

Teacher's Hand Book 8th Chemistry

EXERCISE - 1

I. Choose the correct answer.

- Which among these is the smallest particle of matter? **Ans:** (b) Atom
- The kinetic energy of the molecules increases _____. **Ans:** (a) On heating
- By applying high pressure _____. **Ans:** (a) Gases change to liquid
- By applying heat to liquid _____. **Ans:** (a) It changes to gas
- By applying heat _____. **Ans:** (a) A solid can be changed to liquid
- Intermolecular force is the force between _____. **Ans:** (c) Two molecules of a matter
- In solid, the molecules _____. **Ans:** (b) Vibrate about a fixed point
- The energy of molecules of a solid is _____. **Ans:** (b) Low
- The energy of molecules of a liquid is _____. **Ans:** (a) Moderate
- The energy of molecules of a gas is _____. **Ans:** (c) High
- Hari poured an equal amount of water into the 4 containers as shown below. This result of his experiment shows that water has _____. **Ans:** (b) No definite shape
- Which element has neither definite shape nor volume? **Ans:** (b) Hydrogen
- Which of the following statements is NOT true? **Ans:** (b) All forms of matter have colour
- Which of the following metals is not a solid at room temperature? **Ans:** (c) Mercury
- Which of the following will evaporate faster than the others? **Ans:** (b) Petrol

II. Say True or False.

- Solids have greater density than liquids. **Ans:** True
- Gases are highly diffusible. **Ans:** True
- Gases have definite volume. **Ans:** False
- The molecules of gases move randomly. **Ans:** True
- On heating, the kinetic energy of gases decreases. **Ans:** False
- All matter has volume. **Ans:** True
- Every matter can be seen. **Ans:** False
- Snow and ice can be compressed. **Ans:** False
- Matter can be hard or soft. **Ans:** True
- Air bubble is a gas. **Ans:** True

III. Match the Following.

- Size of naphthalene balls decreases - (c) Sublimation
- Wax melts in the sun - (d) Melting
- Drying of wet clothes - (a) Evaporation
- Formation of clouds - (b) Condensation

IV. Match the Following.

- Solid changes into liquid - (d) Melting Point
- Liquid state changes into gaseous state - (b) Boiling Point
- Gaseous state changes into liquid state - (a) Liquefaction Point
- Liquid changes into solid - (c) Freezing Point

V. Multiple Answer Questions.

- Archana took three biscuits and crushed them as shown below. She can conclude that:
Ans: (b) Both X and Y are in the same state
- Sanjay blows into the straw as shown below. What will he observe?
Ans: (a) Air bubbles escape into the beaker, (c) The water level in the basin increases

3. Aparna puts two basketballs of the same size and material on a balance as shown below. Which of the following statements best describes the two balls?

Ans: (b) The air in Ball A is more compressed than the air in Ball B.

4. Tara accidentally knocked over a glass of milk which was on the table. The milk spilled on the table and flowed onto the floor. What can be concluded from this sequence of events?

Ans: (a) Milk has no definite shape, (b) Milk flows from higher level to lower level

5. Divya put a bottle cork into a beaker containing 100 ml of water. The new water level is shown below. From his experiment, Darius can conclude that the:

Ans: (b) Cork is lighter than water, (c) Cork occupies space

6. Sanjana wanted to find out which solid, marbles or beads, occupies more space. In order to be a fair test, what things should be kept the same?

Ans: (a) Amount of liquid, (b) Size of the container

VI. Assertion and Reason Type Questions

1. **Assertion** : It is difficult to cook food at a hill.

Reason : The boiling point of water increases at a hill.

Ans: (d) Assertion is CORRECT, but reason is INCORRECT.

2. **Assertion** : Liquids diffuse easily as compared to gases.

Reason : Intermolecular forces are greater in gas.

Ans: (e) Both assertion and reason are INCORRECT.

3. **Assertion** : During evaporation of liquid, the temperature of the liquid remains unaffected.

Reason : Kinetic energy of the molecules is directly proportional to absolute temperature.

Ans: (b) Both assertion and reason are CORRECT, but reason is NOT THE CORRECT explanation.

4. **Assertion** : Gases do not have free surfaces.

Reason : Molecules of a gas move randomly in all directions.

Ans: (a) Both assertion and reason are CORRECT, and reason is the CORRECT explanation.

5. **Assertion** : Salt water is sprinkled in cold countries to remove ice on roads.

Reason : Melting point increases by addition of soluble impurities.

Ans: (c) Assertion is CORRECT, but reason is INCORRECT.

VII. Concept Questions.

1. **Why is the kinetic energy of gas molecules more compared to that of solid?**

Ans: Gas molecules move freely and rapidly, while solid molecules only vibrate in fixed positions.

2. **What is the effect of temperature on kinetic energy?**

Ans: Kinetic energy increases with temperature because heat provides energy for molecular motion.

3. **Write any two basic properties of solids.**

Ans: Definite shape and volume; strong intermolecular forces.

4. **Write any two basic properties of liquids.**

Ans: Definite volume but no fixed shape; moderate intermolecular forces.

5. **How do you convert a solid to liquid?**

Ans: By heating the solid to its melting point, which provides energy to overcome intermolecular forces.

Application Skill Achiever

I. Fill up the blanks.

1. The melting point of a substance is less than room temperature. Then the phase of the material may be ____.

Ans: Liquid or gas

2. The boiling point of a substance is less than room temperature. Then the phase of the material may be ____.

Ans: Gas

3. The melting point of a substance is more than room temperature. Then the phase of the material may be ____.

Ans: Solid

4. The boiling point of a substance is more than room temperature. Then the phase of the material may be ____.

Ans: Liquid or solid

5. The room temperature is more than the boiling point of the material. Then the phase of the material ____.

Ans: Gas

II. Tick the correct answer.

1. The intermolecular force between particles is very strong. Then the substance is a _____. **Ans:** [✓] Solid

2. The intermolecular force between particles is very weak. Then the substance is a _____. **Ans:** [✓] Gas

3. The energy content is very high. Then the substance is a _____. **Ans:** [✓] Gas

4. A substance takes the shape of the container. Then the substance is a _____. **Ans:** [✓] Liquid

5. A substance does not have definite volume. Then the item is a _____. **Ans:** [✓] Gas

EXERCISE - 2

I. Choose the correct answer:

1. As per Boyle's law _____ **Ans:** (c) $P_1V_1 = P_2V_2$
2. Boyle's law is applicable when _____ **Ans:** (b) The temperature is constant
3. Which among these is correct about ideal gas? **Ans:** (b) There is no force between the particles of ideal gas
4. As per Charles' law _____ **Ans:** (b) The volume is directly proportional to temperature
5. Charles' law is applicable when _____ **Ans:** (a) The pressure is constant
6. This relation between temperature and pressure is known as _____ **Ans:** (c) Gay-Lussac's law
7. As per Gay-Lussac's law _____ **Ans:** (a) Pressure is directly proportional to temperature
8. Gay-Lussac's law is applicable when _____ **Ans:** (a) Volume is constant
9. The absolute scale of temperature is _____ **Ans:** (c) Kelvin Scale
10. As per the combined gas law _____ **Ans:** (a) $P_1V_1T_1 = P_2V_2T_2$
11. At 27°C, 1 atm pressure, density of a gas is (d). At constant P, at what T its density is 0.75 d? **Ans:** (c) 400 K
12. A vessel has x g of gas at high pressure P. When certain gas escapes, the pressure becomes P/8 and temperature becomes 2T. What is the amount of gas escaped? **Ans:** (a) 2/3 m
13. At 127°C a vessel has certain gas. At same P, to what T must it be heated so that half of the gas escapes? **Ans:** (b) 527°C
14. At same temperature and pressure, which of the following pairs of gases has the same rate of diffusion? **Ans:** (b) CO₂, N₂O
15. A gas which diffuses 4 times slower than H₂ gas is: **Ans:** (b) O₂

II. Say True or False:

1. Boyle's law is applicable to ideal gas. **Ans:** True
2. As per Boyle's law, if pressure is doubled, the volume also doubles. **Ans:** False
3. As per Charles' law, if pressure is doubled, the volume halves. **Ans:** False

4. As per Gay-Lussac's law, if temperature is doubled, the volume halves. **Ans:** False
5. As per ideal gas law, $PV = nRT$. **Ans:** True
6. Boyle's law is applicable only when mass and temperature are made variable. **Ans:** False
7. The graphs at constant volume are called isobars. **Ans:** False
8. The standard temperature is -273°C . **Ans:** True
9. The SI unit of atmospheric pressure is Pascal. **Ans:** True
10. The relation between measurable properties of gases can be obtained by gas laws. **Ans:** True

III. Match the Following:

1. Charles' law - (e) $V \propto T$
2. Boyle's law - (a) $P \propto \frac{1}{V}$ $P \propto \frac{1}{V}$
3. Avogadro's law - (b) $V \propto n$
4. Graham's law - (d) $r \propto \frac{1}{\sqrt{M}}$
5. Gay-Lussac's law - (c) $P \propto T$

IV. Multiple Answer Questions:

1. Which of the following graphs is/are false for the given mass of a gas at constant temperature?

Ans: (d) None of these (All graphs are valid representations of gas laws)

2. Choose the correct statement from the following.

Ans: (a) He gas diffuses $\sqrt{2}$ times more than O_2 .

3. At what temperature will the volume "V" of a certain mass of gas at 37°C be doubled? (Pressure constant)

Ans: (b) 620 K

4. Choose the correct statement from the following.

Ans: (a) Molecular collisions are unaffected by gravity.

V. Assertion and Reason Type Questions:

1. **Assertion** : Greater the mole fraction of a gas in a gaseous mixture, greater is the pressure it exerts.

Reason : Pressure of gas is due to bombardment of gas molecules on the walls of the container.

Ans: (b) Both correct, but reason does not explain assertion.

2. **Assertion** : Plot of P vs $1/V$ is a straight line.

Reason : Pressure is directly proportional to volume.

Ans: (d) Assertion is correct, reason is incorrect.

3. **Assertion** : Volume-temperature ratio is constant for a fixed amount of gas at constant pressure.

Reason : At constant pressure, the volume of a given mass of gas increases or decreases by $1/273$ of its volume at 0°C .

Ans: (a) Both correct, and reason explains assertion.

4. **Assertion** : Gas with lower mass will effuse or diffuse faster.

Reason : Kinetic energy of any gas is independent of temperature.

Ans: (c) Assertion is correct, reason is incorrect.

VI. Concept Questions:

1. What is Boyle's Law?

Ans: Boyle's Law states that when the temperature of a gas is constant, the pressure of the gas increases when its volume decreases, and vice versa. This means pressure and volume are inversely related.

Formula: $P \propto 1/V$

2. What is Charles' Law?

Ans: Charles' Law says that at constant pressure, the volume of a gas increases when the temperature increases. So, volume is directly proportional to temperature (in Kelvin).

$$\text{Formula: } V \propto T$$

3. Explain Gay-Lussac's law.

Ans: Gay-Lussac's Law states that at constant volume, the pressure of a gas increases when the temperature increases. So, pressure is directly proportional to temperature (in Kelvin).

$$\text{Formula: } P \propto T$$

4. What is the combined gas law?

Ans: The Combined Gas Law brings together Boyle's, Charles', and Gay-Lussac's laws. It shows the relationship between pressure, volume, and temperature of a gas.

$$\text{Formula: } \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad (\text{Where } P = \text{pressure, } V = \text{volume, and } T = \text{temperature in Kelvin.})$$

5. Write any two characteristics of an ideal gas.

Ans: The gas has **no intermolecular forces** between its particles.

The gas particles **occupy no space** (they are treated as point particles).

Application Skill Achiever:

1. At a pressure of 600 Pa, a gas occupies 12 liters. What will be the volume if the pressure becomes 900 Pa?

SOL: Given: $P_1 = 600 \text{ Pa}$, $V_1 = 12 \text{ L}$

$P_2 = 900 \text{ Pa}$, $V_2 = ?$

Using Boyle's Law:

$$P_1 V_1 = P_2 V_2 \Rightarrow 600 \times 12 = 900 \times V_2$$

$$7200 = 900 \times V_2 \Rightarrow V_2 = 7200/900 = 8 \text{ L}$$

Ans: The volume will be 8 liters when the pressure becomes 900 Pa.

2. A gas occupies a volume of 900 liters at a pressure of 200 Pa. What will be the volume if the pressure becomes 300 Pa?

SOL: Given: $P_1 = 200 \text{ Pa}$, $V_1 = 900 \text{ L}$

$P_2 = 300 \text{ Pa}$, $V_2 = ?$

$$200 \times 900 = 300 \times V_2 \Rightarrow 180000 = 300 \times V_2$$

$$\Rightarrow V_2 = 180000/300 = 600 \text{ L}$$

Ans: The volume will be 600 liters when the pressure becomes 300 Pa.

3. A balloon contains 7.3 L of He. The pressure is reduced to 2.00 atm and the balloon expands to 25.1 L. What was the initial pressure?

SOL: Given: $V_1 = 7.3 \text{ L}$, $P_2 = 2.00 \text{ atm}$, $V_2 = 25.1 \text{ L}$, $P_1 = ?$

$$P_1 \times 7.3 = 2.00 \times 25.1 \Rightarrow P_1 = \frac{2.00 \times 25.1}{7.3} = \frac{50.2}{7.3} = 6.88 \text{ atm}$$

Ans: The initial pressure was approximately 6.88 atm.

4. 352 ml of chlorine under a pressure of 680 mm Hg is placed in a container under a pressure of 1210 mm Hg. What is the volume of the container in liters?

SOL: Given: $P_1 = 680 \text{ mm Hg}$, $V_1 = 352 \text{ ml} = 0.352 \text{ L}$

$P_2 = 1210 \text{ mm Hg}$, $V_2 = ?$

$$680 \times 0.352 = 1210 \times V_2$$

$$\Rightarrow V_2 = \frac{680 \times 0.352}{1210} = \frac{239.36}{1210} = 0.198 \text{ L}$$

Ans: The volume of the container is approximately 0.198 liters.

5. A cylinder with volume 600 liters contains gas at a pressure 180 Pa. What would be the pressure if the same gas is kept in a cylinder of volume 350 liters?

SOL: Given: $V_1 = 600 \text{ L}$, $P_1 = 180 \text{ Pa}$, $V_2 = 350 \text{ L}$, $P_2 = ?$

$$180 \times 600 = P_2 \times 350$$

$$\Rightarrow P_2 = \frac{180 \times 600}{350} = \frac{108000}{350} = 308.57 \text{ Pa}$$

Ans: The pressure would be approximately 308.57 Pa in the 350-liter cylinder.

EXERCISE - 3

I. Choose the correct answer:

- The symbol of Iron is _____. **Ans:** (a) Fe
- Most of the elements have _____. **Ans:** (b) Double letter symbols
- The symbol for chromium is _____. **Ans:** (c) Cr
- The symbol of oxygen molecule is _____. **Ans:** (b) O_2
- The molecular formula of sugar is _____. **Ans:** (a) $\text{C}_6\text{H}_{12}\text{O}_6$
- In ZnO , what is the valency of Zn if the valency of oxygen is 2? _____. **Ans:** (b) 2
- Which among these is correct about radicals? _____. **Ans:** (a) Radicals are atoms, molecules, or ions with unpaired electrons.

- In the equation $\text{SnO(g)} + \text{H}_2\text{(g)} \rightarrow \text{Sn(s)} + \text{H}_2\text{O(g)}$, the phase of H_2O in the output is _____. **Ans:** (c) Gas
- What is the valency of iron? _____. **Ans:** (c) 2 and 3
- What is the valency of fluorine? _____. **Ans:** (a) 1
- The symbols of lead and mercury are respectively: **Ans:** (b) Pb, Hg
- A symbol of an element conveys information about: **Ans:** (a) Atomic number
- The molecular formula is a short form representation of: **Ans:** (a) A compound
- A balanced chemical equation supports: **Ans:** (c) Law of conservation of mass
- $\text{Na}_2\text{C}_2\text{O}_4$ is the formula of sodium: **Ans:** (c) Oxalate

II. Say True or False:

- The valency of calcium is 2. **Ans:** True
- Cations are positively charged ions. **Ans:** True
- Anions are negatively charged ions. **Ans:** True
- The valency of oxygen in water is 1. **Ans:** False
- The valency of sodium is 3. **Ans:** False

III. Match the Following:

- Monovalent ion - (d) H^+ , Cl^- , Na^+
- Divalent ion - (e) O^{2-} , SO_4^{2-}
- Trivalent ion - (a) Fe^{3+} , Al^{3+}
- Tetravalent ion - (c) Pb^{4+} , Sn^{4+}
- Pentavalent ion - (b) As^{5+} , Sb^{5+}

IV. Match the Following:

- HCO_3^- - (e) Bicarbonate ion
- SO_4^{2-} - (d) Sulphate ion
- HSO_4^- - (c) Bisulphate ion
- PO_4^{3-} - (b) Phosphate ion
- ClO^- - (a) Hypochlorite ion

V. Multiple Answer Questions:

1. Which of the following radicals are bivalent?

Ans: (b) Sulphate

2. The general formula of one molecule of a metallic halide can be:

Ans: (a) MX, (b) MX₂, (c) MX₃

3. Identify the balanced chemical equation from the following:

Ans: (a) $\text{SiCl}_4 + 2\text{H}_2\text{O} \rightarrow \text{SiO}_2 + 4\text{HCl}$, (c) $9\text{Be} + 3\text{N}_2 \rightarrow 3\text{BeN}_2$

4. Identify the salt(s) of an oxyacid formed from a univalent metal (M):

Ans: (a) M₂SO₄, (c) MHCO₃

5. If a compound has a formula of A₂B₃, then:

Ans: (a) The formula of oxide of A is A₂O₃, (c) Bicarbonate of A is A(HCO₃)₃

VI. Assertion and Reason Type Questions:

1. **Assertion** : Ferrous ion is a divalent ion.

Reason : Iron atom loses two electrons to carry two positive charges.

Ans: (A) Both correct, and reason explains the assertion.

2. **Assertion** : Balancing a chemical equation is important to study a chemical reaction.

Reason : A balanced equation tells about energy changes that take place.

Ans: (B) Both correct, but reason does not explain the assertion.

3. **Assertion** : As both calcium and sulphate carry two positive charges, the formula of calcium sulphate is Ca₂(SO₄)₃.

Reason : Calcium sulphate is a compound formed by the combination of calcium and sulphate ions.

Ans: (D) Assertion is incorrect, but reason is correct.

4. **Assertion** : The mass number of hydrogen is equal to its atomic number.

Reason : H-atom has no neutrons.

Ans: (A) Both correct, and reason explains the assertion.

5. **Assertion** : The ratio of weights of carbon and oxygen in CO₂ is 3:8, and it is a constant.

Reason : The atomic weights of carbon and oxygen are constants.

Ans: (A) Both correct, and reason explains the assertion.

VII. Concept Questions:

1. What is expressed in a formula?

Ans: A **chemical formula** shows the **types of atoms** and the **number of each atom** in a molecule of a substance. It represents the **composition** of a compound using chemical symbols and numbers.
For example: H₂O represents water (2 hydrogen atoms and 1 oxygen atom).

2. What is valency as per the modern concept?

Ans: According to the **modern concept**, **valency** is the **number of electrons an atom loses, gains, or shares** to achieve a stable electronic configuration, usually like that of a noble gas.
It tells us how an element will bond with other elements.

3. What is a radical?

Ans: A radical is a group of atoms that behaves like a single unit and carries a positive or negative charge.

Examples: SO_4^{2-} (sulfate) → negative radical
 NH_4^+ (ammonium) → positive radical

4. What are the rules to write a formula?

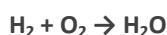
Ans: Here are the main rules to write a chemical formula:

- Write the symbols of the elements or radicals.
- Write the valency of each element above its symbol.
- Cross-multiply the valencies to balance the formula.
- Simplify the ratio to the lowest whole numbers if needed.
- Write the final formula without charges.

5. What is a chemical equation?

Ans: A chemical equation is a written representation of a chemical reaction. It shows the reactants (starting substances) and the products (new substances formed), along with their chemical formulas.

Example:



Application Skill Achiever:

I. Balancing Equations

- | | |
|--|--|
| 1. $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$ | Ans: $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ |
| 2. $\text{H}_2\text{SO}_4 + \text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$ | Ans: $\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$ |
| 3. $\text{N}_2 + \text{H}_2 \rightarrow \text{NH}_3$ | Ans: $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ |
| 4. $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$ | Ans: $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ |
| 5. $\text{AgI} + \text{Na}_2\text{S} \rightarrow \text{Ag}_2\text{S} + \text{NaI}$ | Ans: $2\text{AgI} + \text{Na}_2\text{S} \rightarrow \text{Ag}_2\text{S} + 2\text{NaI}$ |
| 6. $\text{FeS} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3 + \text{SO}_2$ | Ans: $4\text{FeS} + 7\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3 + 4\text{SO}_2$ |
| 7. $\text{PCl}_5 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4 + \text{HCl}$ | Ans: $\text{PCl}_5 + 4\text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4 + 5\text{HCl}$ |
| 8. $\text{As} + \text{NaOH} \rightarrow \text{Na}_3\text{AsO}_3 + \text{H}_2$ | Ans: $2\text{As} + 6\text{NaOH} \rightarrow 2\text{Na}_3\text{AsO}_3 + 3\text{H}_2$ |
| 9. $\text{Hg}(\text{OH})_2 + \text{H}_3\text{PO}_4 \rightarrow \text{Hg}_3(\text{PO}_4)_2 + \text{H}_2\text{O}$ | Ans: $3\text{Hg}(\text{OH})_2 + 2\text{H}_3\text{PO}_4 \rightarrow \text{Hg}_3(\text{PO}_4)_2 + 6\text{H}_2\text{O}$ |
| 10. $\text{HClO}_4 + \text{P}_4\text{O}_{10} \rightarrow \text{H}_3\text{PO}_4 + \text{Cl}_2\text{O}_7$ | Ans: $12\text{HClO}_4 + \text{P}_4\text{O}_{10} \rightarrow 4\text{H}_3\text{PO}_4 + 6\text{Cl}_2\text{O}_7$ |
| 11. $\text{CO} + \text{H}_2 \rightarrow \text{C}_6\text{H}_{18} + \text{H}_2\text{O}$ | Ans: $6\text{CO} + 13\text{H}_2 \rightarrow \text{C}_6\text{H}_{18} + 6\text{H}_2\text{O}$ |
| 12. $\text{KClO}_3 + \text{P}_4 \rightarrow \text{P}_4\text{O}_{10} + \text{KCl}$ | Ans: $10\text{KClO}_3 + 3\text{P}_4 \rightarrow 3\text{P}_4\text{O}_{10} + 10\text{KCl}$ |
| 13. $\text{SnO}_2 + \text{H}_2 \rightarrow \text{Sn} + \text{H}_2\text{O}$ | Ans: $\text{SnO}_2 + 2\text{H}_2 \rightarrow \text{Sn} + 2\text{H}_2\text{O}$ |
| 14. $\text{KOH} + \text{H}_3\text{PO}_4 \rightarrow \text{K}_3\text{PO}_4 + \text{H}_2\text{O}$ | Ans: $3\text{KOH} + \text{H}_3\text{PO}_4 \rightarrow \text{K}_3\text{PO}_4 + 3\text{H}_2\text{O}$ |
| 15. $\text{KNO}_3 + \text{H}_2\text{CO}_3 \rightarrow \text{K}_2\text{CO}_3 + \text{HNO}_3$ | Ans: $2\text{KNO}_3 + \text{H}_2\text{CO}_3 \rightarrow \text{K}_2\text{CO}_3 + 2\text{HNO}_3$ |
| 16. $\text{Na}_3\text{PO}_4 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_3\text{PO}_4$ | Ans: $\text{Na}_3\text{PO}_4 + 3\text{HCl} \rightarrow 3\text{NaCl} + \text{H}_3\text{PO}_4$ |
| 17. $\text{C}_2\text{H}_6\text{O} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ | Ans: $\text{C}_2\text{H}_6\text{O} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$ |
| 18. $\text{Fe}_3 + \text{HC}_2\text{H}_3\text{O}_2 \rightarrow \text{Fe}(\text{C}_2\text{H}_3\text{O}_2)_3 + \text{H}_2$ | Ans: $2\text{Fe} + 6\text{HC}_2\text{H}_3\text{O}_2 \rightarrow 2\text{Fe}(\text{C}_2\text{H}_3\text{O}_2)_3 + 3\text{H}_2$ |
| 19. $\text{NH}_3 + \text{O}_2 \rightarrow \text{NO} + \text{H}_2\text{O}$ | Ans: $4\text{NH}_3 + 5\text{O}_2 \rightarrow 4\text{NO} + 6\text{H}_2\text{O}$ |
| 20. $\text{B}_2\text{Br}_6 + \text{HNO}_3 \rightarrow \text{B}(\text{NO}_3)_3 + \text{HBr}$ | Ans: $\text{B}_2\text{Br}_6 + 6\text{HNO}_3 \rightarrow 2\text{B}(\text{NO}_3)_3 + 6\text{HBr}$ |

EXERCISE - 4

I. Choose the correct answer:

1. Dissolving sugar in water is an example of _____. **Ans:** (a) Physical change
2. Chopping vegetables is an example of _____. **Ans:** (a) Physical change
3. The product formed due to the burning of magnesium is _____. **Ans:** (a) MgO
4. The formula of copper oxide is _____. **Ans:** (a) CuO
5. What is the name of the compound CuCO_3 ? _____. **Ans:** (a) Copper carbonate
6. In an oxidation chemical reaction _____. **Ans:** (a) The chemical combines with oxygen
7. The chemical formula of copper sulphate is _____. **Ans:** (a) CuSO_4
8. KMnO_4 stands for _____. **Ans:** (a) Potassium permanganate
9. The gas evolved by the decomposition of copper carbonate is _____. **Ans:** (b) Carbon dioxide
10. Combustion is a kind of _____. **Ans:** (a) Oxidation

II. Say True or False:

1. Breaking a pane of glass is a chemical change. **Ans:** False
2. Mixing together materials where one is not soluble in the other is a physical change. **Ans:** True
3. In a physical change, no matter is added or removed. **Ans:** True
4. Nitrogen and hydrogen, when compressed and heated, change to ammonia gas. **Ans:** True
5. The color of potassium permanganate is yellow. **Ans:** False

III. Match the Following:

1. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ - Decomposition
2. $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$ - Oxidation
3. Water $\rightarrow$ Ice - Phase change
4. Alloy - Mixture of metals
5. $3\text{H}_2 + \text{N}_2 \rightarrow 2\text{NH}_3$ - Synthesis

IV. Multiple Answer Questions:

1. Which among these are physical changes?

Ans: (a) Breaking a pane of glass, (b) Dissolving sugar in water

2. Which among these indicate phase change?

Ans: (b) Liquid water to ice, (c) Ice to water (liquid)

3. Which among these are not physical changes?

Ans: (a) Burning carbon in air, (c) Burning magnesium in oxygen

4. Which among these are characteristics of a chemical change?

Ans: (a) Formation of one or more products, (c) Release or absorption of energy

5. Which among these are chemical changes?

Ans: (a) Turning graphite into diamond, (b) Oxidizing copper to form copper oxide, (c) Decomposition of KMnO_4 to produce O_2

V. Reasoning Type Questions:

1. **Statement-1 :** Copper foil gains mass when heated.

Statement-2 : Copper oxidizes, i.e., combines with oxygen when heated.

Ans: (a) Both statements are correct, and Statement-2 explains Statement-1.

2. **Statement-1 :** $\text{CuCO}_3 \rightarrow \text{CuO} + \text{O}_2$

Statement-2 : Copper carbonate decomposes to form copper oxide and oxygen.

Ans: (e) Both statements are false. (Correct decomposition: $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$.)

3. **Statement-1 :** $\text{CuSO}_4 \cdot 5\text{H}_2\text{O} \rightarrow \text{CuSO}_4 + 5\text{H}_2\text{O}$

Statement-2 : Hydrated copper sulphate converts into anhydrous copper sulphate.

Ans: (a) Both statements are correct, and Statement-2 explains Statement-1.

VI. Concept Questions:

1. **Write any two examples of physical change.**

Ans: Melting of ice into water

Tearing of paper

2. **What is the difference between physical change and chemical change?**

Ans: A **physical change** is a change in the physical properties of a substance, such as shape, size, or state, without changing its chemical composition.

A **chemical change** results in the formation of new substances with different chemical properties and composition.

3. **What is phase change?**

Ans: A **phase change** is a physical process where a substance changes its state (or phase) from one form to another, such as solid to liquid, liquid to gas, or vice versa. Examples include melting, freezing, boiling, and condensation.

4. **Write any two characteristics of physical change.**

Ans: No new substance is formed.

The change is usually reversible.

5. **Write any two characteristics of chemical change.**

Ans: A new substance is formed with different properties.

The change is usually irreversible and may involve heat, light, or gas release.

Application Skill Achiever:

I. Complete the chemical reactions:

1. $\text{Mg} + \text{O}_2$ **Ans:** 2MgO

2. $2\text{Cu} + \text{O}_2$ **Ans:** 2CuO

3. 2KMnO_4 **Ans:** $\text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2 \uparrow$

4. CaCO_3 **Ans:** $\text{CaO} + \text{CO}_2 \uparrow$

5. CuCO_3 **Ans:** $\text{CuO} + \text{CO}_2 \uparrow$

II. Choose the type of chemical reaction:

1. $\text{I}_2 \rightleftharpoons \text{I}_2$ **Ans:** Reversible

2. $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$ **Ans:** Decomposition

3. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ **Ans:** Decomposition

4. $2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$ **Ans:** Oxidation

5. $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$ **Ans:** Oxidation

III. Choose the correct type of change:

1. Magnetize an iron rod **Ans:** Physical change

2. Burning magnesium in air **Ans:** Chemical change

3. Making an alloy by mixing two metals **Ans:** Physical change

4. Making salt solution by mixing salt and sugar **Ans:** Physical change

EXERCISE - 5

I. Choose the correct answer:

1. The smallest element of an atom is _____. **Ans:** (a) Atom
2. The mass of an electron is _____ amu. **Ans:** (a) 0.000549
3. The relative mass of an electron is _____ of the mass of a proton. **Ans:** (a) 1/1837
4. The charge of an electron is _____. **Ans:** (a) 1.76×10^{-19} Coulomb
5. The mass of a proton is _____. **Ans:** (a) 1.673×10^{-27} kg
6. The charge of a neutron is _____. **Ans:** (a) Zero
7. The mass of a neutron is _____. **Ans:** (a) 1.675×10^{-27} kg
8. The mass number of an element is the sum of _____. **Ans:** (a) The number of protons and neutrons
9. Proton is discovered by _____. **Ans:** (d) None of these (Discovered by Ernest Rutherford)
10. The specific charge of a neutron is _____. **Ans:** (a) Zero
11. According to J.J. Thomson's atomic model, negative charges are embedded in: **Ans:** (a) A lump of positive charge
12. In Rutherford's atomic model, the electrostatic force of attraction is counterbalanced by: **Ans:** (a) The centripetal force exerted on the electrons moving in a circular path
13. Canal ray experiment led to the discovery of _____. **Ans:** (a) Protons
14. Which one of the following is an electromagnetic radiation? **Ans:** (c) X-rays
15. Cathode rays contain: **Ans:** (c) Electrons

II. Say True or False:

1. Proton, electron, and neutron are subatomic particles. **Ans:** True
2. Electron was discovered in the cathode ray experiment. **Ans:** True
3. Cathode rays travel in straight lines. **Ans:** True
4. Cathode rays have no penetrating power. **Ans:** False
5. Cathode rays do not ionize the gas through which they pass. **Ans:** False
6. Cathode rays deflect in the presence of a magnetic field. **Ans:** True
7. Thomson could successfully explain the electrical neutrality of an atom. **Ans:** True
8. In α -ray scattering, some α -rays deflect due to the attraction of electrons. **Ans:** False
9. Anode rays deflect towards the anode in the presence of an electric field. **Ans:** False
10. The α -ray scattering experiment proved the presence of the nucleus in an atom. **Ans:** True

III. Match the Following:

1. Plum pudding model - (c) Thomson's atomic model
2. Planetary model - (e) Rutherford's atomic model
3. Quantum theory - (d) Planck
4. Definite circular orbits - (a) Bohr's atomic theory
5. Atom is indivisible - (b) Dalton's atomic theory

IV. Match the Following:

1. Electron mass in amu - (f) 0.000549
2. Neutron mass in amu - (e) 1.008665
3. Proton mass in amu - (d) 1.007275
4. Electron mass in kg - (b) 9.109×10^{-31}
5. Proton mass in kg - (c) 1.673×10^{-27}
6. Neutron mass in kg - (a) 1.675×10^{-27}

V. Multiple Answer Questions:

1. A neutral atom has a nuclear charge $13\times$ and mass $27\times$ that of hydrogen. What is the $e^-:p^+$ ratio in its stable +ve ion? **Ans:** (b) 10:13
2. Which process can lead to ion formation? **Ans:** (a) Gain of electrons, (c) Loss of electrons
3. Bohr's theory is applicable to: **Ans:** (a) He^+ ion, (b) Li^{2+} ion, (c) Tritium (H^3)
4. The ratio of neutrons in O^{16} and O^{18} is: **Ans:** (a) 8:10
5. Alpha particles consist of: **Ans:** (a) Positively charged, (b) Doubly ionized helium nuclei

VI. Assertion and Reason Type Questions:

1. **Assertion** : Atom is electrically neutral.
Reason : A neutral particle (neutron) is present in the nucleus.
Ans: (b) Both correct, but reason does not explain assertion.
2. **Assertion** : Cathode rays deflect towards the positive plate.
Reason : Cathode rays consist of electrons.
Ans: (a) Both correct, and reason explains assertion.
3. **Assertion** : The mass of an electron is the least among fundamental particles.
Reason : The charge of an electron is $1.602 \times 10^{-19} \text{ C}$.
Ans: (b) Both correct, but reason is irrelevant.
4. **Assertion** : In Rutherford's experiment, most α -particles passed through the foil.
Reason : The positive charge and mass are concentrated in the nucleus.
Ans: (a) Both correct, and reason explains assertion.
5. **Assertion** : Isotopes have the same chemical properties.
Reason : Chemical properties do not depend on neutrons.
Ans: (a) Both correct, and reason explains assertion.

VII. Concept Questions:

1. Write the postulates of Dalton's atomic theory.

Ans: The postulates of Dalton's atomic theory:

- All matter is made up of tiny indivisible particles called atoms.
- Atoms of the same element are identical in mass and properties.
- Atoms of different elements have different masses and properties.
- Atoms cannot be created, divided, or destroyed in a chemical reaction.
- Atoms combine in fixed whole-number ratios to form compounds.
- A chemical reaction is a rearrangement of atoms.

2. What are the demerits of Dalton's atomic theory?

Ans: Demerits of Dalton's atomic theory:

- It could not explain the existence of subatomic particles (electrons, protons, neutrons).
- It did not explain the existence of isotopes (atoms of the same element with different masses).
- It failed to explain how atoms bond or form molecules.

3. Write the properties of cathode Rays.

Ans: Properties of Cathode Rays:

- Cathode rays are streams of negatively charged particles (electrons).
- They travel in straight lines.
- They produce a greenish glow when they strike a fluorescent screen.
- They are deflected by electric and magnetic fields.
- They can rotate a light paddle wheel, showing they have mass and momentum.

4. What are basic characteristics of Proton?

Ans: Basic characteristics of Proton:

- Proton is a positively charged particle.
- Its charge is +1 (same as the electron but opposite in sign).
- It is found inside the nucleus of an atom.
- Its mass is approximately 1 atomic mass unit (amu).
- The number of protons determines the atomic number of an element.

5. What are basic characteristics of neutron?

Ans: Basic characteristics of Neutron:

- Neutron has no charge (it is neutral).
- It is found in the nucleus of an atom.
- Its mass is slightly more than that of a proton (around 1 amu).
- It helps add mass and stability to the nucleus.
- Neutrons are important in nuclear reactions.

Application Skill Achiever:

I. Electronic configurations:

- | | | | | | | | | |
|-------------|-------------|--------|--------|--------|--------|--------|--------|-----------|
| 1. Al (13): | Ans: | $1s^2$ | $2s^2$ | $2p^6$ | $3s^2$ | $3p^1$ | | |
| 2. K (19): | Ans: | $1s^2$ | $2s^2$ | $2p^6$ | $3s^2$ | $3p^6$ | $4s^1$ | |
| 3. Cu (29): | Ans: | $1s^2$ | $2s^2$ | $2p^6$ | $3s^2$ | $3p^6$ | $4s^1$ | $3d^{10}$ |
| 4. O (8): | Ans: | $1s^2$ | $2s^2$ | $2p^4$ | | | | |
| 5. Si (14): | Ans: | $1s^2$ | $2s^2$ | $2p^6$ | $3s^2$ | $3p^2$ | | |
| 6. Na (11): | Ans: | $1s^2$ | $2s^2$ | $2p^6$ | $3s^1$ | | | |
| 7. Fe (26): | Ans: | $1s^2$ | $2s^2$ | $2p^6$ | $3s^2$ | $3p^6$ | $4s^2$ | $3d^6$ |

II. Identify elements from configurations:

- | | |
|---------------------------------|--|
| 1. $1s^2$: | Ans: Helium (He), Atomic No. 2 |
| 2. $1s^2 2s^2 2p^6 3s^1$: | Ans: Sodium (Na), Atomic No. 11 |
| 3. $1s^2 2s^2 2p^6 3s^2 3p^6$: | Ans: Argon (Ar), Atomic No. 18 |
| 4. $1s^1$: | Ans: Hydrogen (H), Atomic No. 1 |
| 5. $1s^2 2s^2 2p^2$: | Ans: Carbon (C), Atomic No. 6 |

EXERCISE - 6

I. Choose the correct answer:

- The atomic number of carbon is _____. **Ans:** (a) 6
- Which among these is correct about diamond? _____ **Ans:** (a) Diamond is a crystalline allotrope of Carbon
- Which among these is correct about graphite? _____ **Ans:** (a) Graphite is a crystalline allotrope of Carbon
- Which among these is correct about diamond? _____ **Ans:** (a) It is the hardest substance known
- Which among these is a good conductor of heat and electricity? _____ **Ans:** (b) Graphite
- The C-C bond in diamond is _____. **Ans:** (b) Covalent bond
- Diamond is _____ of electricity. **Ans:** (b) Bad conductor
- Diamond reacts with _____ at 750°C. **Ans:** (a) Fluorine
- The structure of graphite is _____. **Ans:** (b) Hexagonal and 3-dimensional
- The number of free electrons in graphite is _____. **Ans:** (c) One
- Graphite is _____ to X-rays. **Ans:** (b) Transparent
- Diamond and graphite burn to give out: **Ans:** (b) Carbon dioxide
- In diamond, the number of free electrons is: **Ans:** (c) 0
- Which among the following is not a free state of carbon? **Ans:** (c) Petrol
- Black diamonds are called: **Ans:** (b) Carbonado

II. Say True or False:

- Diamond is transparent to X-rays. **Ans:** True
- Diamond is a good conductor of heat and electricity. **Ans:** False
- At 700°C, diamond reacts with oxygen to form methane. **Ans:** False
- Wood charcoal is amorphous carbon. **Ans:** True
- Lampblack is a good conductor of electricity. **Ans:** False
- Sugar charcoal is prepared by pouring water on sugar syrup. **Ans:** False
- Bone charcoal is prepared by destructive distillation of bones. **Ans:** True
- Diamonds which are pure are colored. **Ans:** False
- Lead pencil is made up of lead metal. **Ans:** False
- Carbon and oxygen burn in excess to give carbon monoxide. **Ans:** False

III. Match the Following:

- Diamond - (d) Abrasive
- Water gas - (c) $\text{CO} + \text{H}_2$
- Producer gas - (b) $\text{CO} + \text{N}_2$
- Graphite - (a) Lubricant

IV. Match the Following:

- Wood charcoal - (e) Good absorbent
- Sugar charcoal - (c) Purest form of amorphous carbon
- Animal charcoal - (a) Bone charcoal
- Lampblack - (b) Soot deposited on kerosene lamps
- Coke - (f) Smokeless fuel
- Gas carbon - (d) Used as electrodes

V. Multiple Answer Questions:

- The following statements are true regarding diamond: **Ans:** (a) Diamond is the hardest substance, (b) It is three-dimensional
- Pyroligneous acid consists of: **Ans:** (a) Acetone, (b) Methanol, (c) Acetic acid
- A good fuel has these qualities: **Ans:** (a) High calorific value, (c) Easy to transport

4. Coke is used in the preparation of: **Ans:** (a) CO + H₂, (b) CO + N₂, (c) Artificial graphite
5. Pure diamonds are: **Ans:** (b) Transparent to X-rays, (c) Colorless

VI. Assertion and Reason Type Questions:

1. **Assertion** : Diamond is a bad conductor of electricity.

Reason : There are no free electrons in it.

Ans: (a) Both correct, and reason explains the assertion.

2. **Assertion** : Carbon has 2 crystalline forms.

Reason : This is due to the tetravalency of carbon.

Ans: (b) Both correct, but reason does not explain the assertion.

3. **Assertion** : Sugar charcoal is prepared by dehydration of cane sugar.

Reason : Sulfuric acid acts as a dehydrating agent.

Ans: (a) Both correct, and reason explains the assertion.

4. **Assertion** : Wood charcoal is heavier than water.

Reason : It floats on water.

Ans: (e) Both are incorrect.

5. **Assertion** : Biogas is a renewable source of energy.

Reason : Fossil fuels are non-renewable.

Ans: (b) Both correct, but reason does not explain the assertion.

VII. Concept Questions:

1. Write any four allotropes of carbon.

Ans: Four allotropes of carbon: Diamond, Graphite, Fullerene, Amorphous carbon (e.g., charcoal).

2. Write any two physical properties of diamond.

Ans: Physical properties of diamond: Hardest natural substance, poor conductor of electricity.

3. Write any two physical properties of graphite.

Ans: Physical properties of graphite: Soft, slippery, good conductor of electricity.

4. How graphite is prepared?

Ans: Preparation of graphite: Heating coke or coal at high temperatures (3000°C) in an electric furnace.

5. What are the uses of wood charcoal?

Ans: Uses of wood charcoal: Fuel, water purification, decolorizing agent.

Application Skill Achiever:

I. Complete the equations:

1. C (Diamond) + 2F₂ → **Ans:** CF₄
2. SiO₂ + 3C (coke) → **Ans:** SiC + 2CO
3. ZnO + C → **Ans:** Zn + CO
4. Fe₂O₃ + 3C → **Ans:** 2Fe + 3CO

II. Tick the correct form:

1. Diamond: **Ans:** Crystalline
2. Wood Charcoal: **Ans:** Amorphous
3. Graphite: **Ans:** Crystalline
4. Fullerene: **Ans:** Crystalline
5. Lamp Black: **Ans:** Amorphous

III. Tick the best answer:

1. Graphite: **Ans:** Good conductor of electricity
2. Diamond: **Ans:** Bad conductor of electricity
3. Fullerene: **Ans:** Bad conductor of electricity
4. Coke: **Ans:** Bad conductor of electricity
5. Sugar Charcoal: **Ans:** Bad conductor of electricity

EXERCISE - 7

I. Choose the correct answer:

1. The two oxides of carbon are: **Ans:** (a) CO_2 and CO
2. Carbon monoxide is used in the manufacturing of: **Ans:** (a) Methyl alcohol
3. _____ reduces metal oxides to metals. **Ans:** (a) CO
4. The carbon dioxide bond is: **Ans:** (a) Linear and covalent
5. Dry ice is: **Ans:** (b) Solid CO_2
6. Number of hydrogen atoms in a methane molecule is: **Ans:** (b) 4
7. Which is correct about carbon monoxide? **Ans:** (c) It is very stable
8. Which is toxic in nature? **Ans:** (a) CO
9. The molecular formula of carbonic acid is: **Ans:** (a) H_2CO_3
10. _____ reacts with water to form carbonic acid. **Ans:** (b) CO_2
11. Carbon monoxide differs from carbon dioxide in: **Ans:** (c) Combustibility
12. Water gas is a mixture of: **Ans:** (a) CO and H_2
13. Producer gas is a mixture of: **Ans:** (b) CO and N_2
14. Carbon monoxide is the acid anhydride of: **Ans:** (b) Formic acid
15. Carbogen is a mixture of: **Ans:** (b) 95% O_2 and 5% CO_2

II. Say True or False:

1. Carbon monoxide is slightly soluble in water. **Ans:** False
2. Carbon dioxide is highly soluble in water. **Ans:** True
3. Carbon dioxide is a colorless, odorless, and tasteless gas. **Ans:** True
4. Carbon monoxide is used in fire extinguishing. **Ans:** False
5. Carbon dioxide is used in the manufacture of urea. **Ans:** True
6. Diamond is the purest form of carbon. **Ans:** True
7. Gems are pure diamonds. **Ans:** False
8. Graphite is a bad conductor of electricity. **Ans:** False
9. Gas carbon is a crystalline allotrope of carbon. **Ans:** False
10. Incomplete combustion of hydrocarbon fuels leads to pollution. **Ans:** True

III. Match the Following:

1. Health salts - (c) Citric acid with sodium bicarbonate
2. Carbogen - (d) Oxygen with carbon dioxide
3. Producer gas - (a) Carbon monoxide with nitrogen
4. Water gas - (b) Carbon monoxide with hydrogen

IV. Assertion and Reason Type Questions:

1. **Statement A** : Foam extinguishers cannot be used for electrical fires.
Statement R : Foam does not cut the air supply.

Ans: (C) A is true, R is false (Foam conducts electricity; R is irrelevant.)

2. **Statement A** : Turning limewater milky tests for CO₂.

Statement R : Limewater forms calcium carbonate with CO₂.

Ans: (A) Both true, R explains A.

3. **Statement A** : Soda-acid extinguishers cannot be used for oil fires.

Statement R : The solution sinks to the bottom.

Ans: (B) Both true, but R does not explain A.

4. **Statement A** : Soda-acid extinguishers are used in electrical fires.

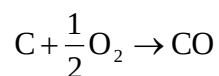
Statement R : The solution contains electrolytes.

Ans: (D) A is false, R is true (They are unsafe for electrical fires.)

V. Concept Questions:

1. **Write any one step to prepare carbon monoxide.**

Ans: Carbon monoxide can be prepared by heating carbon (like charcoal) in a limited supply of air or oxygen:



2. **Write any two physical properties of carbon monoxide.**

Ans: It is a colorless and odorless gas.

It is slightly lighter than air and is neutral to litmus.

3. **What are the uses of carbon monoxide?**

Ans: It is used as a fuel and reducing agent in metallurgy.

It is used in the production of chemicals like methanol.

4. **What are the uses of carbon dioxide?**

Ans: It is used in fire extinguishers.

It is used by plants in photosynthesis.

It is also used in making soft drinks fizzy.

5. **What are the harmful effects of carbon monoxide?**

Ans: It is highly poisonous and can cause headache, dizziness, or even death when inhaled in large amounts.

It binds with hemoglobin in blood and reduces the oxygen-carrying capacity, leading to suffocation.

EXERCISE - 8

I. Choose the correct answer:

1. A chemical reaction where reactants are solid and products are liquid is a _____. **Ans:** (b) Heterogeneous
2. A chemical reaction where reactants and products are gases is a _____. **Ans:** (a) Homogeneous
3. A reaction where heat is released is _____. **Ans:** (a) Exothermic
4. A reaction where heat is absorbed is _____. **Ans:** (b) Endothermic
5. Reactions proceeding in both directions are _____. **Ans:** (a) Reversible
6. Two reactants combining to form one product is a _____ reaction. **Ans:** (b) Combination
7. A single molecule breaking into many products is a _____ reaction. **Ans:** (a) Decomposition
8. A less reactive element replaced by a more reactive one is a _____ reaction. **Ans:** (a) Displacement
9. Formation of an insoluble compound is a _____ reaction. **Ans:** (c) Precipitation
10. Which is an endothermic reaction? **Ans:** (a) $\text{N}_2 + \text{O}_2 + \text{Heat} \rightarrow 2\text{NO}$

II. Say True or False:

1. Melting butter is a physical change. **Ans:** True
2. Heating sugar solution is a chemical change. **Ans:** True
3. Endothermic reactions absorb heat. **Ans:** True
4. In redox reactions, oxidation and reduction occur simultaneously. **Ans:** True
5. Two elements combine to form one compound in a displacement reaction. **Ans:** False
6. Exothermic reactions occur in hand warmers. **Ans:** True
7. Endothermic reactions occur during photosynthesis. **Ans:** True
8. In displacement, one metal replaces another. **Ans:** True
9. "Redox" is short for oxidation and reduction. **Ans:** True

III. Match the Following:

- | | |
|-------------------------------------|---|
| 1. Expansion/contraction of metals | Ans: (a) Physical change |
| 2. Action of heat on zinc hydroxide | Ans: (c) Chemical change |
| 3. A stone placed under sunlight | Ans: (d) Neither physical nor chemical |
| 4. Oxidizing agent | Ans: (b) Gives oxygen to another substance |

IV. Match the Following:

- | | |
|--------------------------------|----------------------------|
| 1. Absorption of energy | - (d) Endothermic reaction |
| 2. Curdling of milk | - (c) Chemical change |
| 3. Glowing of an electric bulb | - (a) Physical change |
| 4. Releasing energy | - (b) Exothermic reaction |

V. Multiple Answer Questions:

1. Chemical change involves:
Ans: (b) Change in composition, (c) Energy absorption/release
2. Incorrect statement(s):
Ans: (a) Physical changes are not reversible, (c) Physical changes involve color change.
3. The reaction $\text{AB} \rightarrow \text{A} + \text{B}$ is a:
Ans: (b) Decomposition reaction
4. Combination reaction:
Ans: (a) $\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$
5. Two compounds forming a new product:
Ans: (b) $\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$

VI. Assertion and Reason:

- Assertion** : Physical change alters all properties and composition.
Reason : Physical change alters composition without changing properties.
Ans: (e) Both incorrect. (Physical changes do not alter composition.)
- Assertion** : Burning coal is a physical change.
Reason : Carbon converts to CO₂ irreversibly.
Ans: (d) Assertion false, reason true.
- Assertion** : Beating metal into sheets is physical.
Reason : Sheets can be reconverted to metal.
Ans: (a) Both correct; reason explains assertion.
- Assertion** : Catalyst alters reaction rate and undergoes change.
Reason : Catalyst does not participate but changes rate.
Ans: (c) Assertion correct, reason incorrect.

VII. Concept Questions:

- Write any two reversible reactions.

Ans: Two reversible reactions: $N_2 + 3H_2 \rightleftharpoons 2NH_3$
 $2H_2O \rightleftharpoons 2H_2 + O_2$

- What is exothermic reaction?

Ans: An **exothermic reaction** is a chemical reaction that **releases heat** or energy to the surroundings.
Example: Burning of fuel.

- What is endothermic reaction?

Ans: An **endothermic reaction** is a chemical reaction that **absorbs heat** or energy from the surroundings.
Example: Photosynthesis.

- What is the difference between homogeneous and heterogeneous reaction?

Ans: In a homogeneous reaction, all the reactants and products are in the same phase (solid, liquid, or gas).
Example: Mixing of gases.
In a heterogeneous reaction, the reactants and products are in different phases.
Example: Reaction between a solid and a gas.

- What is an oxidizing agent?

Ans: An oxidizing agent is a substance that adds oxygen to another substance or removes electrons from it during a chemical reaction.
It helps in oxidation and gets reduced itself.
Example: Oxygen, potassium permanganate (KMnO₄).

Application Skill Achiever:

I. Choose the type of Reaction (Exothermic or Endothermic)

- $NH_4Cl(s) + H_2O(l) \rightarrow NH_4Cl(aq) - \text{Heat}$ **Ans:** Endothermic
- $2Na(s) + Cl_2(s) \rightarrow 2NaCl(s)$ **Ans:** Exothermic
- $Na_2S_2O_3 \cdot 5H_2O + H_2O \rightarrow Na_2SO_3(aq) - \text{Heat}$ **Ans:** Endothermic
- $N_2 + O_2 + \text{Heat} \rightarrow 2NO$ **Ans:** Endothermic
- $6CO_2 + 6H_2O + \text{Sunlight} \rightarrow C_6H_{12}O_6 + 6O_2$ **Ans:** Endothermic
- $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l) + \text{Heat}$ **Ans:** Exothermic
- $SnO_2(g) + 2C(s) \rightarrow Sn(s) + 2CO_2(g) - \text{Heat}$ **Ans:** Endothermic
- $CaO + H_2O \rightarrow Ca(OH)_2 + \text{Heat}$ **Ans:** Exothermic

9. $\text{C}_2\text{H}_6(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) + \text{Heat}$ **Ans:** Exothermic
10. $2\text{Mg}(\text{s}) + \text{O}_2(\text{g}) \rightarrow 2\text{MgO}(\text{s}) + \text{Heat}$ **Ans:** Exothermic

II. Choose the type of Reaction (Reversible or Irreversible)

1. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ **Ans:** Irreversible
2. $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$ **Ans:** Reversible
3. $\text{H}_2 + \text{I}_2 \rightleftharpoons 2\text{HI}$ **Ans:** Reversible
4. $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$ **Ans:** Irreversible
5. $\text{NH}_4\text{HCO}_3 + \text{NaCl} \rightarrow \text{NaHCO}_3 + \text{NH}_4\text{Cl}$ **Ans:** Irreversible
6. $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$ **Ans:** Reversible

III. Choose the type of Reaction (Homogenous or Heterogenous)

1. $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}(\text{g})$ **Ans:** Homogeneous
2. $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightarrow 2\text{HI}(\text{g})$ **Ans:** Homogeneous
3. $\text{Zn}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{ZnO}(\text{s})$ **Ans:** Heterogeneous
4. $2\text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}_2(\text{g})$ **Ans:** Homogeneous
5. $2\text{NH}_3(\text{g}) \rightarrow \text{N}_2(\text{g}) + 3\text{H}_2(\text{g})$ **Ans:** Homogeneous
6. $\text{HCl}(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l})$ **Ans:** Homogeneous
7. $\text{P}_4(\text{s}) + 5\text{O}_2(\text{g}) + 6\text{H}_2\text{O}(\text{l}) \rightarrow 4\text{H}_3\text{PO}_4(\text{l})$ **Ans:** Heterogeneous