checks and balances.
(d) a type of balancing powers.

6. Choose the correct option: [CBSE 2011]

Power sharing is desirable because it helps:

(a) To increase pressure on government.
(b) To reduce possibilities of conflicts.
(c) To generate awareness among people.
(d) To increase percentage of voters.

7. System of 'checks and balances' means:

(a) Horizontal distribution of powers.
(b) Separation of powers.
(c) Put a check on the exercise of unlimited powers of the organs of government by maintaining a balance of power among various institutions.
(d) Federal division of powers

8. Which of the following features are common to Indian and Belgian form of power-sharing arrangements?

A. Power is shared among governments at different levels.
B. Power is shared among different organs of government.
C. Power is shared among different social groups.
D. Power is shared among different parties and takes the form of competition.

(a) A, B, C, D
(b) B, C and D
(c) A and C
(d) A, C and D

9. In dealing with power sharing, which one of the following statements is NOT correct about democracy?

(a) People are the source of all political power. !
(b) In a democracy, people rule themselves j through institutions of self-governance.
(c) In a democracy, due respect is given to diverse groups and views that exist in a society.
(d) In a democracy, if the power to decide is dispersed, it is not possible to take quick decisions and enforce them.

10. A belief that the majority community should be able to rule a country in whichever way it wants, by disregarding the wishes and needs of the minority is:

(a) Power Sharing
(b) Central Government
(c) Majoritarianism
(d) Community Government

11. A system of 'checks and balances' is another name for which one of the following power-sharing arrangements:

(a) Power sharing among different social groups.
(b) Vertical division of power or power shared among different levels of government.
(c) Horizontal division of power or power shared among different organs of the government.
(d) Power sharing in the form of political parties, pressure groups and governments.

12. Which one of the following statements about power-sharing arrangements is correct?

(a) Power sharing is necessary only in societies which have religious, linguistic or ethnic divisions.
(b) Power sharing is suitable only for big countries that have regional divisions.
(c) Every society needs some form of power sharing even if it is small or does not have social divisions.
(d) Power-sharing is not necessary at all.

13. Consider the following statements about the

ethnic composition of Sri Lanka:

A. Major social groups are the Sinhala- speaking (74%) and Tamil-speaking (18%)?
B. Among the Tamils, there are two sub-groups, Sri Lankan Tamils and Indian Tamils.
C. There are about 7% Christians, who are both Tamil and Sinhala.
D. Most of the Sinhala-speaking are Hindus or Muslims and most of the Tamil-speaking are Buddhists.

Which of the above statements are correct?

(a) A, B, C
(b) A, B, D
(c) B, C, D
(d) A, B, C, D

14. Prudential reasons of power sharing stress on the facts that:

A. It ensures the stability of political order.
B. It reduces the possibility of conflict between social groups.
C. It gives a fair share to minority.
D. It is the very spirit of democracy.

Which of the above statements are correct?

(a) A, B
(b) A, C and D
(c) All are correct
(d) A, B & C

15. How many people speak French and Dutch in the capital city of Brussels?

(a) 60 percent French 40 percent Dutch
(b) 50% Dutch 50% French
(c) 80% French 20% Dutch
(d) 80% Dutch 20% French

Very Short-

1. What is Majoritarianism?

2. Mention one step which was taken by Sri Lankan Government to create Majoritarianism.

3. State one prudential reason and one moral reason for power sharing from the Indian context.

4.Name the country which has lost peace due to Majoritarianism.

5. What is the difference between prudential and moral reasons for power sharing?

6. Name two subgroups of Tamils in Sri Lanka.

7. What is the system of checks and balances of power sharing?

8. State two main bases of the social divisions in Sri Lanka.

9. Who formed majority in terms of population in Sri Lanka?

10. Who formed majority in terms of population in Belgium?

Short Questions-

1. How Belgian government solved its ethnic Problem?

2. What is majoritarianism? How it has led to alienation of majority community in Sri Lanka?

3. Describe three demands of Sri Lankan Tamils. How did they struggle for their independence?

4. How is power shared among different organs of the government, I.e., legislature, executives and judiciary?

5. How is federal government better than a unitary government? Explain with examples of Belgium and Sri Lanka.

6. Write down the features of Horizontal division of power sharing.

7. Write Down the features of Vertical division of power sharing.

8. Give a comparative analysis between Belgium and India in the sphere of area.

9. What is the reason for tension in Belgium?

10. What was the background of Sri Lankan Tamils?

11. What do you mean by civil war?

Long Questions-

1. How are the ethnic problem solved in Belgium? Mention any four steps which were taken by the governments to solve the problem?

2. Explain the power sharing arrangement among the different political parties,

pressure groups and movements.

3. Explain the power sharing arrangement among the different organs of the government.

4. Explain the power sharing arrangement among the different social groups.

5. Explain the power sharing arrangement among the different levels of the government.

6. What are advantages enjoyed by the Sinhala Community in Sri Lanka? Describe the consequences.

7. Describe the population composition of Sri Lanka and the reasons for the formation of Majoritarian government in 1948.

8. What measures were adopted by the Belgium government to accommodate regional and cultural diversities?

Assertion Reason Questions:

1. **DIRECTION:** Mark the option which is most suitable:
    a. If both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
    b. If both assertion (A) and reason (R) are true, but reason (R) is not the correct explanation of assertion (A).
    c. Assertion (A) is true, but reason (R) is false.
    d. Both assertion (A) and reason (R) are false.

Assertion(A): Community government in Belgium allows to share power among religious and linguistic groups.

Reason(R): In India there are legal and constitutional arrangements where by socially weaker sections and women are represented in the legislatures and administration.

2. **DIRECTION:** Mark the option which is most suitable:
    a. If both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
    b. If both assertion (A) and reason (R) are true, but reason (R) is not the correct explanation of assertion (A).
    c. Assertion (A) is true, but reason (R) is false.
    d. Both assertion (A) and reason (R) are false.

Assertion(A): Sri Lanka emerged as an independent country in 1949.

Reason(R): The leaders of the Sinhala community sought to secure dominance over government by virtue of their majority.

Case Study Questions:

1. Read the passage below and answer the questions that follow:

   Power may also be shared among different social groups, such as the religious and linguistic groups. 'Community government' in Belgium is a good example of this arrangement. In some countries there are constitutional and legal arrangements whereby socially weaker sections and women are represented in the legislatures and administration. This type of arrangement is meant to give space in the government and administration to diverse social groups who otherwise would feel alienated from the government. This method is used to give minority communities a fair share in power.

   i. Power sharing means:

      a. System of political arrangement in which power is shared between ministers of the government.

      b. System of political arrangement in which power is shared between different organs of the government.

      c. System of political arrangement in which power is shared between different levels of the government.

      d. All of the above.

   ii. Which one is not a benefit of Power sharing?

      a. Reduces the possibilities of conflicts between social groups.

      b. Ensures political stability in the long run.

      c. All the political parties get their expected share.

      d. It upholds the spirit of democracy.

   iii. Apart from the Central and State Government, there is a third type of government in Belgium called the:

      a. Regional Government.

      b. State Government.

      c. Union Government.

      d. Community Government.

   iv. Which is not a feature of Community government?

      a. Apart from the Central and the State Government, this is a third type of government.

b. It is elected by the people belonging to one community that is Dutch, French, German speaking.

c. It is mainly based on cooperation and tolerance.

d. It does not have the power regarding cultural, educational and language related issues.

2. Read the passage below and answer the questions that follow:

Power is shared among different organs of government, such as the legislature, executive and judiciary. Let us call this horizontal distribution of power because it allows different organs of government placed at the same level to exercise different powers. Such a separation ensures that none of the organs can exercise unlimited power. Each organ checks the others. This results in a balance of power among various institutions. Last year we studied that in a democracy, even though ministers and government officials exercise power, they are responsible to the Parliament or State Assemblies. Similarly, although judges are appointed by the executive, they can check the functioning of executive or laws made by the legislatures. This arrangement is called a system of checks and balances.

i. Power sharing between different organs of the government is being referred as:

a. Horizontal distribution of power.

b. Vertical division of power.

c. Union Government.

d. Community Government.

ii. Power Sharing is between:

a. Legislature, executive and parliament.

b. Legislature, executive and judiciary.

c. Legislature, high court, and judiciary.

d. None of the above.

iii. It allows different organs of government placed at the same level to exercise different powers is known as:

a. Circular distribution of power.

b. Vertical distribution of power.

c. Horizontal distribution of power.

d. All of the above.

iv. Judges are appointed by the executive; they can check the functioning of executive or laws made by the legislature known as:

a. Horizontal distribution of power.
b. Vertical distribution of power.
c. Checks and balances.
d. All of the above.

MCQ Answers-

1. Answer: b
2. Answer: a
3. Answer: c
4. Answer: b
5. Answer: a
6. Answer: b
7. Answer: c
8. Answer: (b) B, C and D
9. Answer: d
10. Answer: c
11. Answer: c
12. Answer: c
13. Answer: (a) A, B, C
14. Answer: d
15. Answer: c

Very Short Answers-

1. Ans. A belief that the majority community should be able to rule a country in whatever way it wants, by disregarding the wishes and needs of the minorities.
2. Ans. In 1956, an act was passed to recognize Sinhala as the official language.
3. Ans. India is a multinational society and India is a democratic country.
4. Ans. Sri Lanka.
5. Ans. Prudential reasons stress that power sharing will bring out better outcome or results; where as moral reasons emphasize the very act of power sharing as valuable.

6. Ans. Sri Lankan Tamils and Indian Origin Tamils.
7. Ans. Under this system, one organ of the government keeps the check over other. None of the organs can exercise unlimited power.
8. Ans. Religion and Language
9. Ans. Sinhalese Buddhist formed majority.
10. Ans. The Dutch formed majority

Short Answers-

1. Ans. The Path of accommodation adopted in Belgium.

a). Dutch and French speaking ministers shall be equal in the central govt.

b). Many Powers of the central government have been given to state govt. The state govt are not subordinate to the central govt.

c). Brussels has a separate govt in which both the communities have equal representation.

d). There is a third kind of govt called community govt elected by the people belonging to Dutch, French and German no matter where they live.

2. Ans. The dominance of majority community to rule the country in whichever way it wants totally disregarding the wishes and needs of minority community is known as majoritarianism.

a). In srilanka mainly there are two communities- Sinhala and Tamils the leaders of the sinhala community sought to secure dominance over the govt by virtue of their majority. Sinhala has been recognized as the official language of the country by disregarding

b). Government followed a preferential policy favouringsinhalased in university portions and govt jobs.

c). The govt encouraged and protected Budhism The distrust has turned into a civil war that has caused a setback to social cultural and economic life of Srilanka.

3. Ans.

a).Recognition of Tamil as an official language.

b). Regional autonomy

c). Equal opportunity in securing jobs and education.

They formed several political organizations, but when the government tried to suppress their activities by force, this led to civil war

4. Ans.

a).This type of power sharing is known as horizontal power sharing as well as all the organs is placed at the same level and each organ can check the other.

b). For example even through ministers and government officials exercise power, they are responsible to the parliament.

5. Ans. Federalism is a system of government under which power is divided between a central authority and its various constituent units.

a). In federal government power is shared among the different levels of government but in unitary government all powers are in the hands of a single unit.

b). The Belgium leaders tried to solve the ethnic problem by respecting the feeling and interest if different committees and regions by establishing a federal government, whereas the Sri Lankan Government tried to solve the problem through Majoritarianism.

6. Ans. Horizontal Division of power, in which power is shared among different organs of the government like legislature, Executive and Judiciary.

a). Different organs of the government exercise the power.

b). It specifies the concept of check and balance.

c). It ensures the concept of the expansion of the democracy.

d). Examples: Legislature, Executive and Judiciary are the organs Government of India

7. Ans. In vertical division of Power Sharing power is shared among the different levels of the government like Union Government, state government and Lower levels.

a). Different levels of the government exercise the power of the government.

b). No specification of the system of checks and balance.

c). It ensures the concept of deepening of democracy.

d). Central Government, State Government and Panchayat Raj are the example of the Vertical division of Power Sharing.

8. Ans.

a).Area wise Belgium is a small country in Europe. It is smaller in area than that of Haryana in India.

b). It has borders with Netherlands, France and Germany.

c). Regarding population it has a population over one crore, about half of the population of Haryana.

d). It has a very complex ethnic composition comprising various language speaking communities than India which is a secular and integrated country.

9. Ans.

a). The Dutch form 59%, the French form 40% and the German about 1% comprises the population of Belgium.

b). The French community is in majority in the capital of Belgium, Brussels.

c). They are rich and powerful and this is not liked by the Dutch.

d). The Dutch speaking community got the benefit of economic development and education much later showed the resentment.

e). This led to conflict between French and Dutch speaking people.

10. Ans.

a). Their forefathers came from India as plantation workers during colonial period.

b). Tamils who are brought as indentured laborers from India by British colonists to work in estate plantation are called Indian Origin Tamils re 5%.

c). Sri Lankan Tamils live in the north eastern part of the country.

11. Ans.

A violent conflict between opposing groups within a country that becomes so intense that it appears like a war.

Long Answers-

1. Ans.

a). Equal no of Ministers for both the groups: The Belgium constitution prescribes that the number of Dutch and French speaking ministers shall be equal in the central government. Some special laws require the support of majority of members from each linguistic group.

b). More powers to the state government: Under the proper power sharing arrangement many powers of the central government were given to state government for the two regions of the country. The state governments were not subordinate to the central government.

c). Equal representation at state and the central level: A separate government has been set up at Brussels in which both the communities have equal representation.

d). Formation of community government: A third kind of government was made that is community government. This community government is elected by the people belonging to one language community. Dutch, French and German speaking people have their own community government.

2. Ans.

a). In a democracy power is also shared among the different political parties,

pressure groups and movements.

b). Democracy provides the citizens a choice to choose their rulers. This choice is provided by the various political parties, who contest elections to win. Such competition ensures that power does not remain in one hand.

c). In the long run power is shared among different political parties that represent different ideologies and social groups.

d). Sometimes this kind of sharing can be direct, when two or more parties from an alliance to contest elections. If their alliance is elected, they form a coalition government and thus share power.

e). In a democracy, various pressure groups and movements also remain active. They will also have a share in governmental power, either through participation in governmental committees or bringing influence on the decision making process.

3. Ans.

a). In a democracy power is shared among the different organs of the government such as Legislature, Executive and Judiciary. This is also called as the horizontal distribution of power sharing.

b). Legislature is lawmaking body, Executive is law implementing body and Judiciary is dispute solving body of the Government.

c). Because it also allows different organs of government placed at the same level to exercise different power.

d). Under this kind of power sharing arrangements, no organ of the government can exercise unlimited powers.

e). Each organ has its own power and checks the powers of other.

f). This results in the in a balance of power among various institutions.

4. Ans.

a). In a democracy, especially in multiethnic society, power is also shared among social groups such as the religious and linguistic groups.

b). Community government in Belgium is a good example of this arrangement.

c). In some countries, there are constitutional and legal arrangements whereby socially weaker sections and women are represented in the legislatures and administration.

d). In India to provide share in power to backward and other classes, a system of reserved constituencies in assemblies and the parliament is followed.

e). This type arrangement is meant to give proper share in the government and administration to diverse social groups who otherwise would feel alienated from the

Government.

5. Ans.

a) Under this people choose separate government at separate levels for example a general government for the entire country and governments at the provincial, sub-national or regional level.

b). Such a general government for the entire country is usually called a federal government.

c). In India we refer to it as the union government. The governments at the provincial or regional level are called by different names in different countries.

d). In India these are known as state governments. This system is not followed in all the countries of the world.

e). The division of power is more important under such type of Governments. A government at different levels enjoys different powers which are given to them by the constitution.

f). The divisions of power involving higher and lower levels of government are called vertical division of power.

6. Ans.

(a) The leaders of the Sinhala community tried to ensure the dominance of their community over the other communities of Sri Lanka after independence.

(b) The adopted a series of majoritarian measures to establish Sinhala supremacy.

(c) In 1956, an act was passed to recognize Sinhala as the only official language.

(d) Sinhala people were given special preference in government jobs and university admissions.

(e) Buddhism was declared the national religion.

(f) Consequences: All these government measures increased the feeling of alienation among the other Communities. They felt that their language and culture were not given due importance. They also felt that the constitution and the policies of the government denied them to give equal political powers. As a result their relations with the Sinhala community worsened.

7. Ans.

(a) It is an Island nation south of India. Tamil natives are called Sri Lankan Tamils and formed 13% population.

(b) The Indian Tamils whose forefathers had come from India as planatation workers formed 5% population.

(c) The Sinhala Buddhist, who was 74% of the population, formed the majority

government after independence in 1948.

(d) Tamils are either Hindus or Muslims, 7% of the people are Christian who are both Tamil and Sinhala.

(e) Sinhalese enjoy majority and can impose their will on the entire country.

8. Ans.

(a) In 1970-193, the constitution of Belgium was amended for times to accommodate linguistic, cultural and regional differences.

(b) The Dutch and French speaking ministers were equal number in the central government.

(c) Special laws required the support of majority of members from each linguistic group.

(d) Many powers of the central government had been given to state governments of the two regions of the country.

(e) Brussels had a separate government where both communities were given equal representation.

(f) Community government of each section was also introduced.

Assertion Reason Answer:

1. (b) If both assertion (A) and reason (R) are true, but reason (R) is not the correct explanation of assertion (A).
2. (d) Both assertion (A) and reason (R) are false.

Case Study Answer:

1. i (d) All of the above.

ii. (a) Reduces the possibilities of conflicts between social groups.

iii. (b) State Government.

iv. (a) Apart from the Central and the State Government, this is a third type of government.

2. i (b) Vertical division of power.

ii. (c) Legislature, high court, and judiciary.

iii. (b) Vertical distribution of power.

iv. (d) All of the above.

Q1. What are the different forms of power sharing in modern democracies? Give an example of each of these?

Ans In modern democracies power sharing arrangement are in many forms. The most important and common arrangements are as follows:

1. Horizontal Distribution of powers:-

a. In this form of distribution power is shared among different organs of government such as the legislature, executive and judiciary.

b. This type of distribution advocates separation of powers in which different organs of government in the same level exercise different powers.

c. Separation of power ensures a check over the unlimited powers of each organs. This results in a balance of power among various institutions.

d. Horizontal distribution of power is also called a system of 'check and balances' e.g although the judges are appointed by the executive, they can check the functioning of executive or laws made by the legislature.

2. Vertical Distribution of powers:-

a. Under this form of power sharing arrangement power is shared among government s at different levels e.g, a general government for the entire country and government s at the provincial, sub-national or regional level.

b. A general govt. for the entire country is usually called federal govt. In our country we refer to it as the central govt.

c. In some countries like India and Belgium the constitution clearly lays down the powers of the govt. at different levels. This is called the "federal division of power".

3. Power sharing among different social groups:-

In another way power may also be shared among different social groups, such as the religious and linguistic groups.

a. This type of arrangements is meant to give space in the govt. and administration to diverse social groups who otherwise would feel alienated from the govt.

b. This method is used to give minority communities a fair share in power
e.g community govt. in Belgium
Reserved constituencies in assemblies parliament in India.

4. Power-sharing arrangement can also be seen in the way political parties, pressure groups and movements control or influence those in power. In

contemporary democracies, this takes the form of competition among different parties that form alliances to contest elections.

e.g In India there were three major alliances in 2004 parliamentary elections

NDA-National Democratic Alliance

UPA- Unlimited progressive alliance

And left front.

Q2. State one prudential reason and one moral reason for power sharing with an example from the Indian content?

Ans In deeply divided societies (divided on ethnic cultural religion grounds) equal representation of all the principal groups is called for. Every social group needs a share in the governance to ensure that their interests would be taken care of. Power sharing is desirable on two grounds.

i. Prudential reasons:-

These reasons are based on careful calculations of gains and losses occurring due to the adoption of a particular style of governance. Power sharing reduces the possibility of conflict between the social groups and the violent upheaval that may happen otherwise.

ii. It is seen as a comprise that is sought among the various groups to ensure the stability of the political order.

iii. Power sharing is a strategy for resolving disputes over who should have the most powerful position in the social hierarchy.

MORAL REASONS

Power sharing is the essence of democracy. A democratic rule involves giving voice and representation to all the people would be affected by the policies and the rules made. The basic principles of power sharing include:-

i. Coalition government In which nearly all political parties have a just share.

ii. Protection of minority rights for groups.

iii. Decentralization of power.

iv. Decision making by consensus.

Q4. The major of merchtem, a town near Brussels in Belgium, has defended a ban on speaking French in the town's schools. He said that the ban would help all non-Dutch speakers integrate in this Flemish town. Do you

think that this measure is in keeping with the spirit of Belgium's power sharing arrangements? Give your reasons in about 50 words?

Ans No we do not think that this measure of putting a ban on speaking French in Belgiums school is in keeping with the spirit of Belgium's power sharing because:-

i) The Dutch community could take advantage of its numeric majority and forced its will on the French and German speaking population.

ii) This would push the conflict among communities further and could lead to a very messy partition of the country.

Hence, the Belgium constitution prescribes the equal-representation and partition to both the French and Dutch speaking people whether in the schools or at the govt. levels.

Q5. Passage on book

Ans "Panchayat Raj" establishes true democracy and is also a way to reduce corruption and increase administrative efficiency i.e towards political stability.

Additional questions

Q1. Which are the two social groups in Sri Lanka?

Ans In Sri Lanka the two social groups are:

i) Sinhalese:- They constitute 74%

ii) Tamils:- They also constitute two groups

Sri lanka Tamils constitute 13%

Indian Tamils constitute 50%

Q2. Define the term 'Majoritarianism'?

Ans The term 'Majoritarianism' signifies a political belief that the majority community should be able to rule a country in whichever way it wants, disregarding the wishes and needs of the minority community or communities. Sri lanka adopted the majoritarian concept of govt.

Q3. Why was the act of 1956 passed?

Ans The Act of 1956 was passed by the Sri lankan govt. to recognize Sinhala as the only official language in order to provide majoritian status to the Sinhala community.

Q4. Define the term civil war?

Ans Civil war is a type of conflict between the two or more communities or between the civilians and the govt. of the country e.g. Srilanka civil war.

Q5. What do you mean by prudential?

Ans "Prudential" is a set of reasons which favours powers sharing. It is based on prudence on careful calculation of gains and losses. Prudential reasons stress beneficial consequences.

Q6. Text Book (Multiple Choice Questions)

1 a

Q7. A

Q8. C

Q9. B

ADDITIONAL QUESTIONS

Q1. What are the differences between the style of governance in Sri Lanka and Belgium? What are the outcomes and lessons learned?

Ans. Sri lanka:- After independence in 1948, the Sinhalese majority community sought to establish their dominance over the govt.

i. Majoritarianism measures were adopted to enforce the supremacy of Sinhalese community and alienate the minority Tamil community.

ii. An act was passed in 1956 which recognized Sinhala as the only official language of Sri Lanka that out rightly disregarded Tamil.

iii. The govt. followed preferential policies favoring Sinhalese communities in university jobs, govt. positions and other interests and opportunities.

iv. Also a new constitution stipulated that the state shall protect and foster Buddhism.

BELGIUM:- The Belgian leaders recognized the cultural and linguistic differences in their country. To avoid civic strife and political tensions in the country, the leaders followed accommodating policies.

i. In the central govt., there would be an equal number of French and Dutch speakers according to the constitution. No. decisions can be made by a single community or unilaterally since they would require the support of majority of members from each linguistic group.
ii. A lot of powers have been transferred from the central govtss to the state govts. For the two regions of the country and the state govts. would not be subordinate to the central govt. for the decisions taken by them.
iii. The capital regions of Brussels has its own govt. with both communities enjoying equal powers.
iv. Belgium also implemented the model of "community govt." which is elected by the people democratically for each linguistic group. This govt. has powers over their cultural, language and educational related matters.

Q. Describe any three demands of Sri Lankan Tamils. How did they struggle for their demands.

Ans. Three demands of Sri Lanka Tamils:-
i. Their language i.e., the Tamil should be given equal status with that of the Sinhala language.
ii. There should be no discrimination between them and the Sinhala residents of Sri Lanka in govt jobs and university posts.
iii. Their religion whether Hinduism or Christianity should be equally respected with that of Buddhism.
iv. They should be given political rights.

Q. How did they struggle for their demands?

i. They launched struggles for the fulfillment of their above demands.
ii. They established several political organization and demanded regional autonomy.
iii. They started some sort of a civil war when their legitimate demands were denied by the Sri Lankan Govt.

Q1. What are the different forms of power sharing in modern democracies? Give an example of each of these?

Ans In modern democracies power sharing arrangement are in many forms. The most important and common arrangements are as follows:

5. Horizontal Distribution of powers:-
e. In this form of distribution power is shared among different organs of govt. such as the legislature, executive and judiciary.

f. This type of distribution advocates separation of powers in which different organs of govt. in the same level exercise different powers.
g. Separation of power ensures a check over the unlimited powers of each organs. This results in a balance of power among various institutions.
h. Horizontal distribution of power is also called a system of 'check and balances' e.g although the judges are appointed by the executive, they can check the functioning of executive or laws made by the legislature.

6. Vertical Distribution of powers:-

d. Under this form of power sharing arrangement power is shared among govts. at different levels e.g, a general govt. for the entire country and govts. at the provincial, sub-national or regional level.
e. A general govt. for the entire country is usually called federal govt. In our country we refer to it as the central govt.
f. In some countries like India and Belgium the constitution clearly lays down the powers of the govt. at different levels. This called the "federal division of power".

7. Power sharing among different social groups:-
In another way power may also be shared among different social groups, such as the religious and linguistic groups.

c. This type of arrangements is meant to give space in the govt. and administration to diverse social groups who otherwise would feel alienated from the govt.
d. This method is used to give minority communities a fair share in power
e.g community govt. in Belgium
Reserved constituencies in assemblies parliament in India.

8. Power-sharing arrangement can also be seen in the way political parties, pressure groups and movements control or influence those in power. In contemporary democracies, this takes the form of competition among different parties that form alliances to contest elections.
e.g In India there were three major alliances in 2004 parliamentary elections
NDA-National Democratic Alliance
UPA- Unlimited progressive alliance
And left front.

Q2. State one prudential reason and one moral reason for power sharing with an example from the Indian content?

Ans The prudential reason for power sharing is the precautionary measure.

1. This reason for power sharing is good because it helps to reduce the possibility of conflict between social groups.
Reserved constituencies for minorities and women in assemblies and parliament is the best example.
2. The moral reason of power sharing is the very spirit of democracy.
3. Here, people have a right to be consulted on how they are to be governed.
4. Decentralization of powers in India is the best example of moral reason of power sharing.

Q3. Write a short note on the power sharing in J & K Legislative council according to the constitution of J & K?

Ans In the constitution of J & K we find the provisions dealing with power sharing. In view of the nature of the state being composed of three distinct geographical regions with internal social diversity. The constitution ensures representation of each region in the legislative council, e.g Article 50 of the state constitution says that the legislative council shall consistof 36 members. Out of these, 11 have to be necessarily from Kashmir including one each from Ladakh and Kargil. Similarly 11 are also to be elected from jammu region with one each from Doda and Poonch. 2 members are elected by the members of municipal councils. Town areas committees and notiied Area committees four members are elected by the members of Panchayats and other local bodies as the governor may be order specify, two each in the province of Kashmir and jammu. Eight members are nominated by the governor from amongst persons belonging to socially and educationally backward classes in the state or persons having contributed in the field of literature, science, art etc.

Q4. The major of merchtem, a town near Brussels in Belgium, has defended a ban on speaking French in the town's schools. He said that the ban would help all non-Dutch speakers integrate in this Flemish town. Do you think that this measure is in keeping with the spirit of Belgium's power sharing arrangements? Give your reasons in about 50 words?

Ans No we do not think that this measure of putting a ban on speaking French in Belgiums school is in keeping with the spirit of Belgium's power sharing because:-

iii) The Dutch community could take advantage of its numeric majority and forced its will on the French and German speaking population.

iv) This would push the conflict among communities further and could lead to a very messy partition of the country.

Hence, the Belgium constitution prescribes the equal-representation and partition to both the French and Dutch speaking people whether in the schools or at the govt. levels.

Q5. Passage on book

Ans "Panchayat Raj" establishes true democracy and is also a way to reduce corruption and increase administrative efficiency i.e towards political stability.

Additional questions

Q1. Which are the two social groups in Sri Lanka?

Ans In Sri Lanka the two social groups are:

iii) Sinhalese:- They constitute 74%

iv) Tamils:- They also constitute two groups
Srilanka Tamils constitute 13%
Indian Tamils constitute 50%

Q2. Define the term 'Majoritarianism'?

Ans The term 'Majoritarianism' signifies a political belief that the majority community should be able to rule a country in whichever way it wants, disregarding the wishes and needs of the minority community or communities. Srilanka adopted the majoritarian concept of govt.

Q3. Why was the act of 1956 passed?

Ans The Act of 1956 was passed by the Sri lankan govt. to recognize Sinhala as the only official language in order to provide majoritian status to the Sinhala community.

Q4. Define the term civil war?

Ans Civil war is a type of conflict between the two or more communities or between the civilians and the govt. of the country e.g Srilanka civil war.

Q5. What do you mean by prudential?

Ans "Prudential" is a set of reasons which favours powers sharing. It is based on prudence on careful calculation of gains and lossess. Prudential reasons stress beneficial consequences.

Q6. Text Book (Multiple Choice Questions)

2 a

Q7. A

Q8. C

Q9. B

Q10. A

Q11. D

Q12. d

PRAYERS

Summary

Central Idea:- Man, in spite of being superior to all the other creatures, is ultimately helpless and submissive to Almighty Allah. He begs to Almighty Allah in a desperate and earnest way to provide him with knowledge and to save him from sluggishness, weakness and ignorance.

Detailed Summary:

The poem 'Prayer' has been penlocked by 'G.A. Mehjoor' popularly known as the 'Shair-e-Kashmir'. The poem is addressed to God and the poet expresses his wishes before Almighty Allah. The poet requests Allah to lead him on the path of righteousness and the truth. He wishes to be free from ignorance and wants to be enriched with knowledge so as to come close to his creator. He pleas to Allah to cure him of his troubles and hear his pains and moans. He requests Allah to free him of the clutches of laziness, weakness and doubts. He wishes to be energized with enthusiasm, emotions and pious hopes. The poet further implores Allah to provide him the ability to recite beautiful verses which would not be boring or irritating but would instill rejuvenation into the ignorant 'and demoralized ones. He wants to spread the message of love and gospel of brotherhood to engulf bitterness and hatred among people. The poet requests Allah to bloom him with soothing and calm breezes of righteousness and honesty and pleads Allah to save him from the terrible effects of ignorance and dishonesty which decolourize one's personality. He prays to be awakened from ignorance like the flower which blooms with the first rays of the sun at the daybreak and seeks protection from being like dew which is enlightened after the full illumination of the sun. It means that the poet wishes to be rightly guided by just a wink of Allah's knowledge and wants to unravel the hidden mysteries of nature so as to be close to the ultimate creator. The poet condemns himself by saying that he seems to be a human being physically, but when he ponders on his inner-self, he understands that he is far off from humanity. So, he requests Allah, not to implement difficult trials on him because he is sure that he would not be successful in those tests and thus would be humiliated for being a human, only in from. In the last two lines, the poet concludes his request by considering himself a Mehjoor i.e. a deserted or a secluded one in front of the people of this mortal world. But he does not fear the isolation because he is having this firm belief that his lord would never abandon him despite his follies.

Thinking about the poem:

Q#l Which way the poet implores his lord to Lead him to?

Ans. The poet implores his Lord to lead him to the way of the truth and righteousness. He wishes to be enlightened by knowledge and morality.

Q#2 Name the blessings that the poet prays for.

Ans. The poet prays for the blessing of truthfulness, righteousness; motivation to remove bitterness; the ability to inspire people towards the right path and to establish love and respect for each other in the hearts of people.

Q#3 What is it that the poet wants to sing?

Ans. The poet wants to sing the beautiful songs of love and brotherhood. He wants to motivate people to remove bitterness against each other. He wants to inspire people by his speech to break the shackles of ignorance and to lead ahead towards enlightenment.

Q#5 Subject me not to trials, shame not my human form." Explain.

Ans. The poet seems to be humiliated and condemns himself for being human just physically. He is sure if Allah subjects him to examination, he would not be successful in it because he cannot tolerate or withstand them like a perfect human being. So he requests Allah not to subject him to trials so that he is not ashamed of being a human being.

MATHEMATICS

Chapter 1: Real Numbers

Real Numbers

Euclid's Division Lemma:

Given positive integers a and b, there exists unique integers q and r satisfyinga=bq+r,where0 ≤ r < b

- **Lemma** is a proven statement used for proving anotherstatement.

Euclid's Division Lemma states that given two integers a and b, there exists a unique pair of integers q and r such that a=b×q+r and 0≤r<b.

This lemma is essentially equivalent to: dividend = divisor × quotient + remainder

In other words, for a given pair of dividend and divisor, the quotient and remainder obtained are going to be unique.

Euclid's DivisionAlgorithm:

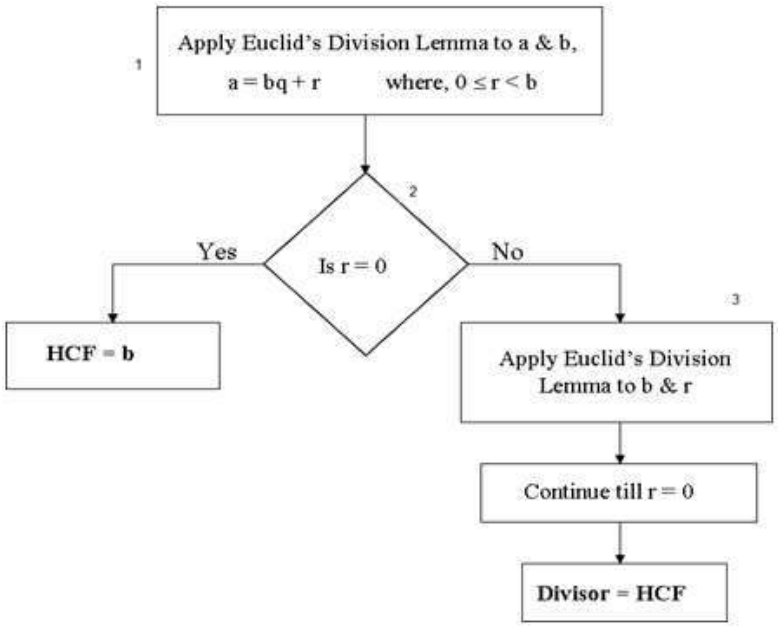
- An **algorithm** is a series of well defined steps which gives a procedure for solving a typeof problem.
- This algorithm is a technique to compute the **H.C.F** of two given positiveintegers.
- According to this algorithm, the **HCF** of any two positive integers 'a' and 'b', with a > b, is obtained by following the steps givenbelow:

Step 1: Apply Euclid's division lemma, to 'a' and 'b', to find q and r, such that a = bq + r, 0 ≤ r < b.

Step 2: If r = 0, the HCF is b. If r ≠ 0, apply Euclid's division lemma to b and r.

Step 3: Continue the process till the remainder is zero. The divisor at this stage will be HCF (a, b).Also, note that HCF (a, b) = HCF (b, r).

Euclid's Division Algorithm can be summarized as follows:



- Euclid's Division Algorithm is stated for only positive integers but it can be extended for all integers except zero, i.e., b ≠0.

Consider two numbers 78 and 980 and we need to find the HCF of these numbers. To do this, we choose the largest integer first, i.e. 980 and then according to Euclid Division Lemma, a = bq + r where 0 ≤ r < b;

980 = 78 × 12 + 44

Now, here a = 980, b = 78, q = 12 and r = 44.

Now consider the divisor 78 and the remainder 44, apply Euclid division lemma again.

78 = 44 × 1 + 34

Similarly, consider the divisor 44 and the remainder 34, apply Euclid division lemma to 44 and 34.

44 = 34 × 1 + 10

Following the same procedure again,

34 = 10 × 3 + 4

10 = 4 × 2 + 2

4 = 2 × 2 + 0

As we see that the remainder has become zero, therefore, proceeding further is not possible. Hence, the HCF is the divisor b left in the last step. We can conclude that the HCF of 980 and 78 is 2.

Let us try another example to find the HCF of two numbers 250 and 75. Here, the larger the integer is 250, therefore, by applying Euclid Division Lemma a = bq + r where 0 ≤ r < b, we have

a = 250 and b = 75

⇒ 250 = 75 × 3 + 25

By applying the Euclid's Division Algorithm to 75 and 25, we have:

75 = 25 × 3 + 0

As the remainder becomes zero, we cannot proceed further. According to the algorithm, in this case, the divisor is 25. Hence, the HCF of 250 and 75 is 25.

RealNumbers:

- The numbers which can be represented in the form $\frac{p}{q}$,of where p and q are integersandq ≠ 0are called **Rational numbers**.
- Any number that cannot be expressed in the $\frac{p}{q}$,formof, where p and q are integersandq ≠ 0arecalled **Irrational numbers**.
- There are more irrational numbers than rational numbers between two

- Rational and Irrational numbers together constitute **Realnumbers**.

Properties of Irrational numbers:

i. The **Sum, Difference, Product** and **Division** of two irrational numbers need not always be an irrationalnumber.

ii. **Negative** of an irrational number is an irrationalnumber.

iii. **Sum** of a **rational** and an **irrational** number isirrational.

iv. **Product** and **Division** of a non-zero rational and irrational number is alwaysirrational.

Fractions:

- **Terminating fractions** are the fractions which leaves remainder 0 on normaldivision.
- **Recurring fractions** are the fractions which never leave a remainder 0 on normaldivision.

Properties related to primenumbers:

- If p is a prime and divides a^2, then p divides a, where 'a' is a positiveinteger.
- If p is aprime,then$\sqrt{p}$is an irrationalnumber.
- A number ends with the digit zero if and only if it has 2 and 5 as two of its primefactors.

1. **DecimalExpansion:**

- The decimal expansion of rational number is either **terminating** or **non-terminating recurring (repeating).**
- If the decimal expansion of rational number **terminates**, then we can express the number in the form of$\frac{p}{q}$, where p and q are co-prime, and the prime factorization of **q is of the form 2^n5^m**,wheren and m are non negative integers.
- If $x = \frac{p}{q}$is a rational number, such that the prime factorization of q is of the form 2^n5^m, where n, mare non-negative integers. Then, x has a decimal expansion which **terminates.**
- If the denominator of a rational number is of the form 2^n5^m, then itwill terminateafter nplacesif n > m or after m places if m >n.
- The decimal expansion of an irrational number is **non-terminating,non-recurring.**

Fundamental Theorem ofArithmetic:

Every composite number can be expressed (factorized) as a product of primes, and this factorization is unique, apart from the order in which the prime factors occur.

The procedure of finding **HCF(Highest Common Factor)** and **LCM(Lowest Common Multiple)** of given two positive integers a andb:

i. Find the prime factorization of givennumbers.

ii. HCF(a, b) = Product of the smallest power of each common prime factors in thenumbers.

iii. LCM(a, b) = Product of the greatest power of each prime factors, involved in thenumbers.

Fundamental Theorem of Arithmetic states that every integer greater than 1 is either a prime number or can be expressed in the form of primes. In other words, all the natural numbers can be expressed in the form of the product of its prime factors. To recall, prime factors are the numbers which are divisible by 1 and itself only. For example, the number 35 can be written in the form of its prime factors as:

$35 = 7 \times 5$

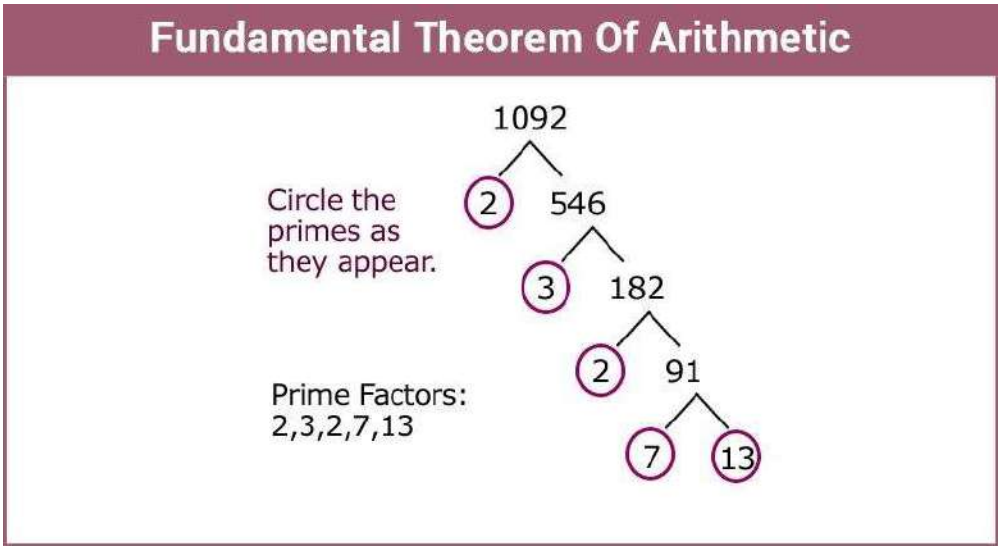
Here, 7 and 5 are the prime factors of 35

Similarly, another number 114560 can be represented as the product of its prime factors by using prime factorization method,

$114560 = 27 \times 5 \times 179$

So, we have factorized 114560 as the product of the power of its primes.

Therefore, every natural number can be expressed in the form of the product of the power of its primes. This statement is known as the Fundamental Theorem of Arithmetic, unique factorization theorem or the unique-prime-factorization theorem.



Proof for Fundamental Theorem of Arithmetic: In number theory, a composite number is expressed in the form of the product of primes and this factorization is unique apart from the order in which the prime factor occurs.

From this theorem we can also see that not only a composite number can be factorized as the product of their primes but also for each composite number the factorization is unique, not taking into consideration order of occurrence of the prime factors.

In simple words, there exists only a single way to represent a natural number by the

product of prime factors. This fact can also be stated as:

The prime factorization of any natural number is said to be unique for except the order of their factors.

In general, a composite number "a" can be expressed as,

$a = p_1 p_2 p_3 \ldots\ldots\ldots p_n$, where $p_1, p_2, p_3 \ldots\ldots\ldots p_n$ are the prime factors of a written in ascending order i.e. $p_1 \leq p_2 \leq p_3 \ldots\ldots\ldots \leq p_n$.

Writing the primes in ascending order makes the factorization unique in nature.

Relationship between HCF and LCM of twonumbers:

If a and b are two positive integers, then HCF (a, b) × LCM (a, b) = a × b

Relationship between HCF and LCM of threenumbers:

$$\text{LCM}(p, q, r) = \frac{p.q.r.\text{HCF}(p, q, r)}{\text{HCF}(p, q).\text{HCF}(q, r).\text{HCF}(p, r)}$$

$$\text{HCF}(p, q, r) = \frac{p.q.r.\text{LCM}(p, q, r)}{\text{LCM}(p, q).\text{LCM}(q, r).\text{LCM}(p, r)}$$

Method of Finding LCM

In Mathematics, the LCM of any two is the value that is evenly divisible by the two givennumbers. The full form of LCM is Least Common Multiple. It is also called the Least Common Divisor (LCD). For example, LCM (4, 5) = 20. Here, the LCM 20 is divisible by both 4 and 5 such that 4 and 5 are called the divisors of 20.

LCM is also used to add or subtract any two fractions when the denominators of the fractions are different. While performing any arithmetic operations such as addition, subtraction with fractions, LCM is used to make the denominators common. This process makes the simplification process easier.

Least Common Multiple(LCM) is a method to find the smallest common multiple between any two or more numbers. A common multiple is a number which is a multiple of two or more numbers.

Properties of LCM

Properties	Description
Associative property	LCM(a, b) = LCM(b, a)
Commutative property	LCM(a, b, c) = LCM(LCM(a, b), c) = LCM(a, LCM(b, c))

Distributive property	LCM(da, db, dc) = dLCM(a, b, c)

LCM Formula

Let a and b are two given integers. The formula to find the LCM of a & b is given by:

LCM (a,b) = (a x b)/GCD(a,b)

Where GCD (a,b) means Greatest Common Divisor or Highest Common Factor of a & b.

LCM Formula for Fractions

The formula to find the LCM of fractions is given by:

L.C.M. = L.C.M Of Numerator/H.C.F Of Denominator

Different Methods of LCM

There are three important methods by which we can find the LCM of two or more numbers. They are:

Listing the Multiples

Prime Factorization Method

Division Method

Listing the Multiples: The method to find the least common multiple of any given numbers is first to list down the multiples of specific numbers and then find the first common multiple between them.

Suppose there are two numbers 11 and 33. Then by listing the multiples of 11 and 33, we get;

Multiples of 11 = 11, 22, 33, 44, 55, ….

Multiples of 33 = 33, 66, 99, ….

We can see, the first common multiple or the least common multiple of both the numbers is 33. Hence, the LCM (11, 33) = 33.

LCM By Prime Factorization: Another method to find the LCM of the given numbers is prime factorization. Suppose there are three numbers 12, 16 and 24. Let us write the prime factors of all three numbers individually.

12 = 2 x 2 x 3

16 = 2 x 2 x 2 x 2

24 = 2 x 2 x 2 x 3

Now writing the prime factors of all the three numbers together, we get;

12 x 16 x 24 = 2 x 2 x 3 x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 3

Now pairing the common prime factors we get the LCM. Hence, there are four 2's and one

LCM (12, 16, 24) = 2 x 2 x 2 x 2 x 3 = 48

LCM By Division Method

- Finding LCM of two numbers by division method is an easy method. Below are the steps to find the LCM by division method:
- First, write the numbers, separated by commas
- Now divide the numbers, by the smallest prime number.
- If any number is not divisible, then write down that number and proceed further
- Keep on dividing the row of numbers by prime numbers, unless we get the results as 1 in the complete row
- Now LCM of the numbers will be equal to the product of all the prime numbers we obtained in the division method

Example: To find the Least Common Multiple (L.C.M) of 36 and 56,

$36=2\times2\times3\times3$

$56=2\times2\times2\times7$

The common prime factors are 2×2

The uncommon prime factors are 3×3 for 36 and 2×7 for 56.

LCM of 36 and 56 = $2\times2\times3\times3\times2\times7$ which is 504

Method of Finding HCF

H.C.F can be found using two methods – Prime factorisation and Euclid's division algorithm.

Prime Factorisation: Given two numbers, we express both of them as products of their respective prime factors. Then, we select the prime factors that are common to both the numbers

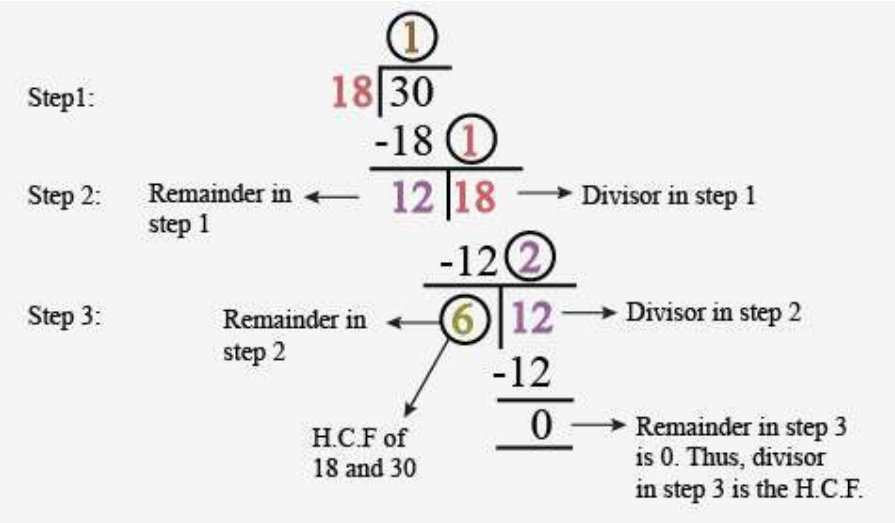
Example – To find the H.C.F of 20 and 24

$20=2\times2\times5 \text{and} 24=2\times2\times2\times3$

The factor common to 20 and 24 is 2×2, which is 4, which in turn is the H.C.F of 20 and 24.

Euclid's Division Algorithm: It is the repeated use of Euclid's division lemma to find the H.C.F of two numbers.

Example: To find the HCF of 18 and 30



HCF by Shortcut method

Steps to find the HCF of any given numbers.

Step 1: Divide larger number by smaller number first, such as;

Larger Number/Smaller Number

Step 2: Divide the divisor of step 1 by the remainder left.

Divisor of step 1/Remainder

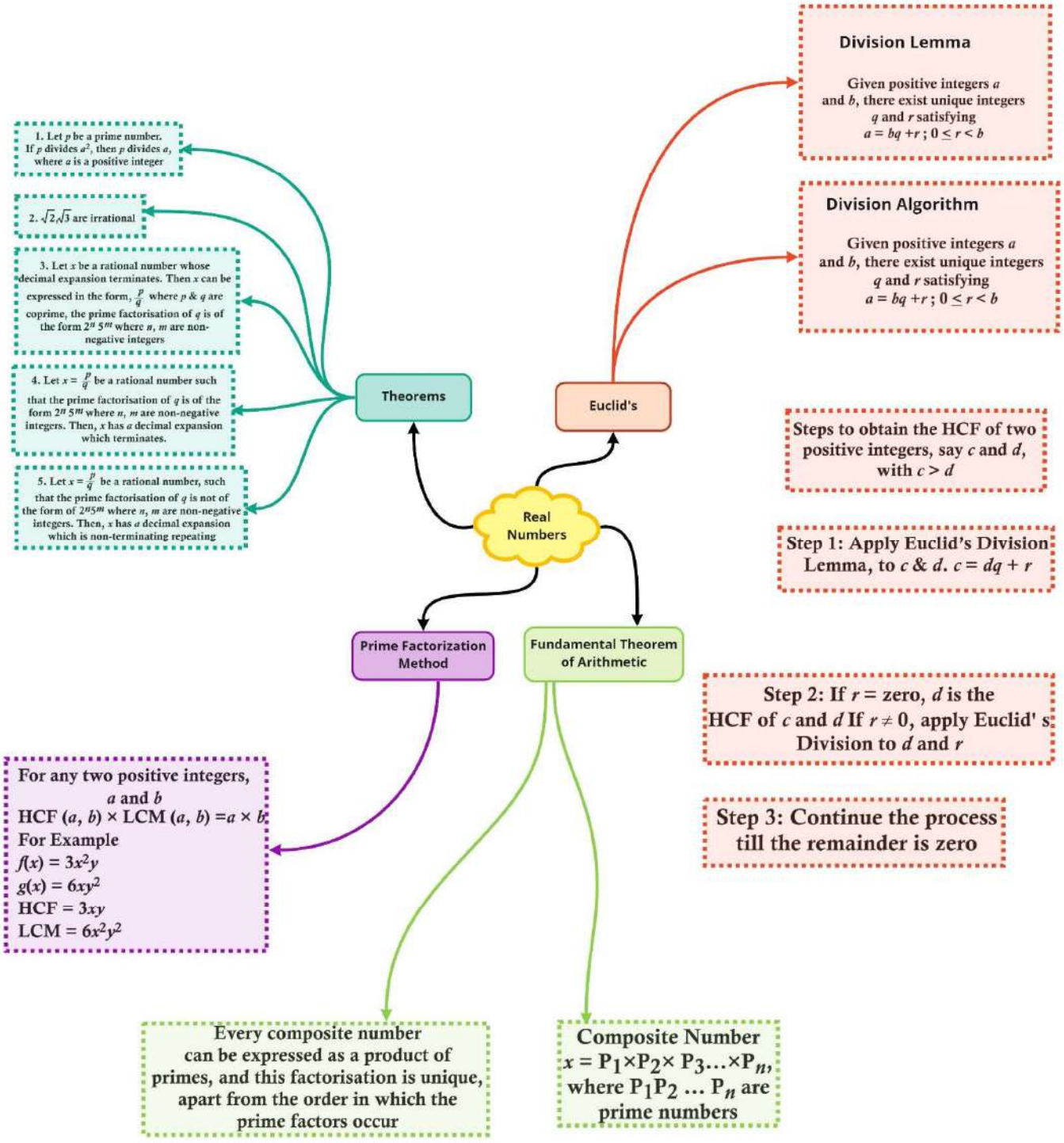
Step 3: Again divide the divisor of step 2 by the remainder.

Divisor of step 2/Remainder

Step 4: Repeat the process until the remainder is zero.

Step 5: The divisor of the last step is the HCF.

Class : 10th mathematics
Chapter-1 : Real Numbers



Important Questions

Multiple Choice questions-

1. HCF of 8, 9, 25 is

(a) 8

(b) 9

(c) 25

(d) 1

2. Which of the following is not irrational?

(a) $\left(2-\sqrt{3}\right)^2$

(b) $\left(\sqrt{2}+\sqrt{3}\right)^2$

(c) $(\sqrt{2}-\sqrt{3})(\sqrt{2}+\sqrt{3})$

(d) $\frac{2\sqrt{7}}{7}$

3. The product of a rational and irrational number is

(a) rational

(b) irrational

(c) both of above

(d) none of above

4. The sum of a rational and irrational number is

(a) rational

(b) irrational

(c) both of above

(d) none of above

5. The product of two different irrational numbers is always

(a) rational

(b) irrational

(c) both of above

(d) none of above

6. The sum of two irrational numbers is always

(a) irrational

(b) rational

(c) rational or irrational

(d) one

7. If b = 3, then any integer can be expressed as a =

(a) 3q, 3q+ 1, 3q + 2

(b) 3q

(c) none of the above

(d) 3q+ 1

8. The product of three consecutive positive integers is divisible by

(a) 4

(b) 6

(c) no common factor

(d) only 1

9. The set A = {0,1, 2, 3, 4, …} represents the set of

(a) whole numbers

(b) integers

(c) natural numbers

(d) even numbers

10. Which number is divisible by 11?

(a) 1516

(b) 1452

(c) 1011

(d) 1121

Very Short Questions:

1. What is the HCF of the smallest composite number and the smallest prime number?

2. The decimal representation of $\frac{6}{1250}$ will terminate after how many places of decimal?

3. If HCF of a and b is 12 and product of these numbers is 1800. Then what is LCM of these numbers?

4. What is the HCF of $3^3 \times 5$ and $3^2 \times 5^2$?

5. if a is an odd number, b is not divisible by 3 and LCM of a and b is P, what is the LCM of 3a and 2b?

6. If P is prime number then, what is the LCM of P, P^2, P^3?

7. Two positive integers p and q can be expressed as $p = ab^2$ and $q = a^2b$, a and b are prime numbers. What is the LCM of p and q?

8. A number N when divided by 14 gives the remainder 5. What is the remainder when the same number is divided by 7?

9. Examine whether $\frac{17}{30}$ is a terminating decimal or not.

10. What are the possible values of remainder r, when a positive integer a is divided by 3?

11. A rational number in its decimal expansion is 1.7351. What can you say about the prime factors of q when this number is expressed in the form $\frac{p}{q}$? Give reason.

12. Without actually performing the long division, find $\frac{987}{10500}$ will have terminating or non. terminating repeating decimal expansion. Give reason for your answer.

Short Questions :

1. Can the number 4^n, n be a natural number, end with the digit 0? Give reason.

2. Write whether the square of any positive integer can be of the form 3m + 2, where m is a natural number. Justify your answer.

3. Can two numbers have 18 as their HCF and 380 as their LCM? Give reason.

4. An army contingent of 616 members is to march behind an army band of 32 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns in which they can march?

5. Find the LCM and HCF of 12, 15 and 21 by applying the prime factorisation method.

6. Find the LCM and HCF of the following pairs of integers and verify that LCM × HCF = product of the two numbers.

(1) 26 and 91 (ii) 198 and 144

7. There is a circular path around a sports field. Sonia takes 18 minutes to drive one round of the field, while Ravi takes 12 minutes for the same. Suppose they both start from the same point and at the same time, and go in the same direction. After how many minutes will they meet again at the starting point?

8. Write down the decimal expansiwns of the following numbers:

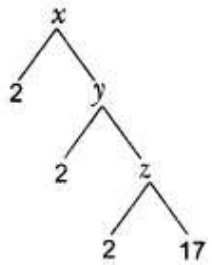
(i) $\frac{35}{50}$ (ii) $\frac{15}{1600}$

9. Express the number $\overline{0.3178}$ in the form of rational number $\frac{a}{b}$.

10. If n is an odd positive integer, show that $(n^2 - 1)$ is divisible by 8.

11. The LCM of two numbers is 14 times their HCF. The sum of LCM and HCF is 600. If one number is 280, then find the other number.

12. Find the value of x, y and z in the given factor tree. Can the value of 'x' be found without finding the value of 'y' and 'z'? If yes, explain.



13. Show that any positive odd integer is of the form 6q + 1 or 6q + S or 6q + 5 where q is some integer.

14. The decimal expansions of some real numbers are given below. In each case, decide whether they are rational or not. If they are rational, write it in the form $\frac{p}{q}$. What can you say about the prime factors of q?

(i) 0.140140014000140000... (ii) $\overline{0.16}$

Long Questions :

1. Use Euclid's division lemma to show that the square of any positive integer is either of the form 3m or 3m + 1 for some integer m.
2. Show that one and only one out of n, n + 2, n + 4 is divisible by 3, where n is any positive integer.
3. Use Euclid's division algorithm to find the HCF of:

   (i) 960 and 432

   (ii) 4052 and 12576.
4. Using prime factorisation method, find the HCF and LCM of 30, 72 and 432. Also show that HCF × LCM ≠ Product of the three numbers.
5. Prove that √7 is an irrational number.
6. Show that 5 – √3 is an irrational number.
7. Using Euclid's division algorithm, find whether the pair of numbers 847,2160 are co-prime or not.
8. Check whether 6^n can end with the digit O for any natural number n.
9. Show that there is iw positive integer n for which $\sqrt{n-1}+\sqrt{n+1}$ is rational.
10. Find the largest positive integer that will divide 398, 436 and 542 leaving remainders 7, 11 and 15 respectively.

Case Study Questions:

1. Srikanth has made a project on real numbers, where he finely explained the applicability of exponential laws and divisibility conditions on real numbers. He also included some assessment questions at the end of his project as listed below. Answer them.

   i. For what value of n, 4n ends in 0?

   a. 10

   b. When n is even.

   c. When n is odd.

   d. No value of n

ii. If a is a positive rational number and n is a positive integer greater than I, then for what value of n, 4n is a rational number?

a. When n is any even integer.

b. When n is any odd integer.

c. For all n > 1.

d. Only when n = 0.

iii. If x and y are two odd positive integers, then which of the following is true?

a. $x^2 + y^2$ is even.

b. $x^2 + y^2$ is not divisible by 4.

c. $x^2 + y^2$ is odd.

d. Both (a) and (b).

iv. The statement 'One of every three consecutive positive integers is divisible by 3' is:

a. Always true.

b. Always false.

c. Sometimes true.

d. None of these.

v. If n is any odd integer, then n2 - 1 is divisible by:

a. 22

b. 55

c. 88

d. 8

2. Real numbers are extremely useful in everyday life. That is probably one of the main reasons we all learn how to count and add and subtract from a very young age. Real numbers help us to count and to measure out quantities of different items in various fields like retail, buying, catering, publishing etc. Every normal person uses real numbers in his daily life. After knowing the importance of real numbers, try and improve your knowledge about them by answering the following questions on real life based situations.

i. Three people go for a morning walk together from the same place. Their steps measure 80cm, 85cm and 90cm respectively. What is the minimum distance travelled when they meet at first time after starting the walk assuming that their walking speed is same?

a. 6120cm
b. 12240cm
c. 4080cm
d. None of these

ii. In a school Independence Day parade, a group of 594 students need to march behind a band of 189 members. The two groups have to march in the same number of columns. What is the maximum number of columns in which they can march?

a. 9
b. 6
c. 27
d. 29

iii. Two tankers contain 768 litres and 420 litres of fuel respectively. Find the maximum capacity of the container which can measure the fuel of either tanker exactly.

a. 4 litres
b. 7 litres
c. 12 litres
d. 18 litres

iv. The dimensions of a room are 8m, 25cm, 6m, 75cm and 4m, 50cm. Find the length of the largest measuring rod which can measure the dimensions of room exactly.

a. 1m, 25cm
b. 75cm
c. 90cm
d. 1m, 35cm

v. Pens are sold in pack of 8 and notepads are sold in pack of 12. Find the least number of pack of each type that one should buy so that there are equal number of pens and notepads.

a. 3 and 2
b. 2 and 5
c. 3 and 4

d. 4 and 5

Assertion Reason Questions-

1. ***Directions:*** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

   (a) Both A and R are true and R is the correct explanation of A.
   (b) Both A and R are true and R is not the correct explanation of A.
   (c) A is true but R is false.
   (d) A is false but R is true.

Assertion: $11 \times 4 \times 3 \times 2 + 4$ is a composite number.

Reason: Every composite number can be expressed as product of primes.

2. ***Directions:*** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

   (a) Both A and R are true and R is the correct explanation of A.
   (b) Both A and R are true and R is not the correct explanation of A.
   (c) A is true but R is false.
   (d) A is false but R is true.

Assertion: If LCM = 350, product of two numbers is 25×70, then their HCF = 5

Reason: LCM × product of numbers = HCF

Answer Key-

Multiple Choice questions-

1. (d) 1
2. (c) $(\sqrt{2} - \sqrt{3})(\sqrt{2} + \sqrt{3})$
3. (b) irrational
4. (b) irrational
5. (b) irrational
6. (a) irrational
7. (a) 3q, 3q+ 1, 3q + 2
8. (b) 6
9. (a) whole numbers
10. (b) 1452

Very Short Answer :

1. Smallest composite number = 4

Smallest prime number = 2

So, HCF (4, 2) = 2

2.

$$\frac{6}{1250} = \frac{3}{625} = \frac{3}{5^4} \times \frac{2^4}{2^4} = \frac{48}{(5\times 2)^4} = \frac{48}{10^4} = 0.0048$$

This representation will terminate after 4 decimal places.

3. Product of two numbers = Product of their LCM and HCF

$\Rightarrow$ 1800 = 12 × LCM

$\Rightarrow$ LCM $= \frac{1800}{12} = 150.$

4. HCF of $3^3 \times 5$ and $3^2 \times 5^2 = 3^2 \times 5 = 45$

5. 6P

6. p^3

7. a^2h^2

8. 5, because 14 is multiple of 7.

Therefore, remainder in both cases are same.

9.

$$\frac{17}{30} = \frac{17}{2\times3\times5}$$

Since the denominator has 3 as its factor.

$\therefore \frac{17}{30}$ is a non4ermznatlng decimal.

10. According to Euclid's division lemma

a = 3q + r, where O r< 3 and r is an integer.

Therefore, the values of r can be 0, 1 or 2.

11. As 1.7351 is a terminating decimal number, so q must be of the form $2^m 5^n$, where in, n are natural numbers.

12. $\frac{987}{10500} = \frac{47}{500}$ and 500 = 22 × 53, so it has terminating decimal expansion.

Short Answer :

1. if 4^n ends with 0, then it must have 5 as a factor. But, $(4)^n = (2^2)^n = 2^{2n}$ i.e., the only prime factor.

of 4^n is 2. Also, we know from the fundamental theorem of arithmetic that the prime factorization of each number is unique.

$\therefore 4^n$ can never end with 0.

2. No, because any positive integer can be written as 3q, 3q + 1, 3q + 2, therefore, square will be

$9q^2 = 3m$, $9q^2 + 6q + 1 = 3(3q^2 + 2q) + 1 = 3m + 1$,

$9q^2 + 12q + 4 = 3(3q^2 + 4q + 1) + 1 = 3m + 1$.

3. No, because here HCF (18) does not divide LCM (380).

4. For the maximum number of columns, we have to find the HCF of 616 and 32.

We have, $616 = 32 \times 19 + 8$

Here, remainder $8 \neq O$. So, we again apply division lemma to 32 and 8.

We have, $32 = 8 \times 4 + O$

Here, remainder is zero. So, HCF (616, 32) = 8

Hence, maximum number of columns is 8.

5. The prime factors of 12, 15 and 21 are

12 $2^2 \times 3$, $15 = 3 \times 5$ and $21 = 3 \times 7$

Therefore, the HCF of these integers is 3.

2^2, 3^1, 5^1 and 7^1 and are the greatest powers involved in the prime factors of 12, 15 and 21.

So, LCM (12, 15, 21) = $2^2 \times 3^1 \times 5^1 \times 7^1 = 420$.

6. (i) We have, $26 = 2 \times 13$ and $91 = 7 \times 13$

Thus, LCM (26, 91) = $2 \times 7 \times 13 = 182$

HCF (26, 91) = 13

Now, LCM (26, 91) × HCF (26, 91) = $182 \times 13 = 2366$

and Product of the two numbers = $26 \times 91 = 2366$

Hence, LCM × HCF = Product of two numbers.

(ii) $144 = 24 \times 32$ and $198 = 2 \times 32 \times 11$

∴ LCM(198,144)$24 \times 32 \times 11 = 1584$

HCF(198, 144) = $2 \times 32 = 18$

Now, LCM (198, 144) × HCF (198, 144) = $1584 \times 18 = 28512$

and product of 198 and 144 = 28512

Thus, product of LCM (198, 144) and HCF (198, 144)

= Product of 198 and 144.

7. To find the time after which they meet again at the starting point, we have to find LCM of 18 and 12 minutes. We have

2	18
3	9
3	3
	1

2	12
2	6
3	3
	1

Therefore, LCM of 18 and 12 = $2^2 \times 3^2 = 36$

So, they will meet again at the starting point after 36 minutes.

8. (i)

$$\text{We have, } \frac{35}{50} = \frac{35}{5^2 \times 2} = \frac{35 \times 2}{5^2 \times 2 \times 2} = \frac{70}{5^2 \times 2^2}$$

$$= \frac{70}{10^2} = \frac{70}{100} = 0.70$$

(ii)

$$\text{We have, } \frac{15}{1600} = \frac{15}{2^6 \times 5^2} = \frac{15 \times 5^4}{2^4 \times 2^2 \times 5^2 \times 5^4} = \frac{15 \times 625}{2^6 \times 5^6}$$

$$= \frac{9375}{10^6} = \frac{9375}{1000000} = 0.009375$$

9. Let $x = \overline{0.3178}$

then x = 0.3178178178 … … (i)

10x = 3.178178178 … …(ii)

10000x = 3178.178178… …(iii)

On subtracting (ii) from (iii), we get

$$9990x = 3175 \Rightarrow x = \frac{3175}{9990} = \frac{635}{1998}$$

$$\therefore 0.3\overline{178} = \frac{635}{1998}$$

10. We know that an odd positive integer n is of the form (4q + 1) or (4 + 3) for some integer q.

Case – I When n = (4q + 1)

In this case $n^2 - 1 = (4q + 1)^2 1 = 16q^2 + 8q = 8q(2q + 1)$

which is clearly divisible by 8.

Case – II When n = (4q + 3)

In this case, we have

$n2^2 = (4q + 3)^2 – 1 = 16q^2 + 24q + 8 = 8(2q^2 + 3q + 1)$

which is clearly divisible by 8.

Hence $(n^2 – 1)$ is divisible by 8.

11. Let HCF of the numbers hex then according to question LCM of the number will be 14x

And x + 14 = 600 ⇒ 15x = 600 ⇒ x = 40

Then HCF = 40 and LCM = 14 × 40 = 560

∵ LCM × HCF = Product of the numbers

560 × 40 = 280 × Second number Second number $= \frac{560 \times 40}{280} = 80$

Then other number is 80.

12. z = 2 × 17 = 34; y = 34 × 2 = 68 and x = 2 × 68 = 136

Yes, value of x can be found without finding value of y or z as

x = 2 × 2 × 2 × 17 which arc prime 1tctors of x.

13. Let a he any positive odd integer and h = 6. Then, by Euclid's algorithm, a = 6q + r, for some

integer q ≥ O and O ≤ r < 6.

i.e., the possible remainders are 0, 1, 2, 3, 4, 5.

1'hus,a canbeoftheform6q,or6q + I,or6q + 2,orßq + 3,ör6q + 4,

or 6q + 5, where q is some quotient.

Since a. is odd integer, so a cannot be of the form , or + 2, or 6q + 4, (since they are even).

Thus, a is of the form 6q + 1, 6q + 3, or 6q + 5, where q is some integer.

Hence, any odd positive integer is of the form 6q + 1 or 6q -1- 3 or 6q + 5, where q is sorne integer.

14. (i) We have, 0.140140014000140000... a non-terminating and non-repeating

decimal expansion. So it is irrational. It cannot be written in the form of $\frac{p}{q}$

(ii) We have, $\overline{0.16}$ a non-terminating but repeating decimal expansion. So it is rational.

Let x = $\overline{0.16}$

Then, x = 0.1616… (i)

100x16.1616… ..(ii)

On subtracting (i) from (ii), we get

100x – x = 16.1616 – 0.1616

$\Rightarrow$ 99x = 16 $\Rightarrow$ x = $\frac{16}{99} = \frac{p}{q}$

The denominator (q) has factors other than 2 or 5.

Long Answer :

1. Let a be an arbitrary positive integer.

Then by Euclid's division algorithm, corresponding to the positive integers a and 3 there exist

non-negative integers q and r such that

a = 3q + r where 0 ≤ r <3

$a^2 = 9q^2 + 6qr + r^2$ ….(i) 0 ≤ r <3

Case – I: When r = 0 [putting in (i)]

$a^2 = 9q^2 = 3(3q^2) = 3m$ where $m = 3q^2$

Case – II: r = 1

$a^2 = 9q^2 + 6q + 1 = 3(3q^2 + 2q) + 1 = 3m + 1$ where $m = 3q^2 + 2q$

Case – III: r = 2

$a^2 = 9q^2 + 12 + 4 = 3(3q^2 + 4q + 1) + 1 = 3m + 1$ where $m = (3q^2 + 4q + 1)$

Hence, square of any positive integer is either of the form 3m or 3m + 1 for some integer m.

2. Let q be the quotient and r be the remainder when n is divided by 3.

Therefore, n = 3q + r, where r = 0, 1, 2

n = 3q or n = 3q + 1 or n = 3q + 2

Case (i) if n = 3q, then n is divisible by 3, n + 2 and n +. 4 arc not divisible by 3.

Case (ii) if 71 = 3q + 1 then n + 2 = 3q + 3 = 3(q + 1), which is divisible by 3 and

n + 4 = 3q + 5, which is not divisible by 3.

So, only (n + 2) is divisible by 3.

Case (iii) If n = 3q + 2, then n + 2 = 3q + 4, which is not divisible by 3 and

(n + 4) = 3q + 6 = 3(q + 2), which is divisible by 3.

So, only (n + 4) is divisible by 3.

Hence one and only one out of n, (n + 2), (n + 4), is divisible by 3.

3. (j) Since 960 > 432, we apply the division lemma to 960 and 432.

We have, 960 = 432 × 2 + 96

Since the remainder 96 ≠ 0, so we apply the division lemma to 432 and 96.

We have, 432 = 96 × 4 + 48

Again remainder 48 ≠ 0 so we again apply division lemma to 96 and 48.

We have, 96 = 48 × 2 + O

The remainder has now become zero. So our procedure stops.

Since the divisor at this stage is 48.

Hence, HOE of 960 and 432 is 48.

i.e., HCF (960, 432) = 4H

(ii) Since 12576 > 4052, we apply the division lemma to 12576 and 4052, to get

12576 = 4052 × 3 + 420

Since the remainder 420 ≠ 0, we apply the division lemma to 4052 and 420, to get

4052 = 420 × 9 + 272

We consider the new divisor 420 and the new remainder 272, and apply the division lemma to get

420 = 272 × 1 + 148

We consider the new divisor 272 and the new remainder 148, and apply the division lemma to get

272 = 148 × 1 + 124

We consider the new divisor 148 and the new remainder 124, and apply the division lemma to get

148 = 124 × 1 + 24

We consider the new divisor 124 and the new remainder 24, and apply the division lemma to get

124 = 24 × 5 + 4

We consider the new divisor 24 and the new remainder 4, and apply the division lemma to get

24 = 4 × 6 + O

The remainder has now become zero, so our procedure stops. Since the divisor at this stage is 4, the HCF of 12576 and 4052 is 4.

4. Given members = 30, 72, 432 .

30 = 2 × 3 × 5; 72 = 23 × 32 and 432 = 24 × 33

Here, 2' and 31 are the smallest powers of the common factors 2 and 3 respectively.

So, HCF (30, 72, 432) = 21 × 31 = 2× 3 = 6

Again, 2, 33 and 51 arc the greatest powers of the prime factors 2, 3 and 5 respectively.

So, LCM (30, 72, 432) = 24 × 33 × 51 = 2160

HCF × LCM = 6 × 2160 = 12960

Product of numbers = 30 × 72 × 432 = 933120 .

Therefore, HCF × LCM ≠ Product of the numbers.

5. Let us assume, to the contrary, that √7 is a rational number.

Then, there exist co-prime positive integers and such that

$\sqrt{7} = \frac{a}{b}$, $b \neq 0$

So, $a = \sqrt{7}\, b$

Squaring both sides, we have

$a^2 = 7b^2$ ..... (i)

$\Rightarrow$ 7 divides $a^2 \Rightarrow$ 7 divides a

So, we can write

a = 7c (where c is an integer)

Putting the value of a = 7c in (i), we have

$49c^2 = 7b^2$ $7^2 = b^2$

It means 7 divides b^2 and so 7 divides b.

So, 7 is a common factor of both a and b which is a contradiction.

So, our assumption that $\sqrt{7}$ is rational is wrong.

Hence, we conclude that $\sqrt{7}$ is an irrational number.

6. Let us assume that $5 - \sqrt{3}$ is rational.

So, $5 - \sqrt{3}$ may be written as

$5 - \sqrt{3} = \frac{p}{q}$, where p and q are integers, having no common factor except 1 and q $\neq 0$.

$\Rightarrow 5 - \frac{p}{q} = \sqrt{3} \Rightarrow \sqrt{3} = \frac{5q-p}{q}$

Since $\frac{5q-p}{q}$ is a rational number as p and q are integers.

$\therefore \sqrt{3}$ is also a rational number which is a contradiction.

Thus, our assumption is wrong.

Hence, $5 - \sqrt{3}$ is an irrational number.

7. Since 2160 > 847 we apply the division lemma to 2160 and 847

we have, 2160 $847 \times 2 + 466$

Since remainder 466 $\neq$ 0. So, we apply the division lemma to 847 and 466

$847 = 466 \times 1 + 381$

Again remainder 381 ≠ 0. So we again apply the division lemma to 466 and 381.

466 = 381 × 1 + 85

Again remainder 85 ≠0. So, we again apply the division lemma to 381 and 85

381 = 85 × 4 + 41

Again remainder 41 ≠ 0. So, we again apply the division lemma to 85 and 41.

85 = 41 × 2 + 3

Again remainder 3 ≠ 0. So, we again apply the division lemma to 4 1 and 3.

41 = 3 × 13 + 2

Again remainder 2 ≠ 0. So, we again apply the division lemma to 3 and 2.

3 = 2 × 1 + 1

Again remainder 1 ≠ 0. So, we apply division lemma to 2 and 1

2 = 1 × 2 + 0

The remainder now becomes O. So, our procedure stops.

Since the divisor at this stage is 1.

Hence, HCF of 847 and 2160 is 1 and numbers are co-prime.

8. If the number 6^n, for any n, were to end with the digit zero, then h would bc divisible by 5. That is, the prime factorisation of 6^n would contain the prime 5. But $6^n = (2 \times 3)^n = 2^n \times 3n$ So the primes in factorisation of 6n are 2 and 3. So the uniqueness of the Fundamental Theorem of Arithmetic guarantees that (here are no other primes except 2 and 3 in the factorisation of 6n. So there is no natural number n for which 6" ends with digit zero.

9. Let there be a positive integer n for which $\sqrt{n-1} + \sqrt{n+1}$ be rational number.

$\sqrt{n-1} + \sqrt{n+1} = \frac{p}{q}$; where p, q are integers and $q \neq 0$ ...(i)

$\Rightarrow \frac{1}{\sqrt{n-1}+\sqrt{n+1}} = \frac{q}{p} \Rightarrow \frac{\sqrt{n-1}-\sqrt{n+1}}{\left(\sqrt{n-1}+\sqrt{n+1}\right)\times\left(\sqrt{n-1}-\sqrt{n+1}\right)} = \frac{q}{p}$

$\Rightarrow \frac{\sqrt{n-1}-\sqrt{n+1}}{(n-1)-(n+1)} = \frac{q}{p} \Rightarrow \frac{\sqrt{n-1}-\sqrt{n+1}}{n-1-n-1} = \frac{q}{p}$

$\Rightarrow \frac{\sqrt{n+1}-\sqrt{n-1}}{2} = \frac{q}{p} \Rightarrow \sqrt{n+1}-\sqrt{n-1} = \frac{2q}{p}$ ...(ii)

Adding (i) and (ii), we get

$$\sqrt{n-1}+\sqrt{n+1}+\sqrt{n+1}-\sqrt{n-1} = \frac{p}{q}+\frac{2q}{p}$$

$\Rightarrow 2\sqrt{n+1} = \frac{p^2+2q^2}{pq} \Rightarrow \sqrt{n+1} = \frac{p^2+2q^2}{2pq}$

$\Rightarrow \sqrt{n+1}$ is rational number as $\frac{p^2+2q^2}{2pq}$ is rational

$\Rightarrow \sqrt{n+1}$ is perfect square of positive integer ...(A)

Again subtracting (ii) from (i), we get

$$\sqrt{n-1}+\sqrt{n+1}-\sqrt{n+1}+\sqrt{n-1} = \frac{p}{q}-\frac{2q}{p} \Rightarrow 2\sqrt{n-1} = \frac{p^2-2q^2}{pq}$$

$\Rightarrow \sqrt{n-1}$ is rational number as $\frac{p^2-2q^2}{2pq}$ is rational.

$\Rightarrow\sqrt{n-1}$is also perfect. square of positive integer From (A) and (B)

$\sqrt{n+1}$and $\sqrt{n-1}$ are perfect squares of positive integer. It contradict the fact that two perfect squares differ at least by 3.

Hence, there is no positive integer n for which $\sqrt{n-1} + \sqrt{n+1}$ is rational.

10. It is given that on dividing 398 by the required number, there is a remainder of 7. This means that 398 – 7 = 391 is exactly divisible by the required timber In other words, required number is a factor of 391.

Similarly, required positive integer is a Íctor of 436 – 11 = 425 and 542 – 15 = 527

Clearly, the required number is the HCF of 391, 425 and 527.

Using the factor tree, we get the prime factorisations of 391, 425 and 527 as follows:

391 = 17 × 23, 425 52 × 17 and 527 17 × 31

∴ HCF of 391, 425, and 527 is 17.

Hence, the required number = 17.

Case Study Answers:

1. Answer :

i. (d) No value of n.

Solution:

For a number to end in zero it must be divisible by 5, but $4^n = 2^{2n}$ is never divisible by 5. So, 4^n never ends in zero for any value of n.

ii. (c) For all n > 1.

Solution:

We know that product of two rational numbers is also a rational number.

So, $a^2 = a \times a$ = rational number.

$a^3 = a^2 \times a$ = rational number.

$a^4 = a^3 \times a$ = rational number.

.....

.....

$a^n = a^{n-1} \times a$ = rational number.

iii. (d) Both (a) and (b).

Solution:

Let x = 2m + 1 and y = 2k + 1

Then $x^2 + y^2 = (2m + 1)^2 + (2k + 1)^2$

$= 4m^2 + 4m + 1 + 4k^2 + 4k + 1$

$= 4(m^2 + k^2 + m + k) + 2$

So, it is even but not divisible by 4.

iv. (a) Always true

Solution:

Let three consecutive positive integers be n, n + 1 and n + 2.

We know that when a number is divided by 3, the remainder obtained is either 0 or 1 or 2.

So, n = 3p or 3p + 1 or 3p + 2, where pis some integer.

If n = 3p, then 2 is divisible by 3.

If n = 3p + 1, then n + 2 = 3p + 1 + 2 = 3p + 3 = 3(p + 1) is divisible by 3.

If n = 3p + 2, then n + 1 = 3p + 2 + 1 = 3p + 3 = 3(p + 1) is divisible by 3.

So, we can say that one of the numbers among n, n + 1 and n + 2 is always divisible by 3.

v. (d) 8

Solution:

Any odd number is of the form of (2k + 1), where k is any integer.

So, $n^2 - 1 = (2k + 1)^2 - 1 = 4k^2 + 4k$

For k = 1, $4k^2 + 4k = 8$, which is divisible by 8.

Similarly, for k = 2, $4k^2 + 4k = 24$, which is divisible by 8.

And fork= 3, $4k^2 + 4k = 48$, which is also divisible by 8.

So, $4k^2 + 4k$ is divisible by 8 for all integers k, i.e., $n^2 - 1$ is divisible by 8 for all odd values of n.

2. Answer :

i. (b) 12240cm

Solution:

Here 80 = 24 × 5, 85 = 17 × 5

and 90 = 2 × 32 × 5

L.C.M of 80, 85 and 90 = 24 × 3 × 3 × 5 × 17 = 12240

Hence, the minimum distance each should walk when they at first time is 12240cm.

ii. (c) 27

Solution:

Here 594 = 2 × 33 × 11 and 189 = 33 × 7

HCF of 594 and 189 = 3^3 = 27

Hence, the maximum number of columns in which they can march is 27.

iii. (c) 12 litres

Solution:

Here 768 = 28 × 3 and 420 = 22 × 3 × 5 × 7

HCF of 768 and 420 = 22 × 3 = 12

So, the container which can measure fuel of either tanker exactly must be of 12 litres.

iv. (b) 75cm

Solution:

Here, Length = 825cm, Breadth = 675cm and Height = 450cm

Also, 825 = 5 × 5 × 3 × 11, 675 = 5 × 5 × 3 × 3 × 3 and 450 = 2 × 3 × 3 × 5 × 5

HCF = 5 × 5 × 3 = 75

Therefore, the length of the longest rod which can measure the three dimensions of the room exactly is 75cm.

v. (a) 3 and 2

Solution:

LCM of 8 and 12 is 24.

$\therefore$ The least number of pack of pens $= \frac{24}{8} = 3$

$\therefore$ The least number of pack of note pads $= \frac{24}{12} = 2$

Assertion Reason Answer-

1. (a) Both A and R are true and R is the correct explanation of A.
2. (c) A is true but R is false.

Social Studies

(Geography)

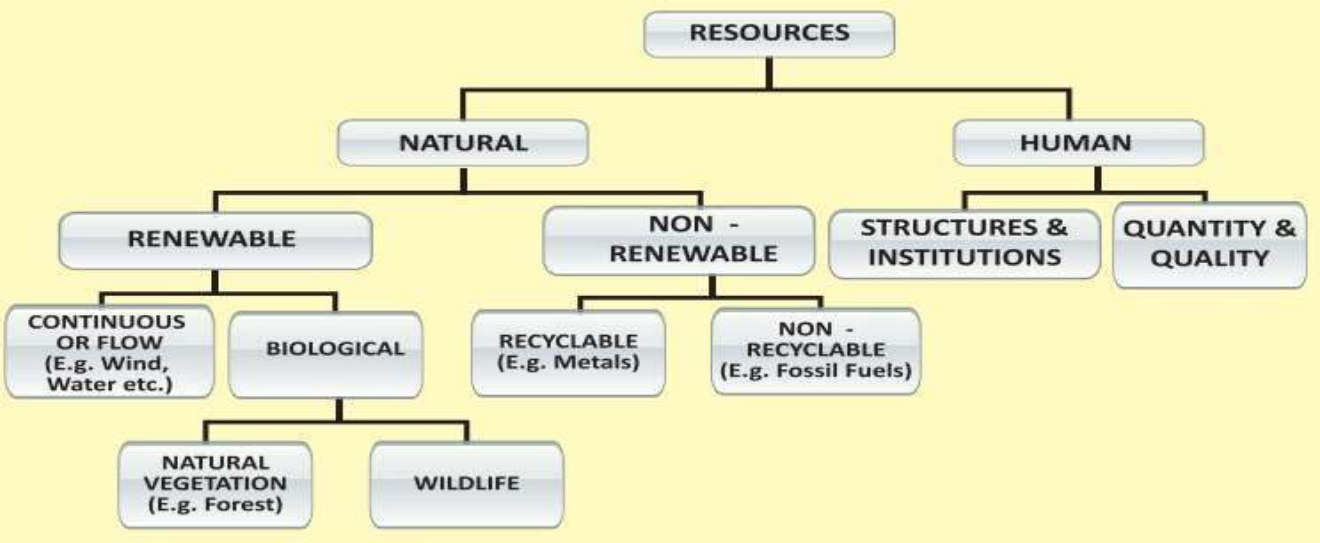
Chapter 1: Resources and Development

Resources and Development

Natural Resources and their Classification

Resources are an indispensable part of human development. Everything which is available in our environment and which can be technologically and economically exploited for satisfying human wants are known as resources.

Classification of Resources



Resources can be classified on the basis of

Origin	Biotic and abiotic	**Biotic resources:** These resources are obtained from nature and have life. Examples: Humans, forests, fisheries, livestock **Abiotic resources:** These resources are obtained from nature but are made of non-living things.Examples: Metals, air, soil
Exhaustibility	Renewable and non-renewable	**Renewable resources:** These resources are available inplenty in nature and can be replenished. Examples:Sunlight, wind, water **Non-renewable resources:** These resources are present in nature and are formed after millions of years. They can be exhausted or depleted after a particular period of time.Examples: Coal, petroleum
Ownership	Individual,communityownednational andinternational resources	**Individual resources** are owned privately by aperson such as farmlands and houses.Community resources are owned by acommunity andare accessible to the members of that community such as grazing lands and burial grounds. **National resources** belong to a nation. Examples:

		Water resources, forests, minerals **International resources** are regulated by internationallaws and regulations. Example: Oceanic resources beyond 200 nautical miles of the Exclusive EconomicZone
Status of Development	Potential resources,developed resources, stock and reserves	**Potential resources:** These resources are available in theregion but are not fully used such as wind energy and solar energy. **Developed resources:** These resources are surveyed andtheir quantity and quality are known. Examples: Coalmines, oil wells **Stock:** These resources can satisfy human needs but humans do not have the required technology to access and harness them. Examples: Geothermal power, hydrogen fuel **Reserves:** The use of such resources has not been fully started and they are used only up to a limited extent.Example: Dams

Resources are often centred in a few hands. This has led to a wide gap between the rich and the poor. Indiscriminate use of resources has resulted in its depletion and global ecological crises.

Development of Resources

Resources are vital for human survival as well as for maintaining the quality of life. It was believed that resources are free gifts of nature. Human beings used them indiscriminately and this has led to the following major problems:

- Depletion of resources for satisfying the greed of few individuals.
- Accumulation of resources in few hands, which, in turn, divided the society into two segments i.e. haves and have nots or rich and poor.
- Indiscriminate exploitation of resources has led to global ecological crises such as, global warming, ozone layer depletion, environmental pollution and land degradation.

Resource Planning in India

Resource planning in India involves the following processes:

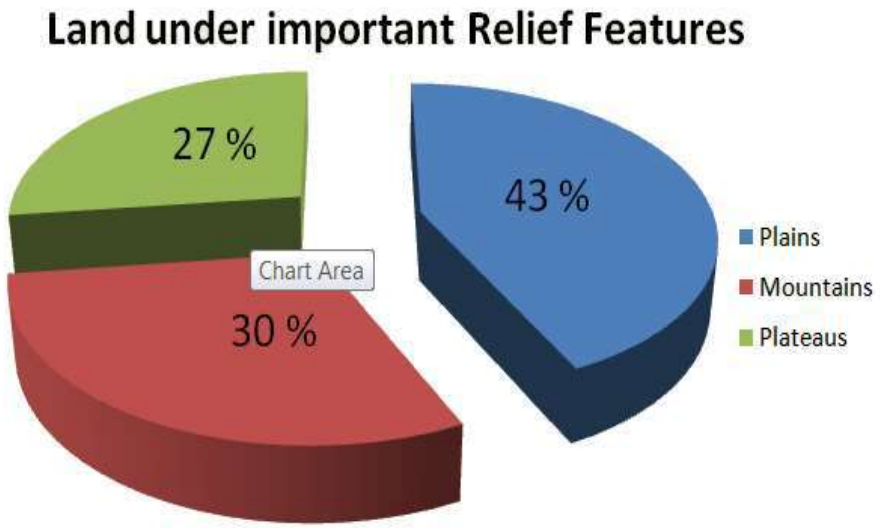
- To identify and make a list of existing resources across the country by surveying andmapping
- To frame a planning structure with the estimates of the level of technology, skill sets and

institutions which are required for harnessing theseresources

- To map the resource development plans with the national developmentplans

Land Resource

The land is among the most important natural resources. It covers only about thirty percent of the total area of the earth's surface. It supports natural vegetation, wild life, human life, economic activities, transport and communication systems. However, land is an asset of a finite magnitude, therefore, it is important to use the available land for various purposes with careful planning.



Land Utilisation

1. Forests

2. Land not available for cultivation

    (a) Barren and waste land

    (b) Land put to non-agricultural uses, e.g.buildings, roads, factories, etc.

3. Other uncultivated land (excludingfallow land)

    (a) Permanent pastures and grazing land,

    (b) Land under miscellaneous tree cropsgroves (not included in net sown area),

    (c) Cultruable waste land (leftuncultivated for more than 5agricultural years).

4. Fallow lands

    (a) Current fallow-(left without cultivationfor one or less than one agricultural year),

    (b) Other than current fallow-(leftuncultivated for the past 1 to 5agricultural years).

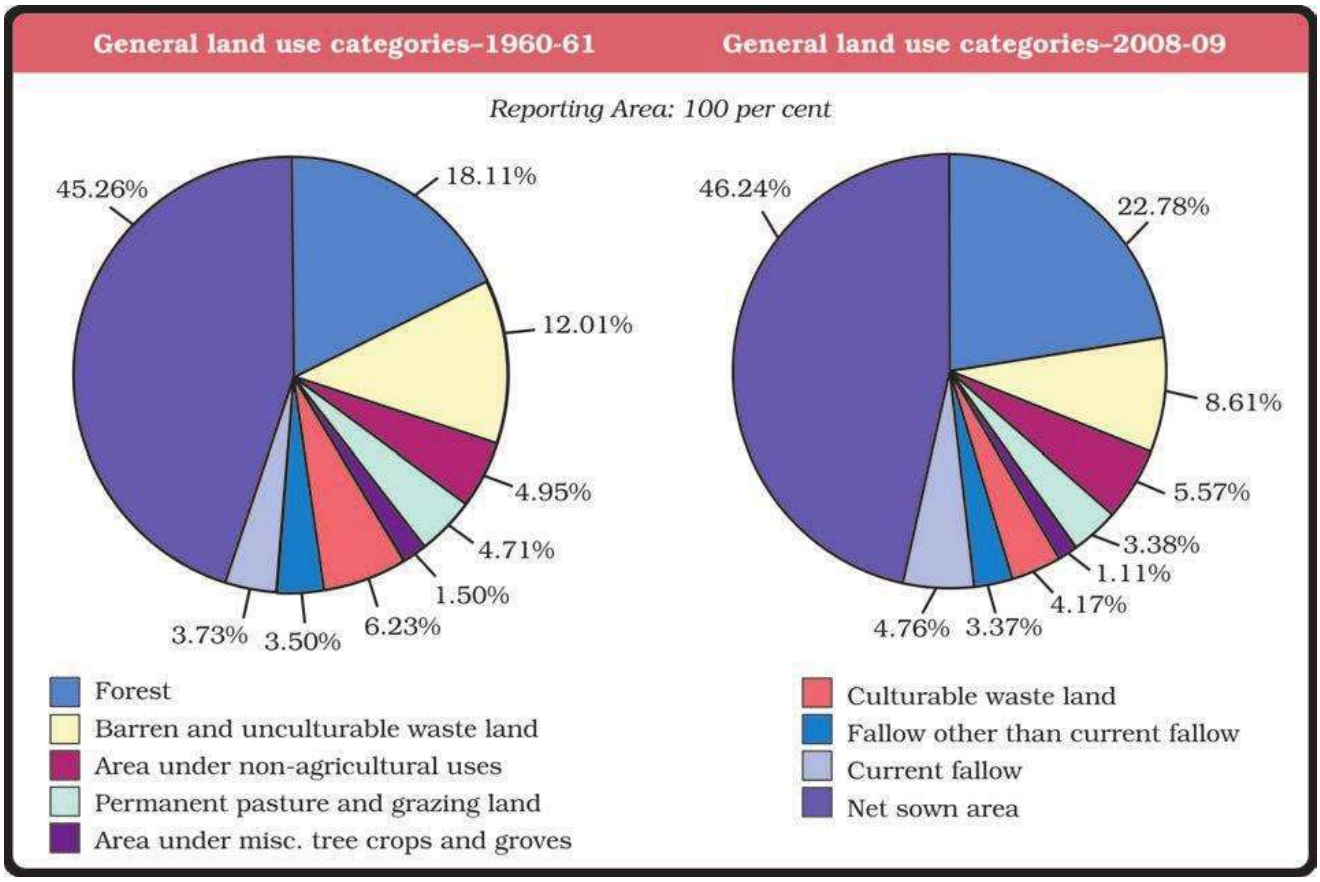
5. Net sown area

cropped area.

Land Use Pattern in India

The forest cover of the country is less than the prescribed 33% of the total country's land. Forests occupy about 23.81% of the total land surface in India.

The total net sown area of India is 46.24% of the total land in the country. The net sown area differs from state to state. While in Punjab and Haryana, the net sown area is more than 80% of the total land in the state, it is less than 10% in Arunachal Pradesh, Mizoram, Manipur and the Andaman and Nicobar Islands. 3.38% of the total land is used for grazing, while the remaining lands are fallow and waste lands.



Waste land is the land put to other non-agricultural uses which include rocky, arid and desert areas, roads, railways, industry etc. Continuous use of land over a long period of time without taking appropriate measures to conserve and manage it, has resulted in land degradation.

Reasons for the Degradation of Land in India

- **Mining:** It is the most important factor for land degradation.
    - The mining sites are abandoned after excavation work is over. The excavation work leaves deep scars and other material which degrades the soil. This is common in states like Jharkhand, Chattisgarh, Madhya Pradesh and Orissa.

- Mineral processing, grinding of lime stone, ceramic industry releases a heavy amount of dust, which later settles down in the surrounding areas.

- **Overgrazing:** Overgrazing of land by animals results in removal of grass over a large area making it easy for wind and water to remove the soil. Example Gujarat, Rajasthan, Madhya Pradesh, Maharastra etc.
- **Water Logging:** Over irrigation of land is also responsible for land degradation, water logging, increases salinity and alkalinity in soil making it unfit for cultivation.
- **Industrialisation:** Industrial waste also leads to water and land degradation.
- Deforestation
- Erosion of land because of flooding
- Excess irrigation oflands

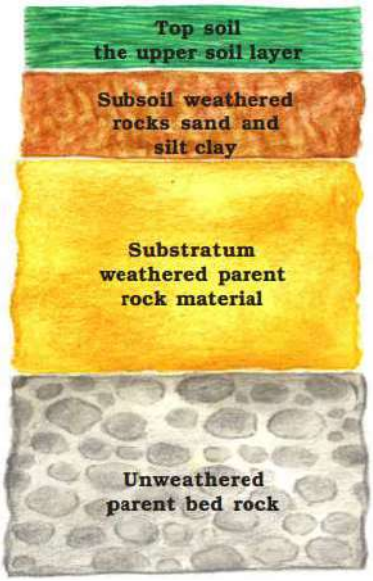
Mining and deforestation have deteriorated the quality of land in Chhattisgarh, Madhya Pradesh, Jharkhand and Odisha. Overgrazing is one of the main reasons for the land degradation in Gujarat, Rajasthan, Maharashtra and Madhya Pradesh. In Punjab, Haryana and western Uttar Pradesh, excess irrigation has resulted in water logging leading to increased soil salinity. In major metropolitan cities, industrial effluents have degraded the land.

Some of the ways through which we can solve the problems of land degradation are:

- Afforestation and proper management of grazing.
- Planting of shelter belts of plants.
- Stabilisation of sand dunes by growing thorny bushes.
- Proper management of waste lands.
- Control of mining activities.
- Proper discharge and disposal of industrial effluents and wastes after treatment.

Soil Resource

Soil is a renewable natural resource. It supports various living organisms and is a medium of plant growth.Topsoil is the uppermost layer of the Earth. It consists of humus. Factors such as variation of temperature, parent rock, decomposers and running water affect the formation of soil. Soil in India can be classified based on their texture, thickness, age, chemical and physical properties.



Classification of Soils

Alluvial Soil: It is the most widely spread soil in India. It has been deposited by three Himalayan river systems—Ganga, Indus and Brahmaputra. Alluvial soil is composed of sand, silt and clay particles. The entire North Indian Plains are made of

this soil. It is also found in the eastern coastal plains and someparts of Rajasthan and Gujarat. The soil is suitable for the cultivation of paddy, wheat, sugarcane and other cereal and pulse crops.

On the basis of age, soil can be classified as bangar and khadar soils.

Differences between bangar and khadar soils

Bangar Soil	Khadar Soil
(i) Bangar is the old alluvium. In other words, Bangar is older than Khadar. (ii) Bangar often contains kankar nodules with calcium carbonates in sub-soil. (iii) Bangar is not renewed frequently. Hence, it is less fertile. (iv) Bangar is found away from the river and higher than ground level.	(i) Khadar is the new alluvium. In other words, Khadar is younger in age. (ii) Khadar is finer, more sandy and free from kankar nodules. (iii) Khadar is renewed frequently and is more fertile. (iv) Khadar is found near river channels in deltas and in flood plains.

Black Soil:

- This soil is black and is also known as regur. Because the soil is ideal for growing cotton, it is also known as black cottonsoil.
- This soil is found in the plateau regions of Saurashtra, Maharashtra, Malwa and Chhattisgarh. The soil is made of fine clayey material and is known for holdingmoisture.
- The soil is rich in calcium carbonate, magnesium and potash. It is most suitable for growingcotton.

Red and Yellow Soils:

- These soils are found in parts of Odisha, Chhattisgarh, southern parts of middle Gangetic plains and some parts of Western Ghats.
- The soil becomes reddish because of the presence of iron oxides. It looks yellow in a hydrated form. Potatoes, maize and cotton are crops which are grown in red soil. Vegetables, tobacco and citrus fruits such as grapes are grown in yellowsoil.

Laterite Soil:

- This soil is found in areas of high temperatureandheavyrainfall.Thissoilhaslow humus content as most of microorganisms get destroyed because of high temperature.
- This soil is found in Kerala, Karnataka, Tamil Nadu, Madhya Pradesh and hilly regions ofAssam.
- This soil is suitable for growing tea and coffee. Cashew nuts are grown in red laterite

Arid Soils:

- These soils are sandy in texture and saline in nature. They are found in areas of high temperature and dryclimate.
- Because of dry climate, the moisture and humus content of the soil is very low. In some areas, common salt is obtained by evaporating the water from thesoil.
- These soils are not fertile but can become fertile after adequate irrigation of thesoil.
- The arid soil is found in Rajasthan and in the northwestern parts ofGujarat.

Forest Soil:

- This soil is found in the hilly and mountainous regions. It is made of sand and silt. In the snow regions of the Himalayas, the soil lacks humus content because of the loss of top cover of thesoil.
- The forest soil found in the lower parts of the Himalayas isfertile.

Alluvial Soils

Black Soil

Red and Yellow Soils

Laterite Soil

Arid Soils

Soil Erosion

The wearing away (because of the action of winds) and washing down of soil cover (because of running water) is known as soil erosion. Because the processes of erosion and soil formation occursimultaneously, there is a balance between the two. However, overgrazing and deforestation at a rapid pace can disturb this balance. Different kinds of erosions are

Gully Erosion: This occurs when running water cuts through the soil making deep channels. The land thus becomes unsuitable for cultivation and is known as **bad land**.


Gully Erosion


Sheet Erosion


Wind Erosion

Sheet Erosion: The washing away of the topsoil because of the flowing of water as a sheet over large areas is known as sheet erosion.

Wind Erosion: When the wind blows away the topsoil, it is known as wind erosion.

Soil Conservation

Soil can be conserved in the following ways:

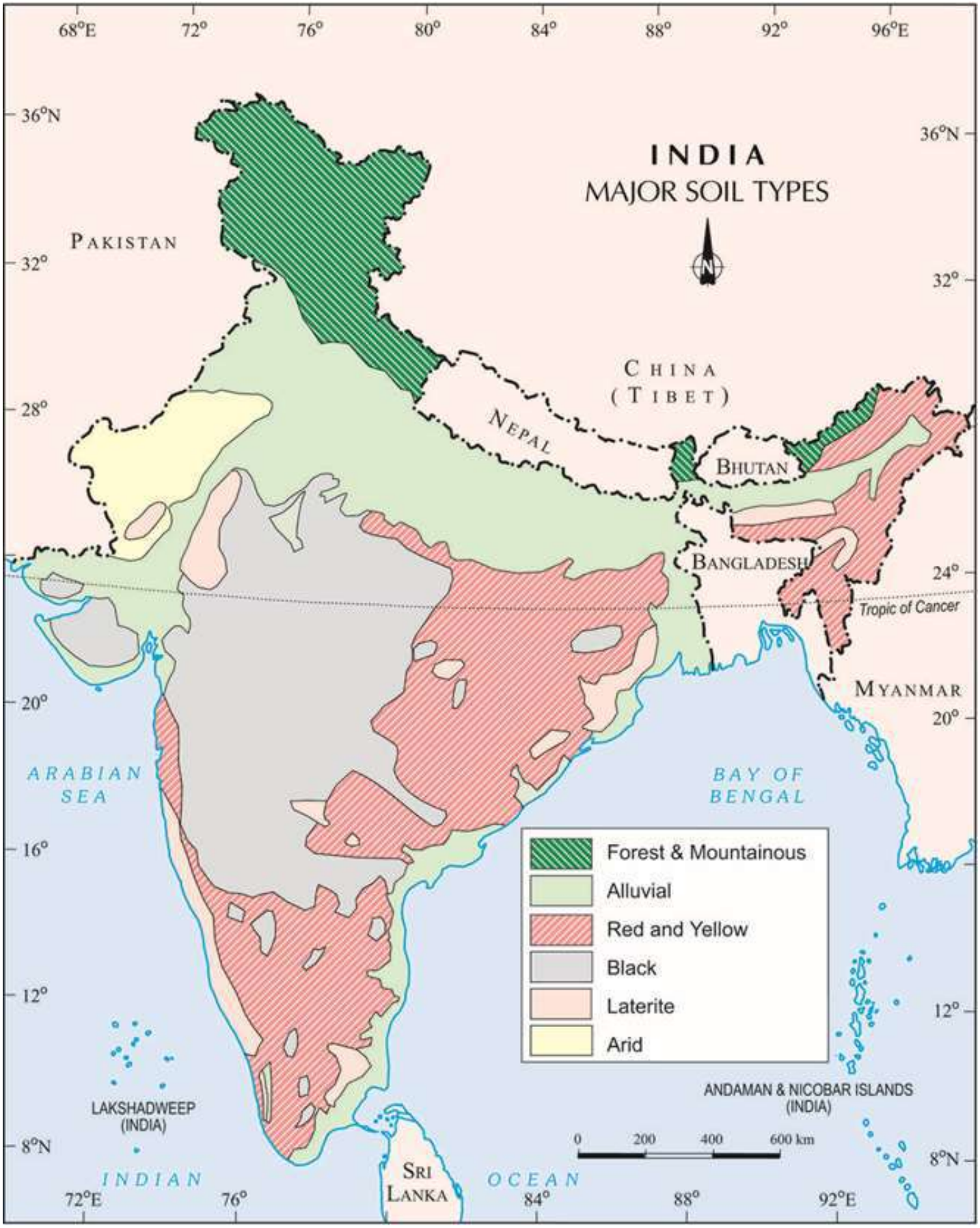
- **Contour Ploughing:** When one ploughs along the contour lines, it is called contour ploughing. It decreases the flow of water down the slopes and thus helps in soilconservation.
- **Terrace Farming:** When steps are cut out on the slopes of the hills making terraces, it reduces soil erosion.
- **Strip Cropping:** When strips of grass are grown between the strips of crops, it is known as strip cropping. It breaks down the speed of winds.
- **Shelter Belts:** When trees are planted in a row, it breaks the force of winds. This method has proved very useful in destabilising the sand dunes in the deserts of westernIndia.


Contour Ploughing


Terrace farming

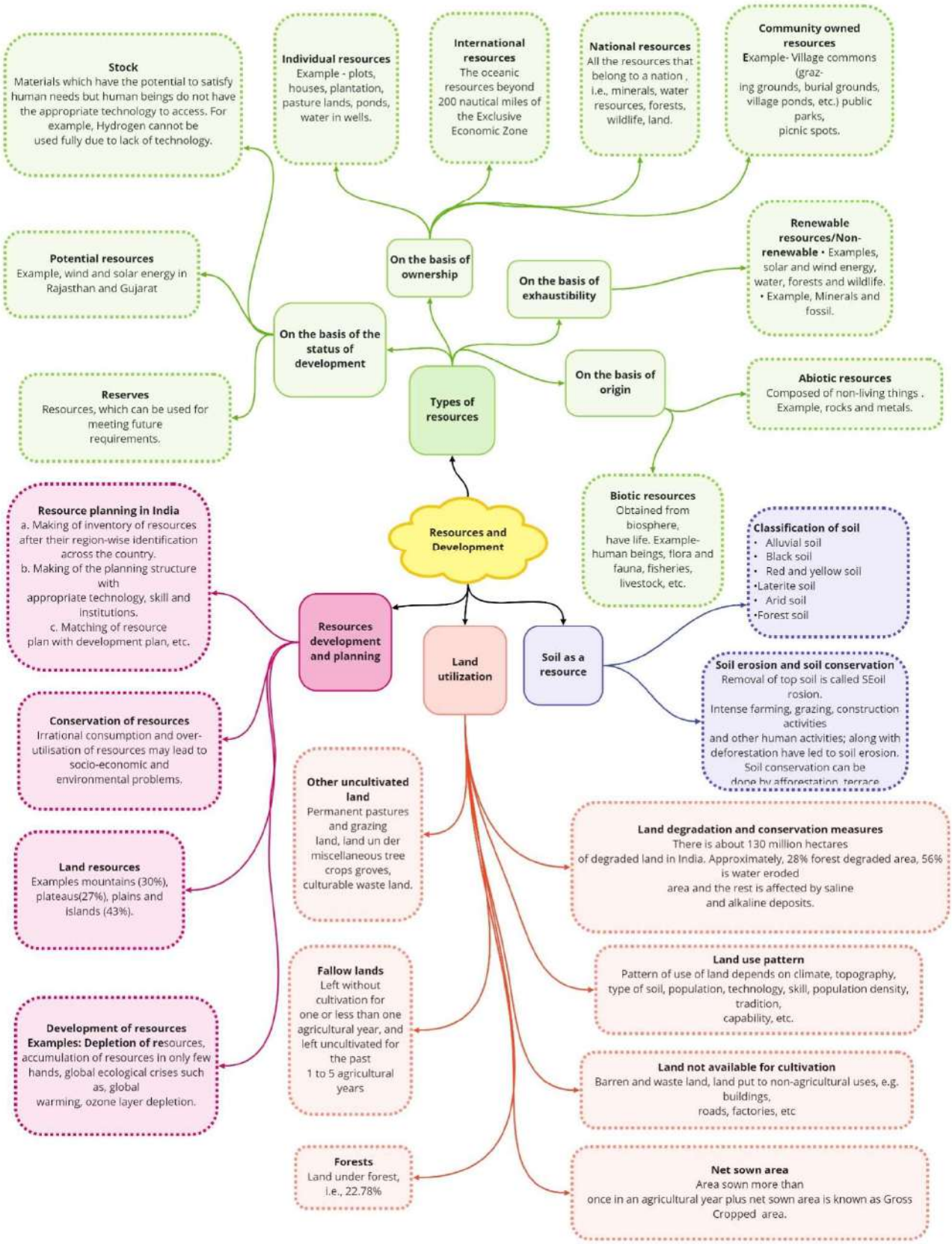

Strip farming


Shelter belt



India: Distribution of Iron Ore, Manganese, Bauxite and Mica

Class : 10th Geography
Chapter-1 : Resources and Development



Important Questions

Multiple Choice questions-

1. Which one of the following soils is ideal for growing cotton?[CBSE 2011]

(a) Regur soil

(b) Laterite soil

(c) Desert soil

(d) Mountainous soil

2. Soil is formed by the process of

(a) Denudation

(b) Gradation

(c) Weathering

(d) Erosion

3. Land left without cultivation for one or less than one agricultural year is called

(a) Culturable waste land

(b) Current fallow land

(c) Waste land

(d) None of the above

4. “There is enough for everybody’s need but not for anybody’s greed”. Who said this?

(a) Jawahar Lai Nehru

(b) Atal Bihari Vajpai

(c) M. K. Gandhi

(d) Sunder Lai Bahuguna

5. Resources which are surveyed and their quantity and quality have been determined for utilisation are known as [CBSE 2011]

(a) Potential resources

(b) Stock

(c) Developed resources

(d) Reserves

6. Which one of the following statements is correct as regard to international resources?

(a) Resources which are regulated by international institutions.

(b) Resources which lie beyond the territorial waters.

(d) Resources which are not yet developed.

7. The first International Earth Summit was held in

(a) Geneva

(b) New York

(c) Japan

(d) Rio de Janeiro

8. The most widespread relief feature of India is

(a) Mountains

(b) Forests

(c) Plains

(d) Plateaus

9. Resources which are found in a region, but have not been utilised

(a) Renewable

(b) Developed

(c) National

(d) Potential

10. Which one of the following statements is true about the term resources?[CBSE 2011]

(a) Resources are free gifts of nature.

(b) They are the functions of human activities.

(c) All those things which are found in nature.

(d) Things which cannot be used to fulfill our needs.

11. The red soil is red in colour because

(a) it is rich in humus.

(b) it is rich in iron compounds.

(c) it is derived from volcanic origin.

(d) it is rich in potash.

12. Soil formed by intense leaching is

(a) Alluvial soil

(b) Red soil

(c) Laterite soil

(d) Desert

13. Which one of the following type of resource is iron ore? (Textbook)

(a) Renewable

(b) Biotic

(c) Flow

(d) Non-renewable

14. Under which of the following type of resource can tidal energy be put? (Textbook)

(a) Replenishable

(b) Human-made

(c) Abiotic

(d) Non-renewable

15. Which one of the following is the main cause of land degradation in Punjab? (Textbook)

(a) Intensive cultivation

(b) Deforestation

(c) Over-irrigation

(d) Overgrazing

Very Short-

Question 1. What do you understand by Resource ?

Question 2. Classify resources on the basis of exhaustibility.

Question 3. Classify resources on the basis of development.

Question 4. Give an example of Biotic resources.

Question 5. What types of resources are solar and wind energy ?

Question 6. Mention a non-renewable source that cannot be recycled and get exhausted with their use.

Question 7. What do you understand by international resources ? Give example.

Question 8. What are developed resources ?

Question 9. Which are the results of using resources indiscriminately by human beings ? Mention any one.

Question 10. What is sustainable development?

Short Questions-

Question 1. What is meant by resource ? Mention the four basis to classify the resources.

Question 2. Are resources free gifts of nature ?

Question 3. What are biotic and abiotic resources ? Give two examples for each.

Question 4. Highlight any three problems associated with the indiscriminate use of resources by the human beings.

Question 5. Why is the issue of sustainability important for development ? Explain.

Question 6. Write a note on the Rio de Janeiro Earth Summit 1992.

Question 7. Explain Agenda 21.

Question 8. Explain the three stages of Resource Planning in India. [CBSE 2016-17]

Question 9. Describe the relief features of land in India and their importance.

Question 10. What are the ways to solve the problem of land degradation ?

Long Questions-

Question 1. Provide a suitable classification for resources on the basis of ownership. Mention main features of any three types of such resources.

Question 2. How are the resources divided on the basis of the status of development ? Give example of each type.

Or

Differentiate between stock resources and reserves.

Question 3. "In India some regions are rich in certain types of resources but deficient in some other resources." Do you agree with the statement ? Support your answer with any three examples.

Question 4. Explain causes for land degradation.

Or

Explain any four human activities which are mainly responsible for land degradation in India.

Question 5. Describe features of laterite soil. Mention the places where they are found in India.

Question 6. Describe the features of Arid soils and Forest soils. Mention the places where they are found in India.

Assertion Reason Questions:

1. **DIRECTION:** Mark the option which is most suitable:
    a. If both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
    b. If both assertion (A) and reason (R) are true, but reason (R) is not the correct explanation of assertion (A).
    c. Assertion (A) is true, but reason (R) is false.
    d. Both assertion (A) and reason (R) are false.

ASSERTION (A): The black soils are made up of extremely fine i.e. clayey material

REASON (R): They are well known for their capacity to hold moisture.

2. **DIRECTION:** Mark the option which is most suitable:
    a. If both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
    b. If both assertion (A) and reason (R) are true, but reason (R) is not the correct explanation of assertion (A).
    c. Assertion (A) is true, but reason (R) is false.
    d. Both assertion (A) and reason (R) are false.

ASSERTION (A): Terrace cultivation is done in plains.

REASON (R): Running water cuts through the clayey soils and makes deep channels as gullies. The land becomes good for cultivation of crops.

Case Study Questions:

1. Read the text given below and answer the questions that follow:

    This is the most widely spread and important soil. In fact, the entire northern plains are made of alluvial soil. These have been deposited by three important Himalayan River s systems– the Indus, the Ganga, and the Brahmaputra. These soils also extend in Rajasthan and Gujarat through a narrow corridor Alluvial soil is also found in the eastern coastal plains particularly in the deltas of the Mahanadi, the Godavari, the Krishna, and the Kaveri River.

    i. Name the soil which is being described in the above paragraph.
        a. Black soil.
        b. Alluvial soil.
        c. Laterite soil.
        d. Forest soil.

    ii. The soil mentioned in the para is _____
        a. Very dry.
        b. Rocky.
        c. Very fertile
        d. Red in colour.

    iii. This soil is mainly good for cultivation of.
        a. Sugar cane.
        b. Paddy.
        c. Wheat.
        d. All of the above.

a. Northern coastal plains.
b. Eastern coastal plains.
c. Southern coastal plains.
d. Western coastal plains.

2. Read the text given below and answer the questions that follow:

The village of Jhabua and the district of Jhabua have shown that it is possible to reverse land degradation. Tree density in Jhabua increased from 13 per hectare in 1976 to 1, 272 per hectare in 1992: Regeneration of the environment leads to economic well-being, as a result of greater resource availability improved agriculture and animal care, and consequently increased incomes. Average annual household income in Jhabua ranged from Rs. 10, 000 - 15, 000 between 1979 and 1984: people's management is essential for ecological restoration. With people being made the decision-makers by the Madhya Pradesh government, 2.9 million hectares, or about 1 percent of India's land area, are being greened across the state through watershed management.

i. The village Sukhomanjiri is located in the state of ___.
   a. Uttaranchal.
   b. Andhra Pradesh.
   c. Rajasthan.
   d. Madhya Pradesh.

ii. Which one of the following is not helpful to reverse land degradation?
   a. Using high doses of fertilizers.
   b. Practicing crop rotation.
   c. Permaculture.
   d. Developing Argo Forestry.

iii. Benefits of Ecological Restoration …….
   a. Helps to solve challenges of water security
   b. Helps to solve challenges of food.
   c. Helps in securing livelihoods and wellbeing.
   d. All of the above.

iv. Which one of the following is not part of Watershed management?
   a. Percolation ponds.
   b. Canals with cement lining.
   c. Check dams and Gully
   d. Diversion drains.

Map Question:

1. The shaded region in the outline map of India represents which soil type.

a. Laterite soil.
b. Mountain soil.
c. Black soil.
d. Alluvial soil.

MCQ Answers-

Answer: a

Answer: c

Answer: b

Answer: c

Answer: c

Answer: a

Answer: d

Answer: c

Answer: d

Answer: b

Answer: b

Answer: c

Answer: d

Answer: a

Answer: c

Very Short Answers-

Answer 1: Everything available in our environment which can be used to satisfy our needs, provided, it is technologically accessible, economically feasible and culturally acceptable can be termed as 'Resource'.

Answer 2: Renewable and non-renewable resources.

Answer 3: Potential, developed stock and reserves.

Answer 4: Human beings, flora and fauna are examples of biotic resources.

Answer 5: Solar and wind energy are renewable resources.

Answer 6: Fossil fuel.

Answer 7: These resources are regulated by international institutions. Examples are the oceanic resources beyond 200 km of the Exclusive Economic Zone belong to open ocean and no [individual country can utilise these without the concurrence of international institutions.

Answer 8: Resources which are surveyed and their quality and quantity have been determined for utilisation. The development of resources depends on technology and level of their feasibility.

Answer 9:

1. Accumulation of resources in a few hands.
2. Depletion of resources for satisfying the greed of few individuals.

Answer 10: Sustainable economic development means 'development should take place without damaging the environment and development in the present should not compromise with the needs of the future generations'.

Short Answers-

Answer 1: (1) Resource : Everything available in our environment which can be used to satisfy our needs provided, it is technologically accessible, economically feasible and culturally acceptable can be termed as resource.

(2) Four basis to classify resources are as mentioned below :

1. On the basis of origin – biotic and abiotic.
2. On the basis of exhaustibility – renewable and non-renewable.
3. On the basis of ownership – individual, community, national and international.

4. On the basis of status of development – potential, developed stock and reserves.

Answer 2: No. Resources are not free gifts of nature. Resources are a function of human activities. Human beings themselves are essential components of resources. They transform material available in our environment into resources and use them.

Answer 3: On the basis of origin resources are divided as given below :

1. Biotic resources : These are obtained from biosphere and have life such as human beings, flora and fauna, fisheries and livestock.
2. Abiotic resources : All those things which are composed of non-living things are called aboitic resources e.g., rocks and metals.

Answer 4: The indiscriminate use of resources by the human beings has resulted in the following:

1. Depletion of resources for satisfying the greed of few individuals.
2. Accumulation of resources in few hands which has divided the society into rich and poor or have and have nots.
3. Indiscriminate exploitation of resources has led to global ecological crises such as global warming, ozone layer depletion, environmental pollution and land degradation.

   Thus, an equitable distribution of resources has become essential for a sustained quality of life and global peace. If the present trend of resource depletion by some individuals and countries continues, the future of our planet is in danger.

Answer 5: Sustainable development means that a development should meet the needs of the present without compromising the ability of future generations to meet their needs. However, since the second half of the twentieth century, a number of scientists have been warning that the present type and levels of development are not sustainable. The issue of sustainable development has emerged from rapid industrialisation of the world in the past century. It is felt that the economic growth and industrialisation have led to reckless exploitation of natural resources. On the other hand, the stock of natural resources are limited. So, the growth of all countries in future is likely to be endangered if the limited resources are completely exhausted. Under these circumstances, the issue of sustainability has become important for development.

Answer 6:

(1) Place : In June 1992, more than 100 heads of states met in Rio de Janeiro in Brazil for the first International Earth Summit.

(2) Objective : The Summit was convened for addressing urgent problems of environmental protection and socio-economic development at the global level.

(3) Achievements :

1. The assembled leaders signed the Declaration on Global Climatic Change and Biological Diversity,
2. The Rio convention endorsed the Global Forest Principles and adopted Agenda 21 for achieving Sustainable Development in the 21st century.

Answer 7:

1. Declaration : It is the declaration signed by world leaders in 1992 at the United Nations Conference on Environment and Development (UNCED) which took place at Rio de Janeiro (Brazil).
2. Aims :
    1. It aims at achieving global sustainable development.
    2. It is an agenda to combat environmental damage, poverty, disease through global cooperation on common interest, mutual needs and shared responsibilities,
    3. One major objective of the Agenda 21 is that every local government should draw its own local Agenda 21.

Answer 8: Three stages of Resource Planning in India are as given below :

1. Identification and inventory of resources across the regions of the country. This involves surveying, mapping and qualitative and quantitative estimation and measurement of resources.
2. Evolving a planning structure endowed with appropriate technology, skill and institutional set up for implementing resource development plans.
3. Matching the resource development plans with overall national development plans.

Answer 9: India has a variety of relief features of land i.e., mountains, plateaus, plains and islands.

1. 43 per cent of land is plain. It is useful for agriculture and industry.
2. 30 per cent of the total land area is mountainous which ensures perennial flow of some rivers. The mountains provide facilities for tourism and ecological aspects.
3. 27 per cent area is plateau region which possesses rich reserves of minerals, fossil fuels and forests.

Answer 10: There are many ways to solve the problem of land degradation. These are as given below :

1. Afforestation – Plantation of trees should be encouraged.
2. Proper management of grazing – Separate sites should be fixed for grazing.
3. Planting of shelter belts of plants

4. Control on overgrazing – Rules for grazing should be framed.
5. Stabilisation of sand dunes by growing thorny bushes to stop land degradation.
6. Proper management of waste lands, control of mining activities, proper discharge and disposal of industrial effluents and wastes after treatment in industrial and suburban areas.

Long Answers-

Answer 1: These are divided as individual, community owned, national and international resources.

(1) Individual resources :

1. These are owned privately by individuals,
2. Many farmers own land in the villages which is allotted to them by government against payment of revenue,
3. Urban people .own plots, houses and other property,
4. Plantation, pasture lands, ponds are also owned by individuals.

(2) Community owned resources :

1. These are owned by community.
2. These are accessible to all the members of the community,
3. Village commons (grazing grounds, burial grounds), public parks, picnic spots in urban areas are accessible to all the people living there.

(3) National resources :

1. These are owned and belong to the nation or state,
2. All the minerals, water resources, forests, wildlife land within the political boundaries and oceanic area upto 12 nautical miles (19.2 km) from the coast termed as territorial water and resources there-in belong to the nation.

(4) International resources :

These do not belong to any country. Some of these resources are regulated by international institutions. Oceanic resources beyond 200 km of the Exclusive. Economic Zone belong to open ocean and no individual country can utilise these without the concurrence of international institutions.

Answer 2: These can be divided into four types :

(1) Potential resources : These are found in a region but have not been utilised, e.g., enormous potential for development of wind and solar energy in Rajasthan and Gujarat. But so far these have not been developed properly.

(2) Developed resources :

1. Resources whose quality and quantity have been determined for utilisation.

2. Their development depends on technology and their level of feasibility.

(3) Stock :

Materials in the environment which can satisfy human needs but human beings do not have the appropriate technology to access these e.g., two components of water — hydrogen and oxygen can be used as a rich source of energy but we, human beings, do not have technology to use them. Hence it is considered as stock.

(4) Reserves :

1. These are the subset of the stock which can be used by present technology but their use has not been started fully.
2. River water can be used for generating hydroelectric power but presently it is being used only to a limited extent,
3. Such resources can be used for meeting future requirements,
4. Water in the dams, forests etc. is a reserve which can be used in the future.

Answer 3: (1) I agree with the statement that in India some regions are rich in certain types of resources but deficient in some other resources as mentioned below :

- Jharkhand, Chhattisgarh and Madhya Pradesh – rich in minerals and coal deposits.
- Arunachal Pradesh – abundance of water resources.
- Rajasthan — lot of solar and wind energy.
- Ladakh – rich cultural heritage.

(2) There is great variation in the availability of resources. Some regions are rich in one resource but deficient in other, as mentioned below :

- Arunachal Pradesh – Lack of infrastructural development.
- Rajasthan – Lack of water resources.
- Ladakh – Deficient in water, infrastructure and vital minerals.

(3) There is lack of technology in some regions. Thus there are regions that are rich in resources but these are included in economically backward regions.

Answer 4:

(1) At present there is about 130 million hectares of degraded land in India as mentioned below :

- Forest degraded area — 28%
- Water eroded area — 56%
- Wind eroded area — 10%
- Saline and Alkaline land — 6%

(2) Following factors/human factors are responsible for land degradation in India :

- Mining : Mining sites are abandoned after excavation work is complete leaving deep scars and traces of over burdening.
- Deforestation : In states of Jharkhand, Chhattisgarh, Madhya Pradesh and Orissa deforestation due to mining have caused severe land degradation.
- Overgrazing : In states like Gujarat, Rajasthan, Madhya Pradesh and Maharashtra overgrazing is the main reason for land degradation.
- Over-irrigation : In the states of Punjab, Haryana, Western Uttar Pradesh, over-irrigation is responsible for land degradation due to water logging leading to increase in salinity and alkalinity in the soil.
- The mineral processing like grinding of limestone for cement industry generate dust in the atmosphere. It retards the process of infiltration of water into soil after it settles down on the land. Thus industrial effluents as waste have become a major source of land and water pollution in many parts of the country.

Answer 6:

Laterite soil :

(1) Features :

- Laterite has been derived from the Latin word 'later' which means brick. It develops in areas with high temperature and heavy rainfall
- Humus content of the soil is low.
- They lack in elements of fertility and are of low value for crop production,
- They are composed of little clay and much gravel of red sandstones,
- They are suitable for cultivation with manures and fertilizers

(2) Places :

- They are found in Karnataka, Kerala, Tamil Nadu, Madhya Pradesh and hilly areas of Orissa and Assam,
- After adopting appropriate soil conservation techniques particularly in the hilly areas of Karnataka, Kerala and Tamil Nadu, this soil is very useful for growing tea and coffee,
- Red laterite soils in Tamil Nadu, Andhra Pradesh and Kerala are more suitable for crops like cashew nut.

Answer 6:

(1) Arid soils :

1. Features

- They range from red to brown in colour.
- They are generally sandy in texture and saline in nature

- In some areas the salt content is very high and common salt is obtained by evaporating the water. Due to the dry climate, high temperature, evaporation is faster and the soil lacks humus and moisture,
- The lower horizons of the soil are occupied by kankar because of increasing calcium content downward.
- These soils can become cultivable if irrigation facilities are made available as has been in the case of western Rajasthan.

Places :

- These soils are found in arid areas of Rajasthan, Punjab and Haryana.

(2) Forest soils :

1. Features :
   - They are found in mountainous area,
   - They are loamy and silty in valley slides and coarse grained in the upper slopes,
   - In the snow covered areas of the Himalayas they are acidic with low humus content.

2. Places: They are found in the hilly and mountainous areas where sufficient rain forests are available. These places are Meghalaya, Arunachal Pradesh, Uttarakhand, Himachal Pradesh and Jammu and Kashmir. The soils found in the lower parts of the valleys particularly on the river terraces and alluvial fans are fertile.

Assertion Reason Answer:

1. (B) If both assertion (A) and reason (R) are true, but reason (R) is not the correct explanation of assertion (A)

2. (c) Both assertion (A) and reason (R) are false.

Case Study Answer:

1. i (b) Alluvial soil.

   Ii (c) Very fertile.

   iii (b) Paddy.

   iv (b) Eastern coastal plains.

2. i (d) Madhya Pradesh.

   Ii (a) Using high doses of fertilizers.

   Iii (d) All of the above.

   iv (a) Percolation ponds

Exercises:

Multiple Choice Questions.

1. Which one of the following type of resource is iron ore?

Ans. Non – Renewable.

2. Under which of the following type of resource tidal energy cannot be put?

Ans. Replenishable.

3. Which one of the following is the main cause of land degradation in Punjab?

Ans. Over irrigation.

4. In which one of the following states is terrace cultivation practiced?

Ans. Uttarakhand.

5. In which of the following states black soil is predominantly found?

Ans. Maharashtra.

Q2. Answer the following questions in about 30 words.

i). Name three states having black soil and the crop which is mainly grown in it.

Ans. Three states having black soil are:-

i). Gujrat. ii). Maharashtra. iii). Tamil nadu.

The crop which is mainly grown in black soil is cotton.

ii). What type of soil is found in the river deltas of the eastern coast? Give 3 main features of this type of soil.

Ans. In the river deltas of the eastern coast alluvial soil is found.

Three features of alluvial soils are the following:

a). This type of soil is the mostly widely spread and the most important.

b). Such a soil is the result of the deposits of rivers.

c). Such a soil is very fertile.

iii). What steps can be taken to control soil erosion in the hilly areas?

Ans. The following steps can be taken to control soil erosion in hilly areas.

1. Contour ploughing:- By this method, the fields are ploughed, harrowed and sown along the natural contour of the hills instead of up and down the slopes. This prevents the rain water from flowing down the hill. It stands in the level furrows and soaks into the ground, so the plants receive more water this is suitable for afforestation and grassland development work.

2. Terracing:- By this method, a series of wide steps are made along the slope following the contours. This method is very common in Asian countries in regions of rice cultivation.

3. Strip – cropping:- In this method, cover crops, such as grasses and small grains are planted alternatively with cultivated crops. These cover crops, absorb the moisture and hold the surface soil together.

4. Plugging of gullies:- This is done by building dams of stones or fixing wire – netting or planting trees across gullies. These measures check the flood waters, and so cause filling of silt in the gullies.

iv). What are the biotic and abiotic resources? Give some examples.

Ans.

a). Biotic resources:- The most clearly recognizable natural resources are those consists of living things. Forests, agricultural crops, wild and domestic animals, birds and fish are all biotic resources. They can continue to reproduce and regenerate their population as long as environment conditions remain favourable and an adequate seed source is maintained. All biotic resources are therefore, renewable. The renewability of a living resource varies with the species and the area involved.

b). Abiotic resources:- Abiotic resources consist of non – living things. In general, they may be considered mostly non – renewable. Minerals and fossil – fuels, such as coal, petroleum, and natural gas are abiotic and hence least renewable resources. These resources are exhausted by reckless use, while their rate of formation is exceedingly slow. All minerals are abiotic resources and they are non – renewable. Certain abiotic minerals such as iron and aluminium are widely distributes throughout the earth's surface.

3 Answer the following questions in about 120 words

i). Explain land use pattern in India and why has the land under forest not increased much since 1960-61?

Ans. Land use pattern in India: Land is one of the most important natural resources. Man has been always using land for various purpose such as construction his dwellings, carrying out agricultural activities, the rearing his animals, mining, industries, laying roads and railway lines etc. The use of land has never been in the same proportion in any part of the country. It is changing from country to country and from region to region. Those countries which had made a judicious use of the land led other countries while others who used this resource carelessly lagged much behind. Total area of India is 3.28 million square kilometers and according to latest estimates our total cultivable land is about 2,93, 190 square kilometers. Of this about 46.6% is net sown area, 7.7% is fallow land and cultivable waste covers about 4.6% of the total area. Forests cover about 26.6% pastures and trees 4.8% and land not available for cultivation forms 13.8% of the total area. The total availability of land in our country is a fixed asset. There is great pressure on land for various purposes i.e., cultivation, forests, pastures, housing, factories etc. So we must plan a proper use of all the available land. The area of forests must be increased to at least 25%. Fallow land must be utilized by using fertilizers and better means of irrigation. The wastelands must be reclaimed for more cultivation.

Land Under Forests Not Increased Much From 1960 – 61.

From the above land use pattern it becomes quite clear that through forest area has increased from 18.11 in 1960 – 61 to 22.57% in 2002 – 03. Yet the increase is not sufficient. By all standards it should be upto 33% of the total land which is about 3.28 million kilometer. The land under forests not increased to expectations because there is much pressure on land because of cultivation, pastures, housing and factories which are also quite important and necessary. Anyhow, in order to bring the forest area to the scientific level of 33% of the total area, strenuous efforts should be made to bring barren and wastelands under forest cover. Otherwise there is very little scope of the expansion of forest area in face of great demand of land for other important needs.

ii). How have technical and economic development led to more consumption of resources?

Ans. There is no denying the fact that technical and economic development is quite necessary for industrial growth and advancement of the country. But too much use of the resources would not only lead to the depletion of the resources but also to land degradation. A few years back, USA tried to over – utilize the resources of the country in order to become bread – basket of the world but in doing so she became dust – bowl of the world. Likewise the resources should be utilized judiciously. Technical and economical development leads to industrialization which further leads to degradation of the land over and above leading to the depletion of the resource:

a). The dirty and poisonous effluents of factories which go on collecting in the surrounding areas completely degrade lands and render them unfit for cultivation.

b). The dumping of wastes of factories on any land day in and day out leads to the degradation of land.

c). Industries require a lot of raw material especially different types of minerals. Surface mining leads to degradation of land.

d). The mineral processing like grinding of limestone for cement industry and soapstone for ceramic industry generates a large amount of dust. Such a dust ultimately settles down in the surrounding areas which greatly affects the cultivation work.

e). Out of their greed, various industry owners resort to cutting of trees indiscriminately which leads to deforestation and turns the land into wasteland.

f). Sometimes the construction of industrial units of factories one after the other also leads to the degradation of the land.