

Teacher's Hand Book 9th Chemistry

EXERCISE - 1

I. Choose the Correct Answer

1. Substances that contain particles of only one kind are called _____. **Ans:** (a) Homogeneous
2. A pure substance is _____. **Ans:** (a) Homogeneous in nature
3. Silver and iron are examples of _____. **Ans:** (a) Metals
4. The number of atoms present in the molecule of an element is called its _____. **Ans:** (b) Atomicity
5. The molecules of a diatomic element contain _____ atoms. **Ans:** (a) Two
6. Which among these is correct about mercury? **Ans:** (c) Both a and b
7. Which among these is a property of metal? **Ans:** (a) Metals are good conductors of heat.
8. Metal oxides are _____ in nature. **Ans:** (b) Basic
9. Which of the following mixtures will be the most difficult to separate? **Ans:** (b) Nitrogen + hydrogen
10. You can separate a mixture of sand, salt, and water by _____. **Ans:** (a) Filtration and distillation
11. Which of the following is an example of a solid-in-gas mixture? **Ans:** (b) Smoke
12. Which changes of state occur during distillation? **Ans:** (b) Boiling followed by condensation

II. Say True or False:

1. The atomicity of Cu is one. **Ans:** False
2. Hydrogen gas is monoatomic. **Ans:** False
3. Ozone is polyatomic. **Ans:** True
4. Metals gain electricity easily. **Ans:** True
5. The atomicity of a monoatomic element is five. **Ans:** False
6. Distilled water cannot be separated into its constituents by physical methods. **Ans:** True
7. Separation of CCl_4 from CS_2 can be carried out by separating funnel method. **Ans:** False
8. A handful of soil is a homogeneous mixture of solids. **Ans:** False
9. A mixture of glucose water can be separated by the method of evaporation. **Ans:** True
10. The components of a mixture can never be separated by physical methods. **Ans:** False

III. Match the Following:

- | | | |
|-------------------------------|---|---|
| 1. Sublimation | - | e. Separation of iodine and sand |
| 2. Magnetic separation | - | d. Separation of iron and sand |
| 3. Gravity method | - | a. Separation of sand and sawdust |
| 4. Solvent extraction | - | c. Separation of sand and wax |
| 5. Fractional crystallization | - | b. Separation of NaCl from KNO_3 |

IV. Multiple Answer Questions:

1. Naphthalene and iron filings can be separated by the method of

Ans: (b) Sublimation, (c) Magnetic separation

2. Choose the correct statement from the following

Ans: (b) The constituent elements of a compound can be separated only by chemical reactions.,
(c) All pure substances are homogeneous in nature.

3. Which of the following is not miscible in alcohol?

Ans: (c) Diesel

4. Choose the correct statement from the following:

Ans: (a) Liquor ammonia and soda water are examples of liquid-gas type mixtures.
(b) Mixture of coconut oil and water can be separated using separating funnel.

5. Choose the correct statement from the following:

Ans: (a) Constituents of ink can be separated by a technique known as chromatography.
(b) By the method of diffusion a mixture helium and sulphur dioxide can be separated.

V. Reason Type Questions:

1. **Statement-1** : A mixture of ammonium chloride and sand can be separated using sublimation.

Statement-2 : Ammonium chloride on heating converts from solid to gas directly.

Ans: (a) Both statements are correct and Statement-2 is the correct explanation of Statement-1.

2. **Statement-1** : The constituents of petroleum can be separated using fractional distillation.

Statement-2 : Fractional distillation is a method of separating heterogeneous liquid mixtures.

Ans: (c) Statement-1 is true & Statement-2 is false.

3. **Statement-1** : All homogeneous substances are pure.

Statement-2 : Alloys are homogeneous mixtures and are pure.

Ans: (e) Both the statements are false.

4. **Statement-1** : A mixture of hydrogen and sulphur dioxide gas can be separated using a method of diffusion.

Statement-2 : Diffusion is a method of separation by which two gases with greater difference in their densities are separated.

Ans: (a) Both statements are correct and Statement-2 is the correct explanation of Statement-1.

VI. Concept Questions:

1. **Write any three physical properties of metals.**

Ans:

- Metals are lustrous (shiny in appearance).
- They are good conductors of heat and electricity.
- Metals are generally malleable (can be beaten into sheets) and ductile (can be drawn into wires).

2. **Write any three chemical properties of metals.**

Ans:

- Metals react with oxygen to form basic metal oxides.
- Metals react with acids to produce hydrogen gas.
- Metals lose electrons to form positive ions (cations) during chemical reactions.

3. **What is the difference between metal and non-metal?**

Ans: Metals are generally hard, shiny, and good conductors, while non-metals are usually soft, dull, and poor conductors.

Metals form basic oxides, while non-metals usually form acidic oxides.

Metals lose electrons, whereas non-metals gain or share electrons in reactions.

4. **What is a metalloid?**

Ans: A metalloid is an element that shows properties of both metals and non-metals.

Example: Silicon (Si), Arsenic (As), and Boron (B).

5. **Write any three physical properties of non-metals.**

Ans:

- Non-metals are non-lustrous (except iodine).
- They are generally brittle and not ductile or malleable.
- Non-metals are poor conductors of heat and electricity (except graphite).

6. **Write any three chemical properties of non-metals.**

Ans:

- Non-metals react with oxygen to form acidic oxides.
- They gain or share electrons to form negative ions or covalent bonds.
- Non-metals do not react with dilute acids like metals do.

7. **What is a compound?**

Ans: A compound is a pure substance made up of two or more elements chemically combined in a fixed ratio.

Example: Water (H_2O) is a compound formed by hydrogen and oxygen.

Application Skill Achiever

I. Choose the best answer:

1. Germanium **Ans:** Metalloid
2. Mercury at room temperature **Ans:** Liquid
3. P_4 **Ans:** Polyatomic
4. H_2O **Ans:** Pure substance
5. Sulphur **Ans:** Nonmetal

II. Which process of separation is used to separate the given combination.

1. Charcoal + iron flakes **Ans:** Magnetic separation
2. Sand + water **Ans:** Sedimentation
3. NaCl + water **Ans:** Distillation
4. KNO_3 + NaCl **Ans:** Fractional crystallization
5. Chalk + water **Ans:** Filtration

III. Do the following:

1. Find out the percentage composition of chlorine in Hydrochloric Acid molecule (HCl).

SOL:

Step 1: Atomic masses: H = 1, Cl = 35.5

Step 2: Molar mass of HCl = 1 + 35.5 = 36.5 g/mol

Step 3: Percentage of Cl = $\frac{35.5}{36.5} \times 100 = 97.26\%$

Ans: 97.26%

2. Find out the percentage composition of Ammonia molecule (NH_3).

SOL:

Molecular formula: NH_3

Atomic masses: Nitrogen (N) = 14; Hydrogen (H) = 1

Molar mass of NH_3 = 14 + (1 × 3) = 14 + 3 = 17 g/mol

Now, calculate percentage of each element:

% of Nitrogen = $\frac{14}{17} \times 100 = 82.35\%$

% of Hydrogen = $\frac{3}{17} \times 100 = 17.65\%$

Ans: Nitrogen: 82.35%, Hydrogen: 17.65%

3. Calculate the percentage composition of water molecule (H_2O).

SOL:

Molecular formula: H_2O

Atomic masses: Hydrogen (H) = 1; Oxygen (O) = 16

Molar mass of H_2O = (1 × 2) + 16 = 2 + 16 = 18 g/mol

Now, calculate:

% of Hydrogen = $\frac{2}{18} \times 100 = 11.11\%$

% of Oxygen = $\frac{16}{18} \times 100 = 88.89\%$

Ans: Hydrogen: 11.11%, Hydrogen: 88.89%

EXERCISE - 2

I. Choose the Correct Answer

1. The symbol of antimony is _____.
Ans: (c) Sb
2. The symbol of Copper is _____.
Ans: (b) Cu
3. The symbol of gold is _____.
Ans: (c) Au
4. The symbol represents the _____ of an element.
Ans: (b) Name
5. The combining capacity of atoms to form molecule is called _____.
Ans: (a) Valency
6. The symbol "I" represents _____.
Ans: (b) Iodine
7. The symbol "Sn" represents _____.
Ans: (b) Tin
8. A _____ is an atom or group of atoms with some positive or negative charge.
Ans: (c) Radical
9. The symbol of sodium is _____.
Ans: (b) Na
10. The ammonium radical is _____.
Ans: (c) NH_4^+
11. Name of the element Ni is _____.
Ans: (c) Nickel
12. Which one of the following is not monovalent? _____.
Ans: (b) Aluminium
13. The ions Mg and PO_4 combine to form compounds _____.
Ans: (a) $\text{Mg}_3(\text{PO}_4)_2$
14. The name of the compound Na_2ZnO_2 is _____.
Ans: (c) Sodium Zincate
15. The valency of gold in AuCl is _____.
Ans: (a) 1

II. Say True or False:

1. The symbol of mercury is Hg. **Ans:** True
2. The symbol of potassium is P. **Ans:** False
3. The symbol of silver is Ag. **Ans:** True
4. Some elements exhibit more than one valency. **Ans:** True
5. The symbol of iron is Fe. **Ans:** True

III. Match the Following

- | | | |
|--------------------------------|---|--------------------|
| 1. 3 Chromium atoms | - | (c) 3Cr |
| 2. 6 Chloride ions | - | (d) 6Cl^- |
| 3. 2 Cobalt atoms | - | (a) 2Co |
| 4. 2 Carbon monoxide molecules | - | (e) 2CO |
| 5. 6 Chlorine molecules | - | (b) 6Cl_2 |

IV. Match the Following

- | | | |
|-----------------|---|----------------------|
| 1. Hypochlorite | - | (d) ClO^- |
| 2. Perchlorate | - | (e) ClO_4^- |
| 3. Bromate | - | (a) BrO_3^- |
| 4. Bromite | - | (c) BrO_2^- |
| 5. Hypobromite | - | (b) BrO^- |

V. Reason Type Questions:

1. **Statement-1** : Ferrous ion is a divalent ion.
Statement-2 : Iron atom loses two electrons to carry two positive charges.
Ans: (a) Both correct; Statement-2 explains Statement-1.
2. **Statement-1** : Balancing a chemical equation is important to study a chemical reaction.
Statement-2 : A Balanced equation tells about energy changes that take place.
Ans: (b) Both correct, but Statement-2 does not explain Statement-1.

3. **Statement-1** : As both calcium and sulphate carry two positive charges the formula of calcium sulphate is $\text{Ca}_2(\text{SO}_4)_2$.

Statement-2 : Calcium sulphate is a compound formed by combination of calcium and sulphate ions.

Ans: (d) Statement-1 false; Statement-2 true.

4. **Statement-1** : A formula tells about the source of the compound.

Statement-2 : Formula is the shorthand notation of representation of one molecule of a compound.

Ans: (d) Statement-1 false; Statement-2 true.

5. **Statement-1** : Oxidation number of an element can be a whole number, zero or a fractional number. But valency can never be zero.

Statement-2 : Valency of inert gases is zero.

Ans: (e) Both false (valency of inert gases is zero, contradicting Statement-1).

VI. Concept Questions:

1. What is a symbol?

Ans: A symbol is a shorthand representation of a chemical element. It usually consists of one or two letters. The first letter is always capital, and the second letter, if present, is small.

A symbol represents:

- The name of the element.
- One atom of that element.
- The atomic mass of the element (when expressed in grams, it represents one mole of atoms).

Examples:

- H stands for Hydrogen
- stands for Oxygen
- Na stands for Sodium (from its Latin name Natrium)

2. Write the name and symbol of any five elements whose symbol is derived from Latin names:

Ans: The name and symbol of any five elements whose symbol is derived from Latin names:

- o Gold (Au – Aurum)
- o Silver (Ag – Argentum)
- o Iron (Fe – Ferrum)
- o Potassium (K – Kalium)
- o Sodium (Na – Natrium)

3. What is valency of an element?

Ans: Valency is the combining capacity of an element. It is the number of electrons an atom can gain, lose, or share to become stable and form a chemical bond. For example, the valency of hydrogen is 1 because it can share one electron.

4. What is variable valency?

Ans: Some elements can show more than one valency. This is called variable valency. It usually happens in transition metals. For example, iron (Fe) can have a valency of 2 (Fe^{2+}) or 3 (Fe^{3+}).

5. 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. It takes part in chemical reactions as a whole. For example, SO_4^{2-} (sulfate) and NH_4^+ (ammonium) are radicals.

6. What does a symbol represent?

Ans: A symbol represents an element. It stands for one atom of the element and also indicates its name. For example, the symbol O stands for one atom of oxygen.

Application Skill Achiever

I. Write the formula of the following carbonate compounds.

1. Hydrogen carbonate : **Ans:** HCO_3^-
2. Calcium carbonate : **Ans:** CaCO_3
3. Sodium carbonate : **Ans:** Na_2CO_3
4. Lithium carbonate : **Ans:** Li_2CO_3
5. Magnesium carbonate : **Ans:** MgCO_3

II. Write the formula of the following compounds.

1. Ammonium chloride : **Ans:** NH_4Cl
2. Ammonium hydroxide : **Ans:** NH_4OH
3. Sodium hydroxide : **Ans:** NaOH
4. Zinc phosphate : **Ans:** $\text{Zn}_3(\text{PO}_4)_2$
5. Ammonium sulphate : **Ans:** $(\text{NH}_4)_2\text{SO}_4$

III. Write the name of the following radicals.

1. ClO_3^- : **Ans:** Chlorate
2. PO_3^{3-} : **Ans:** Phosphite
3. HSO_4^- : **Ans:** Hydrogen sulfate (or Bisulfate)
4. OH^- : **Ans:** Hydroxide
5. NO_3^- : **Ans:** Nitrate

EXERCISE - 3

I. Choose the Correct Answer.

1. Na^+ and Cl^- combine together to form _____. **Ans:** (a) NaCl(s)
2. The chemical bond formed by transfer of electrons from a metal to a non-metal is known as _____. **Ans:** (a) Ionic bond
3. Cation is _____. **Ans:** (a) Positive charge
4. Strong electrostatic force exists in _____ compounds. **Ans:** (a) Ionic
5. Ionic compounds are _____. **Ans:** (b) Crystalline solids
6. The melting point and boiling point of _____ compound is high. **Ans:** (a) Ionic
7. In solid state, ionic compounds _____ electricity. **Ans:** (b) Do not conduct
8. Which among these is an ionic compound? _____. **Ans:** (c) MgO_2
9. In molten or solution state, ionic compounds _____ electricity. **Ans:** (a) Conduct
10. The Lewis theory gave the first explanation of _____. **Ans:** (a) Covalent bond
11. The total number of electrons that take part in forming bonds in N_2 is _____. **Ans:** (c) 6
12. The molecule that deviates from octet rule is _____. **Ans:** (b) BF_3
13. Which of the following is easily formed? _____. **Ans:** (c) Potassium bromide
14. Which of the following compounds contains a covalent bond? _____. **Ans:** (b) H_2
15. Identify the compound with the strongest ionic bond. _____. **Ans:** (b) MgO

II. Say True or False

1. The Cl_2 molecule is formed by covalent bonds. **[True]**
2. In covalent bond some electrons are shared by both atoms. **[True]**
3. The nitrogen gas N_2 has three covalent bonds. **[True]**
4. Covalent compounds are generally not soluble in water. **[True]**

5. Ionic compounds are insoluble in water. [False]
6. Na is more stable than Na^+ . [False]
7. A chloride ion is bigger than its neutral atom. [True]
8. Molecules possess more energy than the total energy of their combining atoms. [False]
9. In Lewis dot symbols, dots indicate the number of electrons of inner shell. [False]
10. Nitrogen shows pentavalency. [False]

III. Match the Following

1. Ionic bond $\rightarrow$ (d) CaF_2
2. Polar covalent bond $\rightarrow$ (e) HBr
3. Coordinate covalent bond $\rightarrow$ (b) H_3O^+
4. Non-polar covalent bond $\rightarrow$ (a) N_2
5. Stability $\rightarrow$ (c) Inert gas configuration

IV. Multiple Answer Questions.

1. Ionic compounds have _____ points.

Ans: (a) High melting, (b) High boiling points

2. In which of the following molecules the central atom of the molecule does not have Octet?

Ans: (b) BCl_3 , (c) BF_3

3. Identify the compounds that contain both ionic and covalent bonds.

Ans: (a) NaOH, (b) KCN

4. Which of the following molecules contain odd electron bonds?

Ans: (b) NO, (c) NO_2

V. Reason Type Questions

1. **Statement-1** : Generally, covalent compounds are gases, liquids or soft solids at room temperature.

Statement-2 : Between covalent compounds Vander Waals forces of attractions exists

Ans: (a) Both correct; Statement-2 explains Statement-1.

2. **Statement-1** : Ionic compounds are bad conductors of electricity.

Statement-2 : In ionic compounds mobile ions exists.

Ans: (b) Both correct but unrelated (solid state lacks mobile ions).

3. **Statement-1** : Covalent compounds contains ions.

Statement-2 : Covalent compounds are good conductor of electricity.

Ans: (e) Both false (Covalent compounds lack ions and are poor conductors).

4. **Statement-1** : Ionic compounds are generally hard solids but brittle in nature.

Statement-2 : Brittleness is because of shift in alignment of its ions. Hardness is due to the strong forces of attraction.

Ans: (a) Both correct; Statement-2 explains Statement-1.

VI. Concept Questions

1. Name the two types of ions present in NaCl.

Ans: The two types of ions present in NaCl are:

Sodium ion (Na^+)

Chloride ion (Cl^-)

2. In sodium chloride lattice, how many Cl^- ions surround each Na^+ ion?

Ans: In the NaCl crystal lattice, each Na^+ ion is surrounded by six Cl^- ions in a cubic arrangement.

3. Why is NaCl a bad conductor of electricity in solid state?

Ans: NaCl is a bad conductor of electricity in solid state because the ions are fixed in position in the crystal lattice and cannot move freely to carry electric current.

4. Write any three properties of ionic bond.

Ans: Ionic bonds are formed by the transfer of electrons from a metal to a non-metal.
Ionic compounds have high melting and boiling points due to strong electrostatic forces.
They conduct electricity in molten or aqueous state but not in solid state.

5. Write any two properties of covalent bond.

Ans: Covalent bonds are formed by sharing of electrons between atoms.
Covalent compounds are generally poor conductors of electricity and may have low melting and boiling points.

Application Skill Achiever

I. Detects the bond in the molecules.

1. H_2O **Ans:** Covalent
2. NH_3 **Ans:** Covalent
3. CH_3CHO **Ans:** Covalent
4. MgO **Ans:** Electrovalent (Ionic)
5. Cl_2 **Ans:** Covalent
6. NaCl **Ans:** Electrovalent (Ionic)
7. CO_2 **Ans:** Covalent
8. MgCl_2 **Ans:** Electrovalent (Ionic)
9. H_2 **Ans:** Covalent
10. O_2 **Ans:** Covalent

II. Write the formula of the compounds.

1. CaCl_2
2. CH_4

EXERCISE - 4

I. Choose the Correct Answer

1. In Mendeleev's periodic table, the elements are classified on the basis of their _____. **Ans:** (c) Mass number
2. In the modern periodic table elements are arranged in the increasing order of their _____. **Ans:** (a) Atomic numbers
3. The modern periodic table has _____ periods. **Ans:** (b) 7
4. In modern periodic table the first period has _____ elements. **Ans:** (a) Two
5. In modern periodic table the second period has _____ elements. **Ans:** (a) Eight
6. In a period the number of valence electrons _____. **Ans:** (a) Increases from 1 to 8
7. In a period the valency of the elements _____. **Ans:** (a) Increases from 1 to 4 and then decreases from 4 to 0 from the left to the right
8. In a period the metallic property of the elements _____. **Ans:** (b) Decreases from the left to the right
9. In a period the non-metallic property of the elements _____. **Ans:** (a) Increases from the left to the right
10. Metalloids appear at the _____ of the periodic table. **Ans:** (a) Middle
11. The long form of the periodic table is based on _____. **Ans:** (a) Number of electrons
12. The pair of atomic numbers which belong to the same group _____. **Ans:** (c) 12, 56
13. Anomalous pair among the following is _____. **Ans:** (c) Cobalt and Nickel
14. Largest ion among the following is _____. **Ans:** (c) S^{2-}

II. Say True or False

1. Hydrogen and helium are in the first period of the periodic table. **Ans:** True
2. The fourth period in the periodic table is incomplete. **Ans:** False
3. The second period is called very long period. **Ans:** False
4. Silicon is a metalloid. **Ans:** True
5. Na is in the second period of the periodic table. **Ans:** False
6. Elements are classified for their systematic study. **Ans:** True
7. Active elements are placed on the right side of the periodic table. **Ans:** False
8. Fifth period of the modern periodic table has 18 elements. **Ans:** True
9. Elements of the same group have same number of electrons for bonding. **Ans:** True
10. Potassium is the most reactive alkali metal. **Ans:** False

III. Match the Following

1. Highest electro negativity - c. Fluorine
2. Highest electron affinity - d. Chlorine
3. Highest electro positivity - a. Caesium
4. Highest oxidation number - b. Ruthenium

IV. Match the Following

1. Dobereiner - d. Law of triads
2. Newlands - c. Law of octaves
3. Mendeleev - a. Atomic weight
4. Modern periodic table - b. Atomic number

V. Multiple Answer Questions

1. Elements are classified:

- Ans:** (a) To correlate their properties with some fundamental property
(b) To study the elements better
(c) To find relationship among elements

2. Which are the demerits of Mendeleev's periodic table?

- Ans:** (a) No proper position for hydrogen
(b) Grouping of chemically dissimilar elements
(c) Position given to isotopes

3. Which of the following positions of elements have same number of valence electrons as atomic number 6 (Carbon)?

- Ans:** (b) Group 14 and period 4

4. The pair of elements having same number of valence electrons:

- Ans:** (a) Zn, Mg (b) Cl, I

5. As we move from left to right in a period, which properties decrease?

- Ans:** (b) Atomic size (c) Electropositivity

VI. Reason Type Questions

1. **Statement-1** : According to Dobereiner's, a group of three similar elements arranged in their increasing atomic weights show that atomic weight of middle is equal to the arithmetic mean of the other two elements.

Statement-2 : Atomic weight is equal to one twelfth of mass of a carbon atom.

- Ans:** (c) Statement-1 is true & Statement-2 is false.

2. **Statement-1** : Newland's law of octaves of elements is a function of their state that the property of every eighth element is the repetition of the first.

Statement-2 : The maximum of 8 electrons can be accommodated in valence shell.

Ans: (b) Both correct but not explanatory.

3. **Statement-1** : Alkali metals have least value of ionisation energy within a period.

Statement-2 : They precedes halogens in periodic table.

Ans: (b) Both correct but unrelated.

4. **Statement-1** : Smaller the size of an atom greater is the electronegativity.

Statement-2 : Electro negativity refer to the tendency of atom to share electrons with other.

Ans: (a) Both correct; Statement-2 explains Statement-1.

5. **Statement-1** : First period of periodic table is shortest period.

Statement-2 : A K shell can accommodate a maximum of two electrons.

Ans: (a) Both correct; Statement-2 explains Statement-1.

6. **Statement-1** : The size of Na^+ ion is smaller than Na

Statement-2 : Na^+ has same nuclear charge as that of Na

Ans: (a) Both correct; Statement-2 explains Statement-1.

VII. Answer the followings.

1. What are the defects of Mendeleev's periodic table?

Ans: Mendeleev's periodic table had these limitations:

- No fixed position for hydrogen
- Position of isotopes not justified
- Anomalous pairs of elements
- Grouping of dissimilar elements

2. How many periods exist in the modern periodic table?

Ans: The modern periodic table has 7 periods:

- Period 1 : 2 elements (H, He)
- Periods 2 & 3 : 8 elements each
- Periods 4 & 5 : 18 elements each
- Period 6 : 32 elements (Lanthanides included)
- Period 7 : Incomplete (32 elements, Actinides included)

3. What are the nine main groups in the modern periodic table?

Ans: The nine main groups are:

1. Group 1 : Alkali Metals (e.g., Na, K)
2. Group 2 : Alkaline Earth Metals (e.g., Mg, Ca)
3. Group 13 : Boron Family (e.g., Al, Ga)
4. Group 14 : Carbon Family (e.g., C, Si)
5. Group 15 : Nitrogen Family (e.g., N, P)
6. Group 16 : Chalcogens (e.g., O, S)
7. Group 17 : Halogens (e.g., Cl, Br)
8. Group 18 : Noble Gases (e.g., Ne, Ar)
9. Groups 3–12 : Transition Metals (e.g., Fe, Cu)

4. How do the valency property change in the periodic table?

Ans:

- In a period, valency increases from 1 to 4 and then decreases to 0
- In a group, valency remains the same

5. How do the atomic number change in the periodic table?

- Ans:**
- Left to right (→): Increases by 1 for each element (e.g., Li=3, Be=4, B=5).
 - Top to bottom (↓): Increases significantly as new shells are added (e.g., F=9, Cl=17, Br=35).

6. How do the atomic size change in the periodic table?

- Ans:**
- Across a period (→): Decreases (stronger nuclear pull shrinks the atom).
 - Down a group (↓): Increases (additional electron shells expand the atom).

Example:

- Period 2: Li (large) → Ne (small).
- Group 1: Li (small) → Cs (very large).

7. How do metallic properties change in the periodic table?

- Ans:**
- Across a period (→): Decreases (elements become more non-metallic).
 - Down a group (↓): Increases (e.g., Group 1 metals get more reactive from Li to Fr).

Example:

- Period 3: Na (metal) → Cl (non-metal).
- Group 14: C (non-metal) → Pb (metal).

8. Why was the basis of classification changed from atomic mass to atomic number?

Ans: The change was made because:

- Atomic number = Proton number, which is unique to each element.
- Solved anomalies (e.g., Co (27) correctly placed before Ni (28)).
- Isotopes accommodated (same atomic number, different masses).
- Better explained periodicity of properties.

9. What is a periodic property? How do these properties change in groups and periods?

Ans: Periodic Property: A property that repeats at regular intervals in the periodic table

(a) Atomic Radius:

- Increases down a group
- Decreases across a period

(b) Ionization Energy:

- Decreases down a group
- Increases across a period

(c) Electron Affinity:

- Decreases down a group
- Increases across a period

(d) Electronegativity:

- Decreases down a group
- Increases across a period

Application Skill Achiever

I. Choose the best answer:

1. Na (Sodium) **Ans:** [✓] Metal
2. Ar (Argon) **Ans:** [✓] Nonmetal
3. Mg (Magnesium) **Ans:** [✓] Metal
4. P (Phosphorus) **Ans:** [✓] Nonmetal
5. S (Sulfur) **Ans:** [✓] Nonmetal
6. Al (Aluminium) **Ans:** [✓] Metal

7. Si (Silicon) **Ans:** [✓] Metalloid
8. Ge (Germanium) **Ans:** [✓] Metalloid
9. C (Carbon) **Ans:** [✓] Nonmetal
10. Sn (Tin) **Ans:** [✓] Metal

II. Put the appropriate symbol as per the size of atoms. (>, <)

1. $H < Na$ 2. $Li > N$ 3. $K > Ca$
4. $C > Ne$ 5. $C < Pb$

EXERCISE - 5

I. Choose the Correct Answer

1. A homogeneous mixture has:

Ans: (a) Only one phase

2. A heterogeneous mixture has:

Ans: (b) More than one phase

3. A Solution is a:

Ans: (a) Homogeneous mixture composed of two or more substances

4. Which among these is correct about polar compounds?

Ans: (a) Polar compounds are soluble in polar solvents.

5. Which among these is correct about non-polar compounds?

Ans: (b) Non-polar compounds dissolve in non-polar solvents.

6. Methane (CH_4) dissolves in:

Ans: (a) CCl_4

7. Which among these is correct about the solubility and temperature in exothermic solutions?

Ans: (a) Solubility decreases on increase of temperature.

8. The molarity of pure Water is:

Ans: (c) 55.5

9. One kg of water contains 4 g of NaOH. The concentration of the solution is:

Ans: (a) 0.1 molal

10. Naphthalene dissolves in kerosene because naphthalene and kerosene are respectively:

Ans: (c) Non-polar and non-polar

11. The sum of mole fractions of solute and solvent of a solution is equal to:

Ans: (b) unity

12. Saturated solution of NaCl on heating:

Ans: (b) becomes unsaturated

II. Say True or False

1. Oil and gasoline are non-polar. **Ans:** True
2. The amount of solute present in a given amount of solution is known as concentration. **Ans:** True
3. Water is a non-polar solvent. **Ans:** False
4. Sodium amalgam is an example of solid-solid solution. **Ans:** False
5. A concentrated solution contains high amount of solute. **Ans:** True
6. Polar compounds are soluble in alcohol. **Ans:** True

7. The molality of a solution is 0.2 m when 18 g of glucose is dissolved in 500 mL of Water. **Ans:** True
8. Concentration is measured in moles per litre. **Ans:** True
9. The concentration of a 5% aqueous solution of Na_2CO_3 is 40 g. **Ans:** False
10. The number of moles of solute present in 600 mL of 0.05 M solution is 0.03. **Ans:** True

III. Match the Following

1. Saturated Solution → (d) Solution which cannot dissolve any more solute.
2. Supersaturated solution → (e) Solution which has excess of solute.
3. Unsaturated solution → (a) Solution which can dissolve some more solute.
4. Alcohol in water → (b) Liquid in liquid solution.
5. Fog → (c) Liquid in solid solution

IV. Multiple Answer Questions

1. Polar compounds are:

Ans: (a) Ionic, (b) Soluble in polar solvent.

2. With increase in pressure:

Ans: (a) Solubility of solids in liquids is unaffected, (b) Solubility of gases in liquids increases.

3. 2.5 M sulphuric acid contains:

Ans: (b) 245.0 g of sulphuric acid per 1000 mL of solution.

4. With increase in temperature, the solubility of solids in liquids:

Ans: (a) Generally increases.

5. 4 M solution of NaOH contains:

Ans: (a) 160 g of NaOH dissolved in 1000 mL of water.

V. Reason Type Questions

1. **Statement-1** : A solution is a homogeneous mixture of two or more chemically non-reacting substances.
Statement-2 : Solution is prepared by the combination of two same phases of matter.

Ans: (c) Statement-1 is true & Statement-2 is false

2. **Statement-1** : The solubility of a solid in a liquid increases with increase of pressure.
Statement-2 : Solubility of gas in a liquid is directly proportional to the pressure of the gas.

Ans: (d) Statement-1 is false & Statement-2 is true

3. **Statement-1** : The boiling point of 0.1 M urea solution is less than that of 0.1 M KCl solution.
Statement-2 : Elevation of boiling point is directly proportional to the number of species present in the solution.

Ans: (a) Both statements are correct and Statement-2 is the correct explanation of Statement-1

4. **Statement-1** : If more and more solute is added to a solvent, the freezing point of the solution keeps on becoming higher and higher.

Statement-2 : Presence of large amount of the solid solute does not allow the solution to freeze.

Ans: (d) Statement-1 is false & Statement-2 is true

VI. Concept Questions

1. What is a solution?

Ans: A solution is a homogeneous mixture of two or more substances. It consists of a solute (the substance that gets dissolved) and a solvent (the substance that does the dissolving).

Example: Salt dissolved in water.

2. What is a saturated solution?

Ans: A saturated solution is one in which no more solute can be dissolved in the solvent at a given temperature. Any extra solute added remains undissolved.

3. What is an unsaturated solution?

Ans: An unsaturated solution is a solution that can still dissolve more solute at a given temperature. It has not yet reached its saturation point.

4. What is a super saturated solution?

Ans: A super saturated solution is a solution that contains more solute than it can normally hold at a given temperature. It is formed by heating a saturated solution, adding more solute, and then cooling it slowly.

5. What is the effect of temperature on saturated solutions?

Ans: When the temperature increases, the solubility of most solid solutes in liquids also increases, meaning more solute can be dissolved, and the solution may become unsaturated. However, cooling may cause the excess solute to crystallize out.

EXERCISE - 6

I. Choose the Correct Answer

1. The nitrogen content in the atmosphere is: **Ans:** (a) 78%
2. What is the color of nitrogen gas? **Ans:** (c) Colorless
3. The weight of nitrogen is: **Ans:** (b) Heavier than air
4. Nitrogen liquefies at: **Ans:** (a) High pressure & low temperature
5. Nitrogen is used in the manufacture of: **Ans:** (a) Ammonia
6. Nitrogen is: **Ans:** (c) Non-poisonous
7. Nitrogen is used for filling electric bulbs because it is: **Ans:** (b) Not helpful in burning
8. Animals die in nitrogen because: **Ans:** (a) Of deficiency of oxygen
9. Nitrogen is liberated by the thermal decomposition of: **Ans:** (c) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$
10. Which compound produces N_2 on strong heating? **Ans:** (c) NH_4NO_2
11. Nitrogen can be prepared by the action of ammonia on: **Ans:** (b) Chlorine

II. Say True or False

1. Nitrogen is present in acid rain. **Ans:** False
2. Ammonia is a compound of nitrogen. **Ans:** True
3. Proteins contain nitrogen. **Ans:** True
4. Nitrogen is a poisonous gas. **Ans:** False
5. Nitrogen supports combustion. **Ans:** False
6. Nitrogen does not form sulphides. **Ans:** True
7. Nitrogen is present in air in combined state. **Ans:** False
8. On heating, metals react with nitrogen. **Ans:** True
9. Liquid nitrogen is used as a refrigerant. **Ans:** True
10. Nitrogen gas turns moist blue litmus paper red. **Ans:** False

III. Match the Following

1. High-temperature thermometers → (a) Reduce evaporation
2. Canning foodstuffs → (c) Retard bacterial growth
3. Plants → (b) Protein synthesis
4. Refrigerant → (a) Provide low temperatures
5. Diluting agent → (d) Control rate of combustion

IV. Multiple Answer Questions

1. Which of the following statements is/are true about nitrogen?

Ans: (b) Ease of formation of triple bond, (c) It is a typical non metal

2. Which of the following applications reveal that nitrogen is inert?

Ans: (a) Tinned food products, (b) Electric bulbs

3. Which of the following gives nitrogen on thermal decomposition?

Ans: (c) Ammonium dichromate

4. Nitrogen is _____

Ans: (d) None of these

5. Nitrogen is used in high temperature thermometer:

Ans: (a) Prevents mercury vaporization

V. Reason Type Questions

1. **Statement-1** : Nitrogen has a boiling point of -196°C .

Statement-2 : Nitrogen is sparingly soluble in water.

Ans: (b) Both statements are correct but Statement-2 is not the correct explanation of Statement-1.

2. **Statement-1** : A mixture of nitrogen and carbon dioxide can be distinguished by passing it through lime water.

Statement-2 : Nitrogen does not turn lime water milky.

Ans: (a) Both statements are correct and Statement-2 is the correct explanation of Statement-1.

3. **Statement-1** : Nitrogen turns moist red litmus paper blue.

Statement-2 : Ammonia is a basic gas.

Ans: (d) Statement-1 is false & Statement-2 is true

4. **Statement-1** : Nitrogen reacts with hydrogen to form ammonium hydroxide.

Statement-2 : Reaction of nitrogen with hydrogen is endothermic.

Ans: (d) Statement-1 is false & Statement-2 is true

5. **Statement-1** : Nitrogen gas is filled in electric bulbs.

Statement-2 : Nitrogen is colorless, odorless, and tasteless gas.

Ans: (a) Both statements are correct and Statement-2 is the correct explanation of Statement-1.

VI. Concept Questions

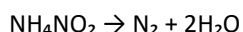
1. Write any three physical properties of nitrogen.

Ans:

- It is a colorless, odorless, and tasteless gas.
- It is lighter than air.
- It has a boiling point of -196°C .

2. What happens when ammonium nitrite is heated?

Ans: On heating, ammonium nitrite (NH_4NO_2) decomposes to form nitrogen gas and water:



3. How can you prepare nitrogen in your lab?

Ans: Nitrogen can be prepared by heating ammonium nitrite:

- Take a solution of ammonium nitrite.
- Heat it gently in a test tube.
- Nitrogen gas is evolved and collected over water.

4. Write any three chemical properties of nitrogen.

- Ans:**
- Reacts with hydrogen at high temperature and pressure to form ammonia (NH_3).
 - Reacts with oxygen during lightning to form nitric oxide (NO).
 - Forms stable compounds like nitrates and amides with metals.

5. Write the name of three compounds of nitrogen.

- Ans:**
- Ammonia (NH_3)
 - Nitric acid (HNO_3)
 - Sodium nitrate (NaNO_3)

6. What is nitrogen fixation?

Ans: Nitrogen fixation is the process of converting atmospheric nitrogen gas (N_2) into usable nitrogen compounds like nitrates or ammonia, either biologically (by bacteria) or industrially.

7. Write any three uses of nitrogen.

- Ans:**
- Used in filling electric bulbs to prevent oxidation.
 - Used in the manufacture of ammonia and fertilizers.
 - Used as a coolant in liquid form (liquid nitrogen) for medical and industrial uses.

Application Skill Achiever

I. Write the name of the following compounds.

1. NH_4NO_2 **Ans:** Ammonium nitrite
2. NaNO_2 **Ans:** Sodium nitrite
3. NH_4Cl **Ans:** Ammonium chloride
4. NH_3 **Ans:** Ammonia
5. CaNCN **Ans:** Calcium cyanamide
6. Mg_3N_2 **Ans:** Magnesium nitride

II. Complete the Equations:

1. $6\text{Na} + \text{N}_2$ **Ans:** $2\text{Na}_3\text{N}$
2. $\text{N}_2 + \text{O}_2$ **Ans:** 2NO (at high temperature)
3. $\text{N}_2 + 3\text{H}_2$ **Ans:** 2NH_3 (Haber process)
4. $3\text{Mg} + \text{N}_2$ **Ans:** Mg_3N_2
5. $2\text{Al} + \text{N}_2$ **Ans:** 2AlN
6. $3\text{Ca} + \text{N}_2$ **Ans:** Ca_3N_2

III. Balance the Equations:

1. $2\text{NO} + \text{O}_2$ **Ans:** 2NO_2
2. $4\text{NO}_2 + 2\text{H}_2\text{O} + \text{O}_2$ **Ans:** 4HNO_3
3. $2\text{HNO}_3 + \text{CaCO}_3$ **Ans:** $\text{Ca}(\text{NO}_3)_2 + \text{H}_2\text{O} + \text{CO}_2$
4. $\text{Mg}_3\text{N}_2 + 6\text{H}_2\text{O}$ **Ans:** $3\text{Mg}(\text{OH})_2 + 2\text{NH}_3$
5. $3\text{Mg} + \text{N}_2$ **Ans:** Mg_3N_2

EXERCISE - 7

I. Choose the Correct Answer

1. Which among these is a crystalline form of Sulphur?

Ans: (a) Rhombic

2. Which among these is an amorphous form of Sulphur?

Ans: (a) Plastic

3. Sulphur is:

Ans: (b) Insoluble in water and soluble in toluene

4. Sulphur is a:

Ans: (b) Non-metal

5. Which among these is correct about sulphur?

Ans: (c) Sulphur is available in both crystalline and amorphous forms.

6. Milk of sulphur is prepared by boiling sulphur with lime water and then cooling it. Then _____ is added to neutralize the lime water.

Ans: (c) HCl

7. Plastic sulphur is prepared by:

Ans: (a) Heating sulphur in a hard glass tube till it boils, then poured into cold water.

8. Sulphur is a:

Ans: (a) Poor conductor of heat and poor conductor of electricity.

9. Concentrated nitric acid is converted to sulphuric acid by the reaction with:

Ans: (a) Sulphur dioxide

10. Sulphur is soluble in:

Ans: (c) Carbon disulphide

11. Sulphur vapors passing over red-hot coke give:

Ans: (a) Carbon disulphide

12. Monoclinic sulphur on cooling to 95.6°C converts to:

Ans: (c) Rhombic sulphur

II. True or False

1. Gypsum is a compound of sulphur.

Ans: True

2. The Sicilian process is used to extract sulphur.

Ans: True

3. Rhombic sulphur is amorphous.

Ans: False

4. In absence of air, sulphur combines directly with Fe to form FeS.

Ans: True

5. Na reacts with sulphur spontaneously.

Ans: True

6. Plastic sulphur has an octahedral shape.

Ans: False

7. Extraction of sulphur using the Frasch process does not require further purification.

Ans: True

8. Chemical formula of Epsom salt is $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$.

Ans: False

9. Colloidal sulphur is used in oral medicines for blood purification.

Ans: True

10. Sulphur oxidizes sulphuric acid to sulphur dioxide.

Ans: False

III. Match the Following

1. Rhombic → (b) Octahedral

2. Monoclinic → (e) Prismatic sulphur

3. Plastic → (a) Amorphous form

4. Colloidal sulphur → (c) Used in medicines
5. Milk of sulphur → (d) Whitish yellow suspension

IV. Multiple Answer Questions

1. Sulphur is used for the vulcanisation of rubber to make it :

Ans: (a) Hard, (b) Elastic.

2. Sulphur shows fungicidal action in the :

Ans: (b) Medicine, (c) Agriculture.

3. On reacting with which of the following chemicals sulphur undergoes combination reaction?

Ans: (a) Metals, (b) Nonmetals.

4. Which of the following is not the allotropic form of sulphur?

Ans: (a) Roll sulphur.

5. Which of the following are crystalline allotropic forms of sulphur ?

Ans: (a) Rhombic, (b) Monoclinic.

V. Reason Type Questions

1. **Statement-1** : Sulphur means enemy of copper.

Statement-2 : Sulphur destroys the metallic properties of carbon.

Ans: (e) Both the statements are false.

2. **Statement-1** : Calcium bisulphite is used in paper industry.

Statement-2 : Metallic sulphites show strong bleaching action.

Ans: (a) Both statements are correct and Statement-2 is the correct explanation of Statement-1.

3. **Statement-1** : Sulphur underlying can be digged out by sinking mining shafts.

Statement-2 : Frasch process is a method devised to obtain maximum pure sulphur.

Ans: (d) Statement-1 is false & Statement-2 is true.

4. **Statement-1** : Sulphur on reaction with HCl produces sulphur monochloride.

Statement-2 : Sulphur undergoes displacement reaction with acid.

Ans: (e) Both statements are correct but Statement-2 is not correct explanation of Statement-1.

5. **Statement-1** : Sulphur is used as ointments for skin ailment.

Statement-2 : Sulphur can combats bacterial growth.

Ans: (b) Both correct but unrelated (Antifungal, not antibacterial).

VI. Concept Questions

1. How is plastic sulphur prepared?

Ans: Plastic sulphur is prepared by quickly cooling boiling sulphur by pouring it into cold water.

This rapid cooling prevents crystallization and forms a rubbery, elastic form called plastic sulphur.

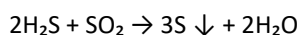
2. Write any two physical properties of sulphur.

Ans:

- Sulphur is a yellow, non-metallic solid.
- It is insoluble in water but soluble in carbon disulphide.

3. How is milk of sulphur prepared?

Ans: Milk of sulphur is prepared by reacting hydrogen sulphide (H₂S) with sulphur dioxide (SO₂) in water:



The sulphur precipitates as a milky suspension, called milk of sulphur.

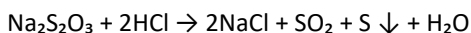
4. What is the action of H_2SO_4 (aq) on S (s)?

Ans: When aqueous sulphuric acid is added to sulphur, no reaction usually takes place because both contain sulphur.

However, concentrated sulphuric acid may oxidize sulphur under heating.

5. How is colloidal sulphur prepared?

Ans: Colloidal sulphur is prepared by adding HCl to a boiling solution of sodium thiosulphate ($\text{Na}_2\text{S}_2\text{O}_3$):



The sulphur forms a colloidal suspension in water.

6. Write any two uses of sulphur.

Ans: Used in the manufacture of sulphuric acid (H_2SO_4).

Used in vulcanization of rubber and making fungicides and gunpowder.

7. Write the reaction equation of sulphur with hydrogen at high temperature.

Ans: $\text{H}_2 + \text{S} \rightarrow \text{H}_2\text{S}$ (Hydrogen sulphide gas is formed)

8. Write the reaction equation of sulphur with hot coke at high temperature.

Ans: $\text{S} + \text{C (hot coke)} \rightarrow \text{CS}_2$ (Carbon disulphide is formed)

9. Write the reaction between sulphur and calcium.

Ans: $\text{Ca} + \text{S} \rightarrow \text{CaS}$ (Calcium sulphide is formed)

10. What are the allotropes of amorphous sulphur?

Ans: The amorphous allotropes of sulphur include:

- Plastic sulphur
- Colloidal sulphur
- Milk of sulphur

Application Skill Achiever

I. Write the name of the following compounds.

1. SO_2 **Ans:** Sulphur dioxide
2. FeS **Ans:** Iron(II) sulphide
3. H_2S **Ans:** Hydrogen sulphide
4. ZnS **Ans:** Zinc sulphide
5. CS_2 **Ans:** Carbon disulphide
6. $\text{Na}_2\text{S}_2\text{O}_3$ **Ans:** Sodium thiosulphate

II. Complete the Equations

1. $\text{CaS} + 4\text{S}$ **Ans:** CaS_5
2. $\text{Cl}_2 + 2\text{S}$ **Ans:** S_2Cl_2
3. $\text{O}_2(\text{g}) + \text{S}(\text{s})$ **Ans:** $\text{SO}_2(\text{g})$
4. $\text{Fe}(\text{s}) + \text{S}(\text{s})$ **Ans:** FeS
5. $\text{H}_2(\text{g}) + \text{S}(\text{s})$ **Ans:** $\text{H}_2\text{S}(\text{g})$
6. $\text{Pb}(\text{s}) + \text{S}(\text{s})$ **Ans:** PbS

III. Balance the Equations

1. $\text{HNO}_3(\text{aq}) + \text{S}(\text{s}) \rightarrow \text{H}_2\text{SO}_4(\text{aq}) + \text{NO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$ **Ans:** $2\text{HNO}_3 + \text{S} \rightarrow \text{H}_2\text{SO}_4 + 2\text{NO}_2$
2. $\text{Cl}_2 + \text{S} \rightarrow \text{S}_2\text{Cl}_2$ **Ans:** $2\text{Cl}_2 + 2\text{S} \rightarrow \text{S}_2\text{Cl}_2$
3. $\text{C} + \text{S} \rightarrow \text{CS}_2$ **Ans:** $\text{C} + 2\text{S} \rightarrow \text{CS}_2$
4. $\text{P} + \text{S} \rightarrow \text{P}_2\text{S}_3 + \text{P}_2\text{S}_5$ **Ans:** $8\text{P} + 9\text{S} \rightarrow \text{P}_2\text{S}_3 + \text{P}_2\text{S}_5$
5. $\text{H}_2\text{SO}_4(\text{aq}) + \text{S}(\text{s}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{SO}_2(\text{g})$ **Ans:** $2\text{H}_2\text{SO}_4 + \text{S} \rightarrow 2\text{H}_2\text{O} + 3\text{SO}_2$

EXERCISE – 8

I. Choose the correct answer.

1. Metals are extracted from _____.
Ans: (b) Ores
2. _____ is a non reactive metal.
Ans: (a) Gold
3. Gold is available mostly in _____ state.
Ans: (a) Free
4. Haematite is a ore of _____.
Ans: (b) Iron
5. Bauxite is a ore of _____.
Ans: (a) Aluminium
6. Manganese is available in _____.
Ans: (c) Pyrolusite
7. Dolomite is a ore of _____.
Ans: (a) Calcium
8. The formula of Zinc Blend is _____.
Ans: (a) ZnS
9. The formula of Pyrolusite is _____.
Ans: (a) MnO_2
10. Galena is a ore of _____.
Ans: (b) Lead
11. The impurity present in the ore is called _____.
Ans: (a) Gangue
12. _____ is a carbonate ore.
Ans: (a) Magnesite
13. In the froth process, the _____ oil is used.
Ans: (b) Pine
14. The purpose of smelting an ore is to _____ it.
Ans: (b) Reduce
15. In electrolytic refining of copper, _____ is used in anode.
Ans: (b) Impure Copper

II. Say True or False

1. Chromite contains Chromium. **Ans:** True
2. Pitch blende contains Uranium. **Ans:** True
3. Carbon is less reactive than manganese. **Ans:** False
4. Haematite can be directly reduced to form iron. **Ans:** True
5. Titanium can also be extracted by adding sodium to Titanium Tetra chloride. **Ans:** True

III. Multiple Answer Questions

1. Metals found in free state are _____. **Ans:** (a) Gold, (b) Silver
2. Ores with Iron are _____. **Ans:** (a) Haematite, (c) Magnetite
3. Bauxite contains _____. **Ans:** (a) Oxygen, (c) Aluminium
4. Gypsum contains _____. **Ans:** (b) Sulphur, (c) Calcium
5. Highly reactive metals are _____. **Ans:** (a) Na, (c) K

IV. Reason Type Questions

1. **Statement-1** : Sodium is not available in free state.
Statement-2 : Sodium is highly reactive.
Ans: (a) Both statements are correct and Statement-2 is the correct explanation of Statement-1
2. **Statement-1** : Gold is available in free state.
Statement-2 : Gold is a non reactive metal.
Ans: (a) Both statements are correct and Statement-2 is the correct explanation of Statement-1
3. **Statement-1** : Na, K, Ca, Mg, Al, all these metals cannot be reduced by coke.
Statement-2 : Na, K, Ca, Mg, Al, all these metals are less reactive.
Ans: (c) Statement-1 is true & Statement-2 is false
4. **Statement-1** : Zn is found in the crust of earth as oxides, sulfides and carbonates.
Statement-2 : Zn is a non reactive metal.
Ans: (c) Statement-1 is true & Statement-2 is false

5. **Statement-1** : Copper glance is ore of Silicon.

Statement-2 : Copper glance contains Sulfur.

Ans: (d) Statement-1 is false & Statement-2 is true

V. Concept Questions

1. **Write the name of any three ores of Iron.**

Ans:

- Haematite (Fe_2O_3)
- Magnetite (Fe_3O_4)
- Siderite (FeCO_3)

2. **Write the three steps of extraction of metal.**

Ans:

- Concentration of Ore – Removing impurities (gangue) from ore.
- Reduction of Ore – Converting ore into metal by removing oxygen or other elements.
- Purification of Metal – Refining the metal to obtain pure form (e.g., electrolytic refining).

3. **What is electrolytic refining?**

Ans: Electrolytic refining is the process of purifying a metal using electricity. The impure metal is made the anode, and the pure metal is deposited on the cathode through an electrolyte solution.

4. **What is Poling?**

Ans: Poling is a method of purifying molten metal by stirring it with green wooden poles. The hydrocarbons from the wood reduce metal oxides to pure metal. It is commonly used for purifying copper and tin.

5. **What is Roasting?**

Ans: Roasting is the process of heating sulfide ores in the presence of oxygen to convert them into oxides, releasing sulfur dioxide gas.

Example: $\text{ZnS} \rightarrow \text{ZnO} + \text{SO}_2$

6. **What is Calcination?**

Ans: Calcination is the process of heating carbonate ores in the absence of air to convert them into oxides, releasing carbon dioxide gas.

Example: $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$

7. **What is Smelting?**

Ans: Smelting is the process of extracting metal from its ore by heating and melting, usually in the presence of a reducing agent like carbon.

Application Skill Achiever

I. Complete the Reactions

1. $2\text{ZnS}_{(s)} + 3\text{O}_{2(g)}$ **Ans:** $2\text{ZnO}_{(s)} + 2\text{SO}_{2(g)}$
2. $\text{ZnO}_{(s)} + \text{C}_{(s)}$ **Ans:** $\text{Zn}_{(s)} + \text{CO}_{(g)}$
3. $\text{ZnCO}_{3(s)} + \text{Heat}$ **Ans:** $\text{ZnO}_{(s)} + \text{CO}_{2(g)}$
4. $3\text{MnO}_{2(s)} + 4\text{Al}_{(s)}$ **Ans:** $3\text{Mn}_{(l)} + 2\text{Al}_2\text{O}_{3(s)}$
5. $\text{Fe}_2\text{O}_{3(s)} + 3\text{C}_{(s)}$ **Ans:** $2\text{Fe}_{(l)} + 3\text{CO}_{(g)}$
6. $\text{Fe}_2\text{O}_{3(s)} + 2\text{Al}_{(s)}$ **Ans:** $2\text{Fe}_{(l)} + \text{Al}_2\text{O}_{3(s)}$
7. $\text{Cr}_2\text{O}_{3(s)} + 2\text{Al}_{(s)}$ **Ans:** $2\text{Cr}_{(l)} + \text{Al}_2\text{O}_{3(s)}$
8. $2\text{Cu}_2\text{S} + 3\text{O}_2$ **Ans:** $2\text{Cu}_2\text{O} + 2\text{SO}_2$
9. $2\text{Cu}_2\text{O} + \text{Cu}_2\text{S}$ **Ans:** $6\text{Cu} + \text{SO}_2$
10. $\text{TiCl}_4 + 2\text{Mg}$ **Ans:** $\text{Ti} + 2\text{MgCl}_2$

II. Write the Equations Involved in the Extraction of the Given Elements

1. Mercury **Ans:** $\text{HgS} + \text{O}_2 \rightarrow \text{Hg} + \text{SO}_2$
2. Copper **Ans:** **Step 1:** $2\text{Cu}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{Cu}_2\text{O} + 2\text{SO}_2$
 Step 2: $2\text{Cu}_2\text{O} + \text{Cu}_2\text{S} \rightarrow 6\text{Cu} + \text{SO}_2$
3. Lead **Ans:** **Step 1:** $2\text{PbS} + 3\text{O}_2 \rightarrow 2\text{PbO} + 2\text{SO}_2$
 Step 2: $\text{PbO} + \text{C} \rightarrow \text{Pb} + \text{CO}$
4. Titanium **Ans:** $\text{TiCl}_4 + 2\text{Mg} \rightarrow \text{Ti} + 2\text{MgCl}_2$ (Kroll Process)
5. Chromium **Ans:** $\text{Cr}_2\text{O}_3 + 2\text{Al} \rightarrow 2\text{Cr} + \text{Al}_2\text{O}_3$