

REVISION PROGRAMME

CHEMISTRY (CBSE)

**TEACHER HAND
COPY**

2024 – 25

PHASE – I

**QUESTIONNAIRE
KEY**

NOTE : The answers presented in this key is only for the support. Students can write appropriate answers with their own knowledge and self expression.

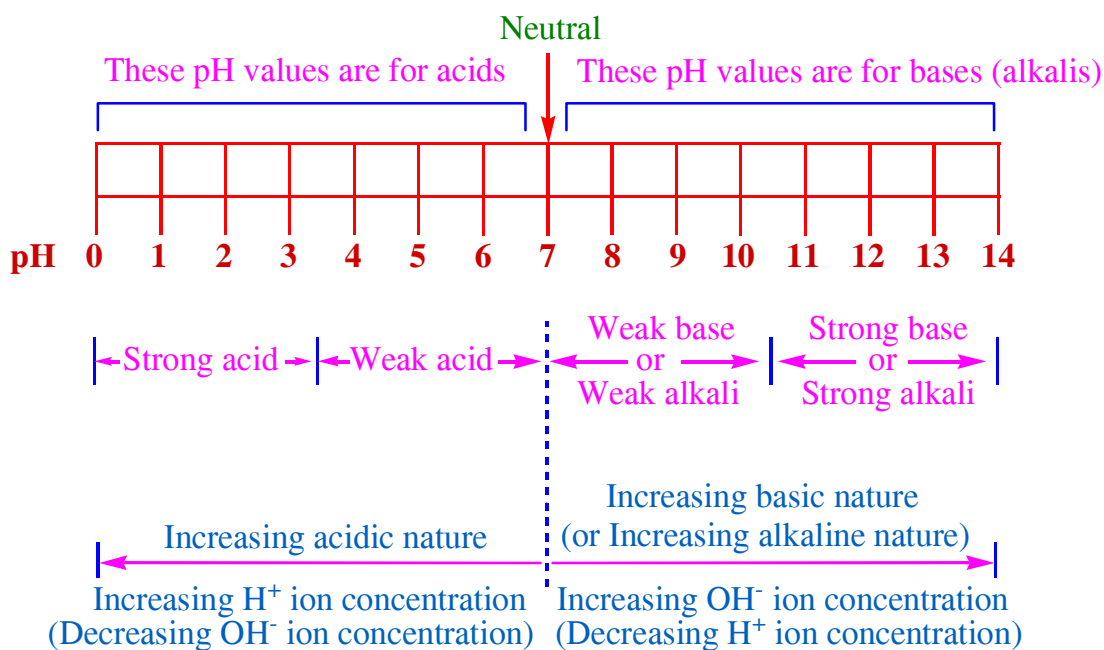
1. ACIDS, BASES AND SALTS

PART – I

PRIORITY – I

I. ACADEMIC SKILL - REMEMBERING :

- Indicator :** - Generally indicators are substance that change colour when they are added to acidic or alkaline solution.
 - Litmus, turmeric, red cabbage leaves, coloured petals of some flowers are natural indicators.
 - Methyl orange, Methyl red, Phenolphthalein are synthetic indicators.
 - Olfactory indicator tells us whether a substance is acidic or basic by change in odour. for example, Onion, Vanilla extract etc...
- The negative logarithm of Hydrogen ion concentration is called pH scale. It is introduced by Sorensen



pH	Colour	pH	Colour	pH	Colour
0	Dark red	5	Orange yellow	10	Navy blue
1	Red	6	Greenish yellow	11	Purple
2	Red	7	Green	12	Dark purple
3	Orange red	8	Greenish blue	13	Violet
4	Orange	9	Blue	14	Violet

(OR)

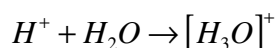
- a) Universal indicator shows different colour at different concentrations of hydrogen ions in a solution.
- b) i) pH scale is used to measure the hydrogen ion concentration in a solution.
ii) On the pH scale we can measure pH generally from 0 (very acidic) to 14 (very alkaline).
- c) The process of dissolving acid or base in water is highly exothermic. If water is added to an acid then the heat generated may cause the acid to splash out and cause burns.
3. A Universal indicator is a mixture of a number of different indicators which shows different colours at different pH values.
A universal indicator is usually composed of water, 1 - propanol, phenolphthalein, sodium hydroxide, methyl red, bromothymol blue, sodium bisulphite and thymol blue.
4. 1) pH in our digestive system
2) pH changes as the cause of tooth decay
3) Soil pH and plant growth
4) pH range and survival of animals
5. Antacids are substances which are basic in nature. These neutralize excess acid in the body. Examples are
i) Milk of magnesium
ii) Sodium hydrogen carbonate

II. ACADEMIC SKILL - UNDERSTANDING :

6. Pure water (or distilled water) is a very weak electrolyte and does not dissociate into ions. Therefore, it does not conduct electricity. However, rain water contains some dissolved acids like Carbonic acid and Sulphuric acid. As a result, water becomes acidulated and gets ionised easily. Therefore rainwater conducts electricity.
7. pH is negative logarithm of hydrogen ion concentration i.e., $pH = -\log[H^+] \Rightarrow \left(pH \propto \frac{1}{[H^+]} \right)$
8. pH paper is used for identification of strength of acids by specific colour.
→ HCl is strong acid gives red colour on pH paper and acetic acid weak as it gives yellow colour on pH paper.

III. ACADEMIC SKILL - APPLYING :

9. Hydrogen ions in HCl are produced in the presence of water. The separation of H^+ ion from HCl molecules cannot occur in the absence of water. So Dry HCl gas doesnot change the colour of dry blue litmus to red. In other words, dry HCl doesnot behave as an acid.



10. A soil usually becomes acidic when there is either a high pest content, iron minerals or there is some rotting vegetables. In order to reduce the acidic strength. "liming of soil" is usually done. For this, any of the substances that have been mentioned are added to the soil since these are of basic nature.

11. a) Fresh milk is acidic and it turns sour easily to become more acidic. In presence of baking soda milk becomes alkaline and does not turn sour easily because the alkali doesnot allow the milk to become more acidic easily.
- b) When the milk sets to curd, the pH decreases, i.e. it becomes more acidic. The presence of alkali does not allow it to become more acidic easily. Hence, it will take a longtime to set as curd.
12. a) Most acidic – A
Most basic – C
- b) $C < B < D < A$
- c) In C – blue
In D – green

IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

13. Baking soda solution ; Being basic, it neutralises excess acid in the stomach.
14. Dry blue litmus paper remains unchanged in colour in the gas jar containing HCl gas but when blue litmus paper is moistened, it colour changes to red. Because in presence of moisture, the gas dissolves to form hydrochloric acid. It releases H^+ ions and as a result. The colour of blue litmus changes to red.
15. Which solution is
- i) Weakly alkaline : **D**
 - ii) Neutral : **C**
 - iii) Strongly acidic : **A**
 - iv) Strongly alkaline : **E**
 - v) Weakly acidic : **B**
16. Onion juice is an olfactory indicator. Thus it changes its odour.
The liquid 'X' turns blue litmus red. so, 'X' has acidic nature.
- a) $Zn + \text{acid} \rightarrow \text{Zinc salt} + H_2 \uparrow$ ($Zn + 2HCl \rightarrow ZnCl_2 + H_2 \uparrow$)
- b) Sodium carbonate (s) + Acid (X) \rightarrow salt + $H_2O + CO_2 \uparrow$
($Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$)

V. ACADEMIC SKILL - CREATING :

17. a) Neutral : "D" with pH = 7
- b) Strongly alkaline : "C" with pH = 11
- c) Strongly Acidic : "B" with pH = 1
- d) Weakly acidic : "A" with pH = 4
- e) Weakly alkaline : "E" with pH = 9
- pH increasing order : $C < E < D < A < B$
18. When fresh milk changes to curd, the pH of the solution is likely to decrease. Actually lactose present in milk gets converted to lactic acid when curd is formed from milk. Therefore, the medium becomes more acidic and its pH decreases.

19. a) * $C < A < B$,
 * B is most acidic,
 * Hydrogen ion concentration decreases
 b) Baking soda is mild base and neutralises the excess acid
 c) Sodium hydrogen carbonate, NaHCO_3
20. a) Lemon juice $\text{pH} = 2.0$ b) Distilled water $\text{pH} = 7.0$
 c) 1 M NaOH $\text{pH} = 14.0$ d) Tomato juice $\text{pH} = 4.0$

VI. PRACTICAL SKILL BASED QUESTION:

21.
 - i) Sodium hydroxide change Colourless phenolphthalein to pink
 - ii) If Dil. HCl is added dropwise slowly the pink colour will be disappeared because of neutralisation
 - iii) Again if you add NaOH solution to the above mixture it becomes basic and it regains its pink colour.
22. Dry Hydrogen chloride does not show any colour change with blue litmus because it cannot produce Hydrogen ions, where as Hydrochloric acid can change the colour of blue litmus in aqueous form since it has H^+ ions
23.
 - a)
 - i) Group A, $\text{B} < 7$,
 - ii) Group C > 7
 - b) Universal indicator, pH scale
 - c) The acids present in tamarind / sour substances react with the coating on metal.
24.
 - a)
 - i) Production of too much acid in stomach during indigestion – Antacid (Sodium bicarbonate).
 - ii) Sting by a honey bee / nettle leaves – sodium bi carbonate (neutralisation).
 - b) pH value will decreases due to the production of lactic acid in curd which is acidic in nature.

PRIORITY – II

I. ACADEMIC SKILL - REMEMBERING :

1. Acid is produced by degradation of left out food particles in the mouth. This acid attacks the enamel on the teeth. To remove the excess acid in the mouth, we brush our teeth with tooth paste which is alkaline in nature.
2.
 - a) Olfactory Indicators works based on smell
 - b) Onion extract, vanilla extract and clove oil

Olfactory indicator is a substance whose smell varies when it is mixed with an acidic or basic solution. Hence it is used to test whether a solution is a base or an acid.

II. ACADEMIC SKILL - UNDERSTANDING :

3. a) Dry Hydrogen chloride gas does not dissociate to give H^+ ions. In aqueous solution, HCl dissociates to form the H^+ ions and changes the litmus colour because H^+ ions are responsible for colour change.

- b) During summer more lactic acid is formed. Thus to neutralize the latic acid, milk man adds small amount of baking soda to fresh milk, as baking soda is basic in nature
 - c) On reaction with water, ammonia forms ammonium hydroxide which further on ionization gives ammonium ion and hydroxide ion.
4. Bee – sting injects methanoic acid
A mild base like baking soda

III. ACADEMIC SKILL - APPLYING :

5.
 - a) Bacteria present in the mouth produce hydrochloric acid as one of the products by the degradation of sugar and food particles remaining in the mouth after eating. Tooth enamel (Calcium - phosphate) gets corroded by hydrochloric acid and forms cavities in the teeth. Tooth pastes are slightly alkaline in nature and neutralise hydrochloric acid.
 - b) Methanoic acid ; Lactic acid
 - c) If the soil is acidic, then the treatment with these materials will neutralise the harmful acidic effect as these materials are alkaline.
6.
 - a) $R > T > S > P > Q$
 - b) $Q > P > S > T > R$
 - c) i) S ii) R iii) Q iv) P v) T
7. On dilution of an acid solution, the concentration of hydronium ions (H_3O^+) per unit volume decreases.

IV. ACADEMIC SKILL - ANALYSING AND EVALUATING:

8.
 - a) Universal indicator paper
 - b) Lemon juice
 - c) Household ammonia
 - d) Salt solution and Sugar solution
 - e) Vinegar
 - f) Baking soda

V. ACADEMIC SKILL - CREATING :

- i) Acidic – Solution A Basic – Solution B
 - ii) Solution A, because H⁺ ion concentration is higher in acidic solutions.
 - b) When same concentration of HCl and Acetic acid are taken (say one molar), then these produce different amounts of H⁺ ion. HCl gives more H⁺ ions, but acetic acid gives less H⁺ ions
10. 1 M HCl have higher Hydrogen ion concentration due to maximum ionisation.
11. The fruit is acidic, because acid solutions change blue litmus solution to red.

VI. PRACTICAL SKILL BASED QUESTION:

12. Since the pH of the soup is less than 7, it is of acidic nature. It will have a sour taste.

PRIORITY – III

I. ACADEMIC SKILL - REMEMBERING :

1. Litmus is used for identification of acidic or basic nature of substance.
Acidic substance changes blue litmus to red, basic substance changes red litmus to blue.

II. ACADEMIC SKILL - UNDERSTANDING :

2. Tooth enamel is composed of mineral Calcium Phosphate.

III. ACADEMIC SKILL - APPLYING :

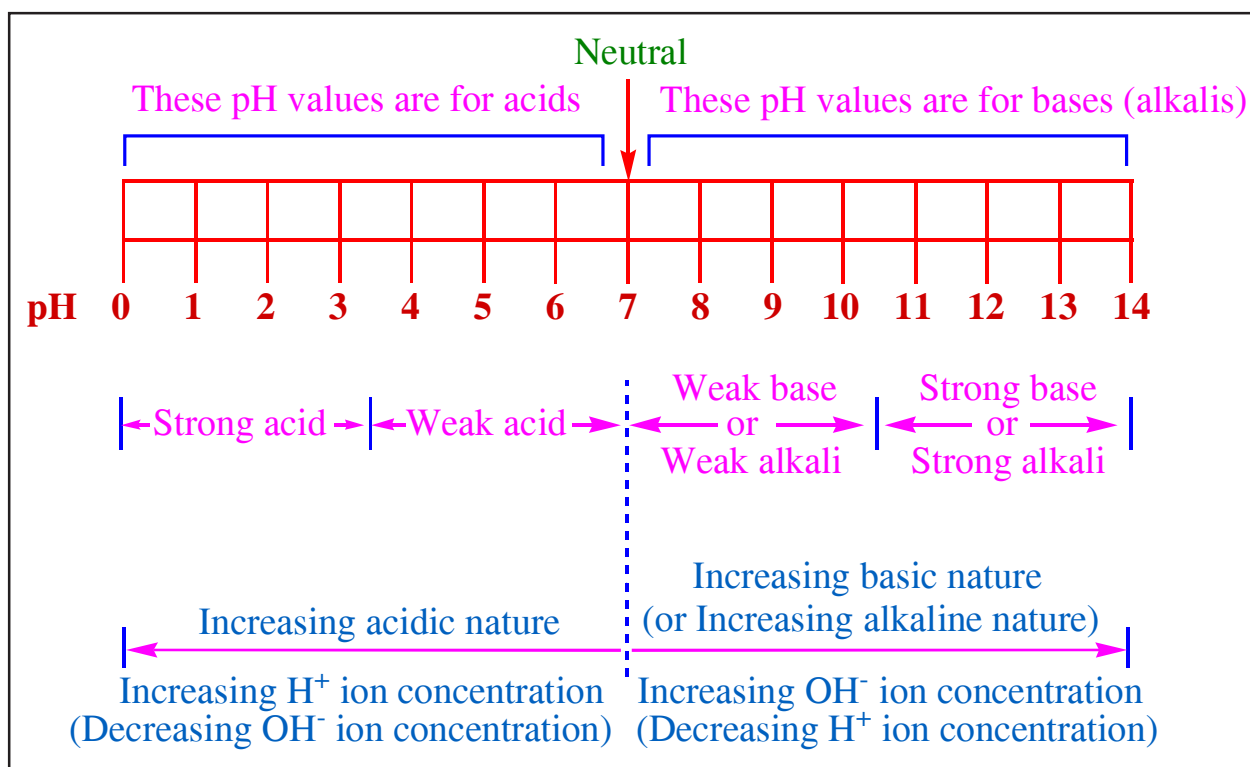
3. When it rains, the gases like NO_2 , SO_2 etc. of the atmosphere dissolve into it and hence its $\text{pH} < 7$. When pH of rain water falls below 5.6, it is called acid rain. When this acid rain flows into the river, the pH of river water falls and the survival of aquatic life becomes difficult.
4. On dissolving excess base in a solution of sodium hydroxide, concentration of OH^- ions per unit volume in the solution increases.

IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

5. a) Turmeric
b) Washing - Yellow to Reddish brown
Rinsing - Reddish brown to Yellow
c) Basic

V. ACADEMIC SKILL - CREATING :

6.



pH	Colour
0	Dark red
1	Red
2	Red
3	Orange red
4	Orange

pH	Colour
5	Orange yellow
6	Greenish yellow
7	Green
8	Greenish blue
9	Blue

pH	Colour
10	Navy blue
11	Purple
12	Dark purple
13	Violet
14	Violet

7. Bacteria present in the mouth produce acid by degradation of sugar and food particles remaining in the mouth after food. If the pH falls below 5.5, the concentration of H^+ ions is enough to dissolve calcium phosphate, one of the ingredients of tooth enamel.

VI. PRACTICAL SKILL BASED QUESTION :

8. Milk contains lactic acid and its effect remains in the empty tank. The acidic effect in the tank can be neutralised by cleaning it with a solution of a base, e.g., NaOH. It changes the acid into salt which then gets removed from the tank by cleaning with water.

PART – II

PRIORITY – I

I. ACADEMIC SKILL - REMEMBERING :

- The substance which produce only hydrogen ions as positive ions upon hydrolysis is called an acid
 - Weak acid - Carbonic acid
 - Strong acid - Nitric acid
 - Organic acid - Acetic acid
 - Inorganic acid - Sulphuric acid
- Dilution of concentrated acid with water is a highly exothermic process, if water is added into concentrated acid, the heat produced is too large that the solution may splash out and the beaker in which the dilution is carried out
- Physical properties of acids** - sour to taste, turns blue limtus to red, conducts electricity in aqueous form, corrosive in nature.

Chemical properties of acids

- Reactive with metals to form H_2 gas.
- React with metal carbonates and bicarbonates to form CO_2 .
- React with bases to form salt and water.
- React with metal oxides to form salt and water.

- Physical properties of bases** - bitter to taste, soapy to touch, turns red limtus to blue, conducts electricity in aqueous form, corrosive in nature.

Chemical properties of bases

- React with some metals to form H_2 gas.
- React with acids to form salt and water.
- React with non-metal oxides to form salt and water.

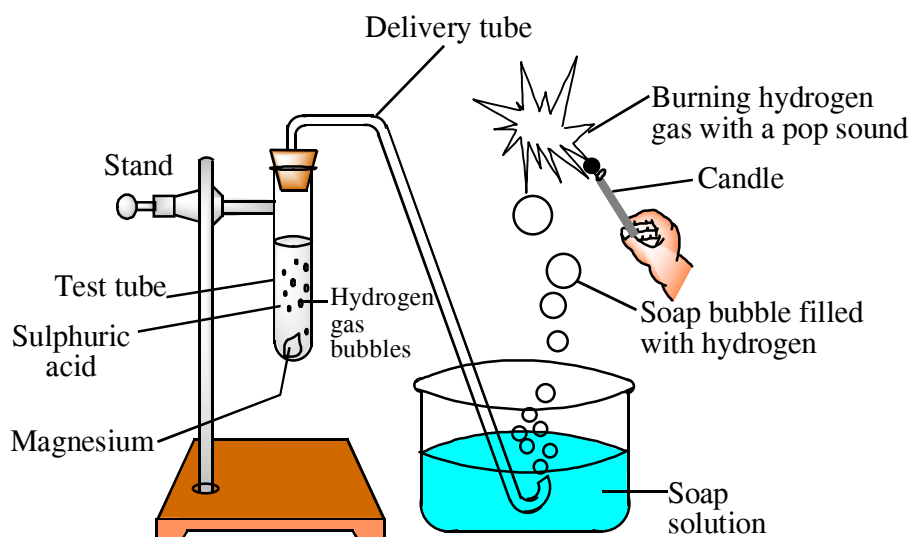
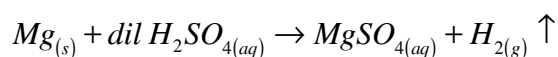
5. **Uses of acids :** As a preservative of food, in the treatment of bone marrow and scurvy diseases, in the production of adhesives and explosive, As vinegar to preserve food and as a flavouring agent.

Uses of bases : In removing grease stains from clothes, in the manufacture of soaps, in temporary softening of hard water, Used as an antacid, so as to neutralise stomach acidity

6. NaOH and KOH are hygroscopic in nature. It absorb moisture from atmosphere in which they ultimately dissolve and generates heat.

II. ACADEMIC SKILL - UNDERSTANDING :

7. Acids which ionize completely in aq. Solutions - Strong acids.
Acids which ionize partially in aq. Solution - Weak acid.
Hydrochloric acid, Nitric acid - Strong acids.
Acetic acid, Formic acid - Weak acids.
8. When Magnesium react with dilute sulphuric acid, a colourless gas is liberated and test tube becomes hot.



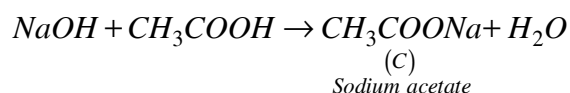
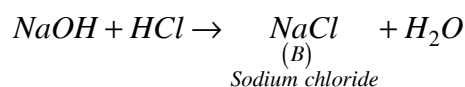
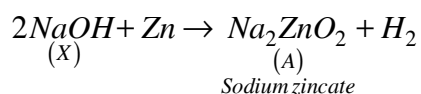
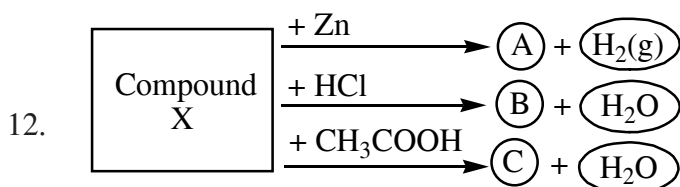
III. ACADEMIC SKILL - APPLYING :

9. HCl, HNO₃ etc. ionise in the aqueous solution to produce H⁺ ions. Hence, they show acidic character. Compounds like C₂H₅OH and Glucose (C₆H₁₂O₆) do not ionise in the aqueous solution to give H⁺ ions, i.e. hydrogen present in them is non - ionizable. Hence they do not show acidic character.
10. i) Bulb does not glow in case of glucose and alcohol but glows in HCl solution
ii) Glucose and alcohol are non electrolytes they cannot ionise to produce free ions, hence bulb will not glow. But in case of HCl it can undergo ionisation to produce free ions in the solution and acts as an electrolyte
iii) In beaker B If NaOH is taken instead of Alcohol bulb will glow because NaOH is also a strong electrolyte

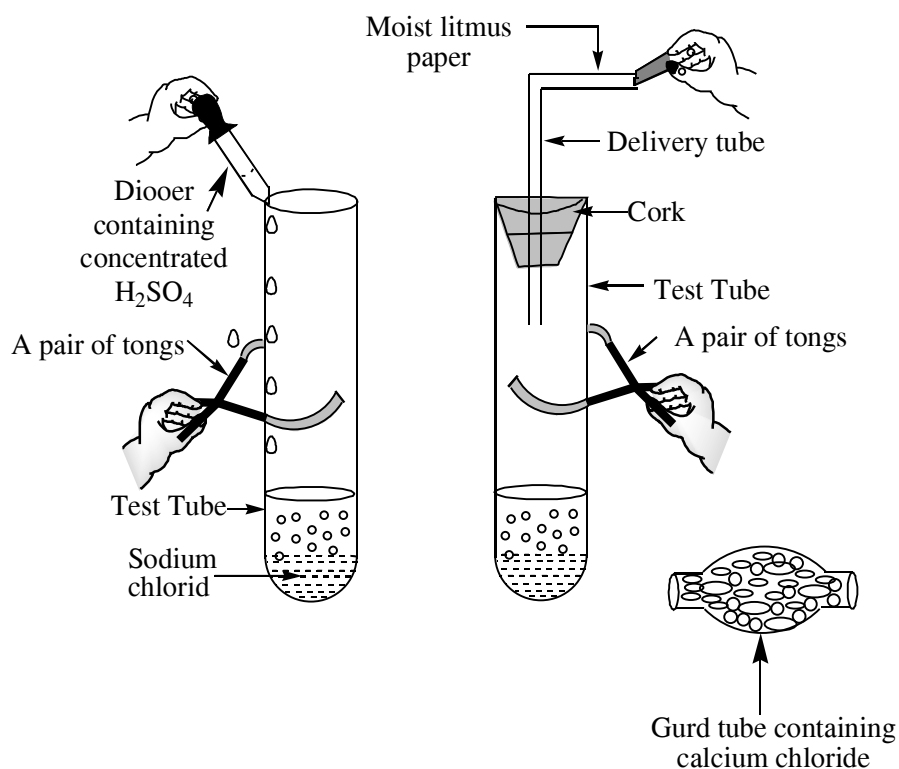
11. Generally acids react with metals and produce salt and hydrogen gas. So acids are not stored in metal containers.

Glass containers are safe to store acids as they are not corroded by acids.

IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :



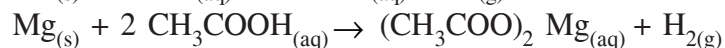
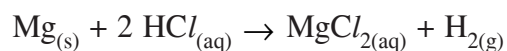
13. i)



- ii) When the HCl gas evolved in the reaction is treated with a wet litmus paper, the colour of the paper changes from blue to red, showing that HCl solution is acidic in nature, no change in colour of litmus paper is observed when the paper is kept dry.
- iii) The reason behind HCl solution exhibiting acidic character is that when HCl is dissolved in water, it dissociates into H⁺ ions.

V. ACADEMIC SKILL - CREATING :

14. Fizzing in the reaction is due to the evolution of hydrogen gas by the action of metal on the acid



Since hydrochloric acid is a strong acid than acetic acid, fizzing occurs more readily in test tube "A" than in test tube "B". Actually hydrogen gas will be evolved more briskly in test tube "A".

15. a) Solution of sulphuric acid has charged ions H^+ and SO_4^{-2} which help in conducting electricity whereas alcohol does not give any ions in water.
- b) Dry ammonia has no H^+ or OH^- ions whereas ammonia in water gives OH^- ions which turns red litmus blue.

VI. PRACTICAL SKILL BASED QUESTION :

16. Pure water (or distilled water) is a very weak electrolyte and does not dissociate into ions. Therefore, it does not conduct electricity. However, rain water contains some dissolved acids like Carbonic acid and Sulphuric acid. As a result, water becomes acidulated and gets ionised easily. Therefore rainwater conducts electricity.
17. Water helps in the dissociation of an acid to give hydronium ion (H_3O^+). In the absence of water, these ions are not produced. Hence acids show acidic behaviour only in the presence of water.

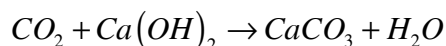
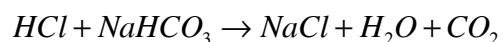
PRIORITY – II**I. ACADEMIC SKILL - REMEMBERING :**

1. Metals are mostly reactive in nature. They react with dilute acids (HCl and H_2SO_4) to evolve hydrogen gas.



The H_2 gas burns with a pop sound when a burning candle is brought near it.

2. The gas evolved is Carbondioxide. When the gas is bubbled through lime water, it becomes milky.

**II. ACADEMIC SKILL - UNDERSTANDING :**

3. Curd and sour substances are acidic in nature. We know that acids attacks most of the metals. Hence if acidic substances like curd or other sour substances are kept in copper or brass vessels, they react to form toxic compounds and make the food stuff unfit for consumption.

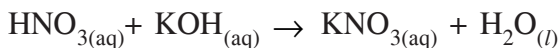
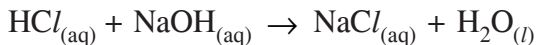
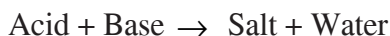
4. a) **Chemical properties of acids**

- Blue litmus changes to Red litmus.
- React with metal carbonates and bicarbonates to form CO_2 .

Chemical properties of bases

- Red litmus changes to Blue litmus.
- Does not react with metal carbonates and bicarbonates

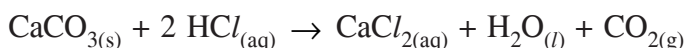
- b) Neutralisation reaction is the reaction between acid and base dissolved in aqueous solution to form salt and water.



5. i) HCl will give rise to more H^+ ions and CH_3COOH produces less H^+ ions. The colour of pH paper depends on the concentration of H^+ ion. Colour becomes red for high H^+ concentration.
 ii) Aqueous solution of acids have H^+ ions which carry electric current through the solution.

III. ACADEMIC SKILL - APPLYING :

6. The compound "A" must be Calcium Carbonate because Carbonates react with the acids to produce Carbondioxide gas which extinguishes fire, and also the compound formed will be Calcium Chloride.



7. Lemon or tamarind juice is acidic in nature and reacts with oxidised copper (compounds) to dissolve it into soluble salt and water. Thus, copper vessels are cleaned.

IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

8. a) Copper (II) chloride, CuCl_2
 b) $\text{CuO} + 2\text{HCl} \rightarrow \text{CuCl}_2 + \text{H}_2\text{O}$
 c) Copper oxide is basic in nature

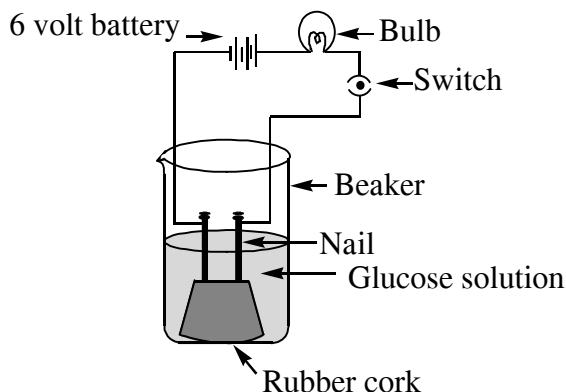
V. ACADEMIC SKILL - CREATING :

9. i) The reagents used by Deepika to prepare HCl gas are sodium chloride and conc.sulphuric acid.
 ii) There are no colour change observed with dry litmus paper. However, wet blue litmus paper turns red.
 iii) $\text{HCl} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{Cl}^-$
10. a) Vigorous reaction will be seen in test tube B.
 b) It is because HCl is stronger acid than HNO_3
 c) i) Hydrogen gas is liberated in test tube B, NO_2 is liberated in test tube A.
 ii) When we bring a burning candle near the evolving gas, it burns with a pop sound. This proves that the produced gas is hydrogen gas.
 NO_2 – Reddish brown gas
 d) $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
 $\text{Mg} + \text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + 2\text{NO}_2 + 2\text{H}_2\text{O}$
 e) HCl will have lower pH.
 HNO_3 will have lower concentration of H^+ .

VI. PRACTICAL SKILL BASED QUESTION :

11. The milkyness is due to the formation of insoluble Calcium Carbonate (CaCO_3).

12. Alcohols and glucose do not give ions dissolved in water while acids do.



- i) Take solutions of glucose, alcohol, hydrochloric acid, sulphuric acid, etc.
- ii) Fix two nails on a cork, and place the cork in a 100 mL beaker.
- iii) Connect the nails to the two terminals of a 6 volt battery through a bulb and a switch, as shown in fig.
- iv) Now pour some dilute HCl in the beaker and switch on the current.
- v) Repeat with dilute sulphuric acid.
- vi) Observe the bulb.
- vii) Repeat the experiment separately with glucose and alcohol solutions and observe.
- viii) Bulb glows in case of HCl and H_2SO_4 but not with Glucose and Alcohol.

PRIORITY – III

I. ACADEMIC SKILL - REMEMBERING :

1.
 - i) Ants – Methanoic acid
 - ii) Lemon – Citric acid
 - iii) Milk – Lactic acid
 - iv) Tomato – Oxalic acid

II. ACADEMIC SKILL - UNDERSTANDING :

2. Aqueous solution of HCl gas show acidic properties because only in the aqueous solution, it dissociates to produce H^+ ions.

III. ACADEMIC SKILL - APPLYING :

3.
 - a) The colour of the solution is bluish - green due to the formation of Copper (II) Chloride.
 - b)
$$\text{CuO} + 2\text{HCl} \longrightarrow \text{CuCl}_2 + \text{H}_2\text{O}$$

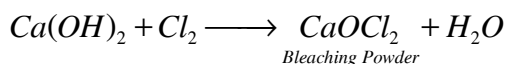
(bluish-green colour)

IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

4. Neutralisation of a carbonate with an acid produces carbon dioxide gas but not with an oxide or hydroxide.
5. Carbon and Sulphur - They form acidic oxides

V. ACADEMIC SKILL - CREATING :

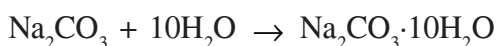
6. HCl in aqueous solution dissociates to give H^+ and Cl^- ions but glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) does not. Hence HCl solution conducts electricity but glucose solution does not.
7. The metal Oxide (MO) is basic in nature. It dissolves in water to form metal hydroxide as follows
 $\text{MO} + \text{H}_2\text{O} \rightarrow \text{M}(\text{OH})_2$
 A blue litmus does not undergo any change in colour in the basic Medium.
8. X is Chlorine gas and Y is Bleaching powder

**VI. PRACTICAL SKILL BASED QUESTION :**

9. Oxide of a metal which is used in cement industry and metal present in bones is CaO . Thus X is CaO . With water it forms calcium hydroxide which is a base and turns red litmus blue.
 $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$
10. Hydrochloric acid gives white fumes of ammonium chloride when in contact with ammonia. Thus sodium chloride from sea water reacts with dil. sulphuric acid forms HCl gas. Dry HCl gas has no effect on litmus paper.
 $\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{HCl}$
 $\text{HCl} + \text{NH}_3 \rightarrow \text{NH}_4\text{Cl}$

PART – III**PRIORITY – I****I. ACADEMIC SKILL - REMEMBERING :**

1. Common Salt is obtained by Evaporation of sea water. We can produce NaOH , Chlorine gas, Hydrogen gas, washing soda and baking soda etc
2. The electrolysis of aqueous solution of NaCl is called chlor alkali process. The main products are sodium hydroxide, hydrogen and chlorine gas
3. $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ – Hydrated Salt / Sodium Carbonate with water of crystallization.

Preparation :**Uses :**

- i) Used in glass, soap and paper industries
- ii) Used in the manufacture of borax
- iii) Used as a cleansing agent for domestic purpose
- iv) Used for removing hardness of water

4. **Sodium Hydrogen Carbonate :**

Sodium hydrogen Carbonate is a basic salt with $\text{pH} > 7$. It is prepared by solvey process.

Baking powder consists of a mixture of baking soda (NaHCO_3) and edible acid such as tartaric acid ($\text{C}_4\text{H}_6\text{O}_6$).

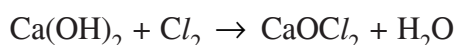


NaHCO_3 on heating liberates CO_2 gas, which makes the cake fluffy. NaHCO_3 is also called baking soda as it is used for baking cakes. It is also a weak base used to neutralise HCl in the stomach.

5. **Bleaching powder :**

Bleaching powder is prepared when Cl_2 gas is passed into dry slaked lime.

Bleaching powder is chemically Calcium Oxychloride (CaOCl_2).



On reaction with water, bleaching powder liberates Cl_2 , which acts as a bleaching agent.

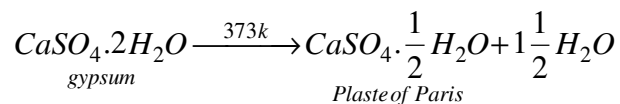
Uses :

- i) Acts as an oxidising agent
- ii) For bleaching cotton in textile industry.

6. **Plaster of Paris :**

Plaster of Paris is calcium sulphate hemihydrate. It is prepared from Gypsum.

The chemical formula of plaster of Paris is $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$



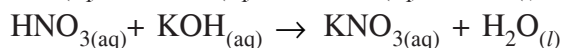
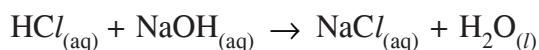
In Plaster of Paris, two molecule of CaSO_4 share one molecule of water.

Uses :

Used to set fractured bones, used for making toys decorative materials, ornaments etc. used as a fire proofing material.

7. Neutralisation reaction is the reaction between acid and base dissolved in aqueous solution to form salt and water.

Acid + Base \rightarrow Salt + Water

8. **Uses of washing soda :**

- i) In the manufacture of glass, soap, paper and chemicals like caustic soda (NaOH) and borax ($\text{Na}_2\text{B}_4\text{O}_7$) etc.
- ii) As a cleansing agent for domestic purposes.

Uses of baking soda :

- i) In baking powder used for preparing cakes.
- ii) In Antacids to reduce acidity in the stomach

9. i) Hydrate salt is a salt molecule that is lankly attached to a certain number of water molecules. Most salts are crystals in a hydrated state.
- ii) Glauber's salt - $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
 Epsom salt - $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
 Gypsum salt - $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

II. ACADEMIC SKILL - UNDERSTANDING :

10. **Acidic salts :** Aluminium chloride, zinc sulphate, copper sulphate, ammonium sulphate.

Basic salts : Sodium acetate, sodium carbonate

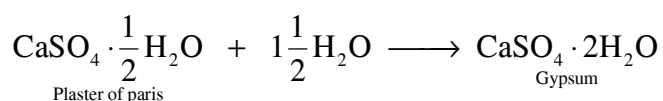
Neutral salts : Sodium chloride, potassium nitrate, sodium sulphate.

(OR)

- i) Solution M gives red colour with universal indicator. Hence the nature of solution M is 'acidic'. An acidic solution (M) has a high concentration of hydrogen ions (H^+).
- ii) Neutral salt.
 M gives red colour – acidic solution
 N gives blue colour – basic solution
 On mixing, it is a neutralisation reaction, the salt formed is neutral.
11. The chemical formula of baking powder is sodium hydrogen carbonate (NaHCO_3) and tartaric acid. Whereas, that of washing soda is sodium carbonate ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$)
 Sodium hydrogen carbonate on heating gives CO_2 gas which will turn lime water milky whereas no such gas is obtained from sodium carbonate.
- $$2\text{NaHCO}_3 \xrightarrow{\text{Heat}} \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$$
- $$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O} \xrightarrow{\text{Heat}} \text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$$

III. ACADEMIC SKILL - APPLYING :

12. In the presence of moisture, plaster of paris gets hydrated and changes to Gypsum which is a hard mass.



It can be no longer used for making moulds and statues. Therefore, plaster of paris is kept in moisture proof containers or bags.

13. The taste of cake becomes bitter as the medium becomes too basic due to baking soda. Baking soda on mixing with other ingredients gives baking powder.

Baking powder contains baking soda, corn and tartaric acid. NaHCO_3 in baking powder on heating gives Na_2CO_3 and CO_2 . $2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$.

14. i) The formula of 'G' is Cl_2 and formula of 'C' is CaOCl_2
 ii) $2\text{NaCl} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{Cl}_2 + \text{H}_2$
 iii) Common name of compound 'C' is bleaching powder.
 Chemical name is calcium hypochlorite.

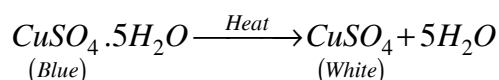
(OR)

The electrolysis of brine solution (10% aq.NaCl) gives.

- i) H_2 at cathode
- ii) Cl_2 at anode
- iii) NaOH (alkali) near the cathode

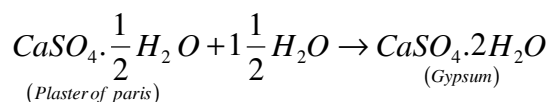
The process is called **chlor - alkali** because of the products formed – [chlor for chlorine and alkali for NaOH].

15. i) 2 formula units of $CaSO_4$ share 1 molecule of water of crystallisation.
 ii) Sodium hydrogen carbonate is used as an antacid because of its alkaline nature.
 iii) Due to loss of water of crystallisation white colour is obtained.



(OR)

- i) x – Gypsum ; $CaSO_4 \cdot 2H_2O$
 y – Plaster of paris ; $CaSO_4 \cdot \frac{1}{2} H_2O$.
- ii) Plaster of paris is a white powder and on mixing with water, it changes to gypsum.

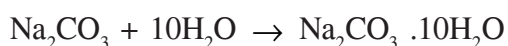


16. a) Chemical name : Sodium carbonate deca hydrate.

Common name : Washing soda

Formula is $Na_2CO_3 \cdot 10 H_2O$

- b) $NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$

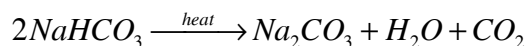


- c) It forms insoluble Ca or Mg salts in the form of Scum.

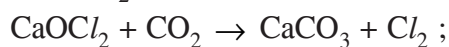
IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

17. The compound 'X' is a constituent of baking powder. It is called baking soda. Chemically, the compound is Sodium hydrogen Carbonate with formula $NaHCO_3$.

On heating, the compound 'X' will release Carbondioxide.



18. The given compound 'A' is calcium oxychloride because it is oxidising agent and in open it reacts with CO_2 to give pungent smelling chlorine gas.

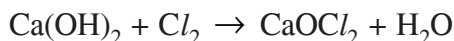


Method of preparation

Bleaching powder :

Bleaching powder is prepared when Cl_2 gas is passed into dry slaked lime.

Bleaching powder is chemically Calcium Oxychloride ($CaOCl_2$).



On reaction with water, bleaching powder liberates Cl_2 , which acts as a bleaching agent.

Uses :

- i) Acts as an oxidising agent
- ii) For bleaching cotton in textile industry.

19. i) Fixed number of water molecules present in one formula unit of a salt.
ii) Examples :

Copper sulphate $CuSO_4 \cdot 5H_2O$

Iron sulphate $FeSO_4 \cdot 7H_2O$

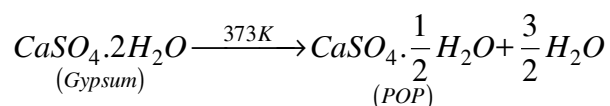
Washing soda $Na_2CO_3 \cdot 10H_2O$

By heating a few crystals of hydrated copper sulphate in a boiling tube. Water droplets are seen in the boiling tube.

Colour : The water of copper sulphate changes to white.

State : The blue crystals changes to white powder.

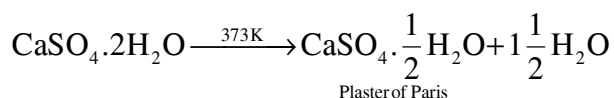
20. a) Fixed number of water molecules present in one formula unit of a salt.
b) i) $2NaHCO_3 \xrightarrow{\text{Heat}} Na_2CO_3 + H_2O + CO_2$
ii) Gypsum gets converted to plaster of paris at 373 K.



21. i) When CO_2 is passed through lime water calcium carbonate is formed which is insoluble in water and turns milky
 $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
ii) When excess CO_2 is passed. The milkyness goes away due to the formation of colourless calcium bicarbonate which is water soluble.

V. ACADEMIC SKILL - CREATING :

22. Gypsum on heating to 373K forms Plaster of paris and water.

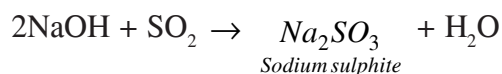
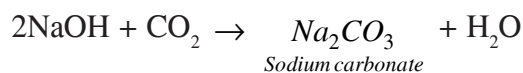


23. When plaster of paris is heated beyond $100^\circ C$, it loses whole of water of crystallisation and anhydrous calcium sulphate is formed. This is called dead burnt plaster.

4. NaCl – formed from Sodium hydroxide and Hydro chloric acid - Neutral – $\text{pH} = 7$
 CuSO_4 – formed from Copper hydroxide and sulphuric acid - Acidic – $\text{pH} < 7$
 Na_2CO_3 – formed from Sodium hydroxide and Carbonic acid - Basic – $\text{pH} > 7$
5. When soap is manufactured, it remains soluble in the solution. On stirring with common salt, the soap separates out as a solid mass. This is called ‘Salting out of Soap’.
6. The substance which is formed as a result of neutralisation reaction is called salt, it is formed when an acid is reacted with a base. pH value is 7 as it is neutral in nature.

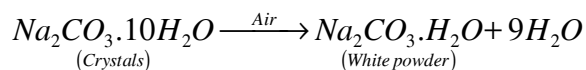
II. ACADEMIC SKILL - UNDERSTANDING :

7. The common base B which absorbs moisture and becomes sticky and is also a by-product of chloroalkali process is sodium hydroxide (NaOH). It reacts with acidic oxides like CO_2 and SO_2 to form salt and water.

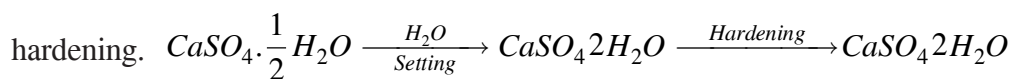


III. ACADEMIC SKILL - APPLYING :

8. The compound is bleaching powder (CaOCl_2). It removes yellowness from clothes due to its bleaching action.
 $\text{Ca(OH)}_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$.
9. Washing soda undergoes efflorescence (The change of crystals of washing soda to a white powder on exposure to air) and as a result it loses nine molecules of water to form white powder.



10. i) Calcium oxychloride or bleaching powder.
 ii) CaOCl_2
 iii) $\text{Ca(OH)}_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2(\text{s}) + \text{H}_2\text{O}$
11. When wetted with water this forms a solid plastic mass and heat is given out during this process and finally a hard porous mass results within 10 to 15 mins. This involves two steps namely setting and



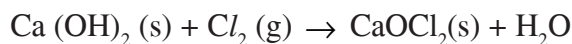
IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

12. a) Ammonium chloride, NH_4Cl
 b) Sodium chloride, NaCl
 c) Sodium carbonate, Na_2CO_3
13. a) $\text{NH}_4\text{Cl}, (\text{NH}_4)_2\text{SO}_4$
 b) $\text{NaCl}, \text{K}_2\text{SO}_4$
 c) $\text{Na}_2\text{CO}_3, \text{CH}_3\text{COONa}$

14. In the manufacture of sodium hydroxide, hydrogen gas and chlorine gas (X) are formed as by-products. When chlorine gas (X) reacts with lime water, it forms calcium oxychloride (bleaching powder) Y. The reactions are



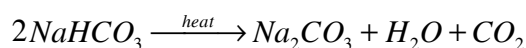
X \rightarrow Cl_2 (Chlorine gas)



Y – Calcium oxychloride (bleaching powder)

15. The compound 'X' is a constituent of baking powder. It is called baking soda. Chemically, the compound is Sodium hydrogen Carbonate with formula NaHCO_3 .

On heating, the compound 'X' will release Carbondioxide.



V. ACADEMIC SKILL - CREATING :

16. Sodium hydrogen Carbonate on heating decomposes to give Sodium Carbonate, Carbondioxide and water.



17. i) **Acid** : Acetic acid and **Base** : sodium hydroxide
ii) **Acid** : Hydrochloric acid and **Base** : Ammonium hydroxide

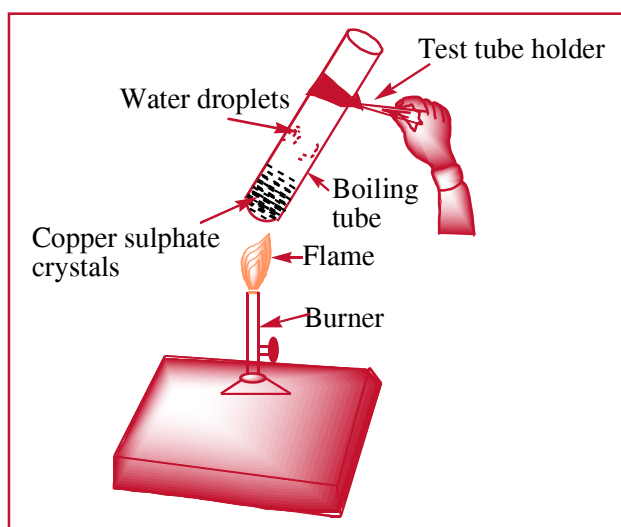
VI. PRACTICAL SKILL BASED QUESTION :

18. Water of crystallization : It is the fixed number of water molecules present in one formula unit of a salt.

Aim : To verify the process of water of crystallization.

Required material :

1) Copper sulphate, 2) Gypsum, 3) Water, 4) Test tube 5) Burner



Procedure :

- i) Heat a few crystals of copper sulphate in a dry test tube.
- ii) We will find water droplets on sides of the test tube.
- iii) Then add 2 to 3 drops of water on the sample of copper sulphate obtained after heating.

Observation :

Copper sulphate crystals which seem to be dry contain water of crystallization, when heated, this water is lost and the salts turn white.

If we moistened the crystals then they gain water, the blue colour reappears.

Conclusion :

Five water molecules are present in one formula unit of copper sulphate. Water of crystallization proves that the crystals contain a fixed quantity of water in them.

19. A) Na_2SO_4 – formed from Sodium hydroxide and Sulphuric acid - Neutral – pH = 7
B) CH_3COOK – formed from Potassium hydroxide and Acetic acid - Basic – pH > 7
C) NH_4Cl – formed from Ammonium hydroxide and Hydro chloric acid - Acidic – pH < 7
Test tube B turns pink.

PRIORITY – III**I. ACADEMIC SKILL - REMEMBERING :**

1. a) Bleaching powder is manufactured by the action of Chlorine on slaked lime Ca(OH)_2
$$\text{Ca(OH)}_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$$

(Bleaching powder)
b) It gradually loses its Chlorine when left exposed to the air by action of Carbondioxide
$$\text{CaOCl}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{Cl}_2 \uparrow$$

c) **Uses :**
i) Acts as an oxidising agent
ii) For bleaching cotton in textile industry.

III. ACADEMIC SKILL - APPLYING :

2. i) $\text{X} = \text{H}_2$, $\text{Y} = \text{Cl}_2$
ii)
$$2\text{NaCl}_{(\text{aq})} \xrightarrow[+2\text{H}_2\text{O}(\text{l})]{\text{Electrolysis}} 2\text{NaOH}_{(\text{aq})} + \text{Cl}_2(\text{g}) + \text{H}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$$

iii) Bleaching powder is obtained when Y (Cl_2) is passed over slaked lime.
3. i) On heating baking soda, the main constituent of baking soda, decomposes to produce CO_2 . This causes cakes and bread to become light, soft and spongy.
ii) Baking soda on reaction with sulphuric acid gives CO_2 vigorously. CO_2 helps to extinguish fire.
iii) The pH of baking soda solution should be greater than 7. (It turns red litmus blue)

IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

4. X is basic salt. It is formed by combination of strong base and weak acid.
5. He forgot to add Baking soda
Baking powder contains baking soda, corn and tartaric acid. NaHCO_3 in baking powder on heating gives Na_2CO_3 and CO_2 . $2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$. The liberated CO_2 will make cake light.

V. ACADEMIC SKILL - CREATING :

6. Sodium bicarbonate is used in soda-acid fire extinguisher and in cakes. On heating it gives sodium carbonate. $2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$
Sodium carbonate on crystallization gives $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
Thus A = NaHCO_3 , B = Na_2CO_3 , C = $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

PATH TO 100/100

- 1) a 2) d 3) c 4) a 5) c 6) b 7) c 8) b 9) c 10) b
11) a 12) c 13) d 14) d 15) d 16) d 17) c 18) b 19) a 20) d
21) b 22) a 23) a 24) b 25) d
-

2. METALS AND NON – METALS

PART – I

PRIORITY – I

I. ACADEMIC SKILL - REMEMBERING :

1. **Metal** : Elements having tendency to lose 1 or more electrons are metals. Metals are electropositive in nature.

Occurrence: $Al > Fe > Ca > Na > K > Mg$

2. **Non – metal** : Elements having tendency to gain electrons are Non – metals.
→ Non – metals are Electronegative in nature.

Occurrence : $O > Si > P > S$

3. Potassium is highly reactive metal. It reacts readily with atmospheric oxygen & moisture. To prevent the reactions, it is stored under Kerosene.

4. a) Gold and silver are more malleable & ductile in nature & less reactive. Hence they are used in making jewellery.
b) Due to malleability & good conduction of heat and high melting points.

5. **Reactivity series** : The arrangement of metals in decreasing order of their reactivity is called reactivity series.

K, Na, Ca, Mg, Al, Zn, Fe, Sn, Pb (H), Cu, Hg, Ag, Au, Pt

6. **Aquaregia** : It is a freshly prepared mixture of concentrated HCl & conc HNO_3 in 3 : 1 ratio.

→ It is also called royal water

→ It is highly corrosive and fuming liquid.

→ It can dissolve noble metals like gold and platinum.

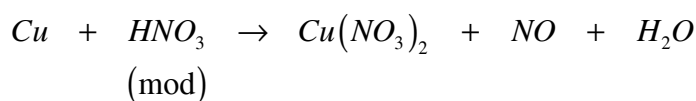
7. a)
$$\begin{array}{ccccccc} 3Fe & + & 4H_2O & \rightarrow & Fe_3O_4 & + & 4H_2 \\ (s) & & (g) & & (s) & & (g) \end{array}$$

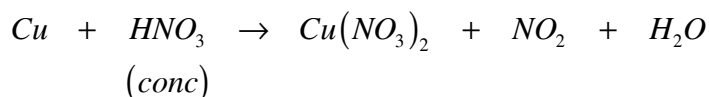
- b)
$$\begin{array}{ccccccc} Ca & + & 2H_2O & \rightarrow & Ca(OH)_2 & + & H_2 \\ (s) & & (l) & & (aq) & & (g) \end{array}$$

- c)
$$2K_{(s)} + 2H_2O_{(l)} \rightarrow 2KOH_{(aq)} + H_{2(g)}$$

8. a)
$$Cu + HNO_3 \rightarrow Cu(NO_3)_2 + NO + H_2O$$

(dil)





- b) **Oxidation:** Addition of oxygen / removal of Hydrogen / loss of electron.
 → In the above reactions
 Cu is Oxidised
 HNO₃ act as Oxidising agent.

9. i) Sodium is soft metal, it can be cut with a knife
 ii) It has low density
 iii) It has low melting point.

II. ACADEMIC SKILL - UNDERSTANDING :

10. **Amphoteric acid:** The metal oxides reacts with both acids and bases to produce salt and water.
EX: Al₂O₃, ZnO
11. * Metals which can displace H₂ from dil acids. sodium, Zinc, Calcium, Aluminium, Iron etc.
 * Metals which cannot displace H₂ from dil acids. copper, silver, gold, platinum.
12. Gold and silver are more malleable & ductile in nature & less reactive. Hence they are used in making jewellery.
Malleability : The property of metals which can be beaten into sheets.
Ductility : The property of metals which can be drawn into wires.

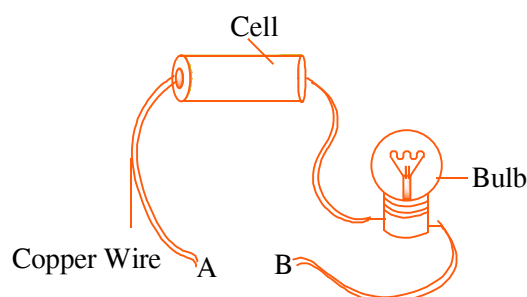
13. Sodium	Calcium	Magnesium
→ It reacts with cold and hot water vigorously	→ It reacts with cold and hot water less vigorously	→ It donot react with cold but react with hot water.
$2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2 \uparrow$	$\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2 \uparrow$	$\text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg}(\text{OH})_2 + \text{H}_2 \uparrow$

14. Fe – H₂O
 Mg – H₂O
 Cu – H₂O
 Mn – H₂O

III. ACADEMIC SKILL - APPLYING :

15. i) $2\text{Na} + 2\text{HCl} \rightarrow 2\text{NaCl} + \text{H}_2 \uparrow$ (H₂ gas is liberated)
 (dill)
- ii) $\text{Al}_2\text{O}_3 + \text{NaOH} \rightarrow \text{NaAlO}_2 + \text{H}_2\text{O}$ (A mixed salt and water are formed)
 $\text{ZnO} + 2\text{NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2\text{O}$
- iii) No reaction occurs
- iv) $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2 \uparrow$ (CO₂ gas is liberated with brisk effervescence)

16. a) i) Set up an electric circuit as shown in fig
 ii) Place the metal to be tested in the circuit between terminals A and B as shown



- iii) Does the bulb glow ? What does this indicate ?
- b) Polyvinyl chloride / PVC
 To provide insulation to the metallic wire
17. The malleability property and antibacterial activity of silver are useful properties for coating on sweets.
18. Yes it is true. Sodium react with cold water, while Mg react hot water, Iron react with only steam.
 That shows decrease in reactivity of these metals
19. a) i) Sodium, potassium
 ii) Iodine
 iii) Mercury
 iv) Gold
 v) Silver
 vi) Carbon
- b) Alloys are less reactive and corrosion resistant.
 They are lighter and harder than metals.
- i) Solder – Pb + Sn
 ii) Amalgam – Metal + Hg
20. i) $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$
 ii) $K_2O + H_2O \rightarrow 2KOH$
 iii) $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

21. a) $M - Mg$ $N - MgO$
 b) $2Mg + O_2 \rightarrow 2MgO$
 c) M undergo Oxidation.
 Addition of O_2 to M to form its oxide.

22. $Cu + ZnO \rightarrow$ No reaction [Cu is less reactive than Zn]
 $Zn + MgO \rightarrow$ No reaction [Zn is less reactive than Mg]
 $Mg + CuO \rightarrow MgO + Cu$ [Mg is more reactive than Cu]
23. a) B
b) Displacement reaction takes place B displaces Cu from $CuSO_4$
c) B, A, C, D
24. conc. HNO_3 act as Oxidising agent. It Oxidises the liberated H_2 to water.
25. a) Due to formation of a layer of Oxide Al_2O_3 .
b) Na, Mg are more reactive metals as compared to carbon.
c) In solid NaCl, no freely moving ions, but in aqueous/molten state ions can move freely.
d) To protect from corrosion zinc is coated
e) They are highly reactive
26. a) $2Cu_{(s)} + O_{2(g)} \rightarrow 2CuO_{(s)}$
Reddish brown Black
b) Amphoteric oxide reacts with both acids and bases to give salt and water – ZnO (Zinc oxide)
c) $Na_2O + H_2O \rightarrow 2NaOH$

2. **Malleability** : The property of metals which can be beaten into sheets.

Ductility : The property of metals which can be drawn into wires.

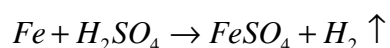
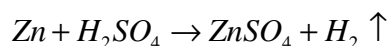
3. Gold and Platinum

4. a) They are highly reactive
b) Due to its low melting point
c) due to formation of Ag_2S
d) It reacts with both acids and bases
e) Fe becomes passive towards HNO_3 , HNO_3 acts as oxidising agent.

II. ACADEMIC SKILL - UNDERSTANDING :

5. Copper is good conductor of heat compared to steel.

6. Hydrogen gas



7. B is near to top of the activity series.

8. Due to free movement of electrons, metals are good conductors of heat and electricity.

III. ACADEMIC SKILL - APPLYING :

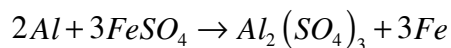
9. a) With the help of hammer, convert both the metals & non – metals in the form of sheets or wires. Metals will readily form these since they are malleable.

Non – metals being brittle will break when they are Hammered. Now construct a cell in both the cases using these sheets / wires as electrodes and switch on current. If the bulb glows, that electrodes are of metals, does not glow, the electrodes are of non –metals.

- b) From these tests, we can conclude like
1) Metals are malleable while non – metals are not
2) Metals are good conductors of electricity while non – metals are not.

10. Na, K – reacts violently with water
L – reacts less violently with water
Mg – reacts with hot water and floats

11. As Al is more reactive than Fe. It displaces Fe



12. Even though Aluminium is more reactive metal, it is used to store food because it forms a protective layer of its oxides on its surface and become passive.

IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

13. a) 'X' may be Na, Ca
Sodium : NaOH & liberates H_2
Calcium reacts less vigorously with cold water & forms $Ca(OH)_2$ & liberates H_2 .
- b) Chemical displacement, exothermic, redox reaction
 $2Na + 2HCl \rightarrow 2NaCl + H_2$; $Ca + 2HCl \rightarrow CaCl_2 + H_2$.
14. A – 2,8,8, B – 2,8,2 C – 2,6 D – 2, 8
i) Mg – B ii) O – C iii) Na^+ – D iv) Cl^- – A

V. ACADEMIC SKILL - CREATING :

15. Na_2O and CaO are basic (oxides of metals). They will turn red litmus to blue. SO_2 and N_2O_5 are acidic (Oxides of non-metals). Hence, they will turn blue litmus to red.
16. All Chemical reactions are the example of displacement reactions. only that reaction will take place in which the metal to displace the other metal from the salt solution is placed above it in the reactivity series of metal
- i) Zinc can displace Copper from Copper sulphate solution because it is placed above Copper in the reactivity series
- ii) Iron cannot displace Zinc from Zinc sulphate solution because it is placed below Zinc in the reactivity series
- iii) Zinc can displace iron from Ferrous sulphate solution because it is placed above Iron in reactivity series
17. i) Metals are regarded as electro-positive elements because they have 1 or 2 or 3 electrons in outer most shell, they have a tendency of losing electrons
- ii) Articles made of aluminium do not corrode even though aluminium is an active metal because it forms a protective layer of aluminium oxide on it
- iii) Metals like Sodium and Potassium are very reactive when exposed to open air, they catch fire immediately, hence for protection, they are kept immersed in kerosene oil
18. a) As metal atoms have free electrons to flow
- b) As hydrogen atoms sometime form positive ions by losing electron from their shell
- c) As Zn is more reactive than Copper, it displaces Copper and forms its own colourless solution of Zinc sulphate
- $$\begin{array}{ccccccc} Zn + CuSO_4 & \rightarrow & ZnSO_4 + & Cu \\ \text{Blue} & & \text{Colourless} & \\ \text{Solution} & & \text{Solution} & \end{array}$$
- d) Nitrogen is an inert (non-reactive) gas.
19. a) These metals placed at the bottom of the activity series are very little reactive in nature. Gold and Platinum are even known as noble metals. They are not affected by air, water and even by chemical. Since they have bright lustre, jewellery can be made from them.

- All the three metals react with water producing lot of heat. As a result, hydrogen gas evolved catches fire. These are kept under kerosene to avoid contact with both air and water.
- When exposed to air the metal changes to its oxide called Aluminium oxide (Al_2O_3). It gets deposited over the surface of the metal and forms protective coating on the surface, it becomes unreactive and can be used in making cooking utensils.
- Metal oxides can be easily reduced to metallic form with coke (C) any other suitable reducing agent. Therefore, carbonates and sulphides are converted into the oxide form by process of calcination and roasting

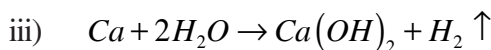
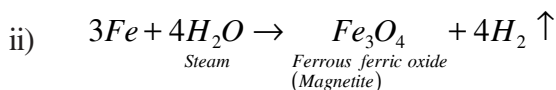
VI. PRACTICAL SKILL BASED QUESTION:

20. a) Copper is more reactive than Silver and hence, displaces Silver from its salt solution.
As a result $\text{Cu}(\text{NO}_3)_2$ is formed which is bluish green in colour
- b) $\text{Cu}_{(\text{s})} + 2\text{Ag NO}_{3(\text{aq})} \rightarrow \text{Cu}(\text{NO}_3)_{2(\text{aq})} + 2\text{Ag}_{(\text{s})}$
Bluish green

PRIORITY – III

I. ACADEMIC SKILL - REMEMBERING :

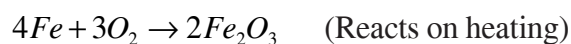
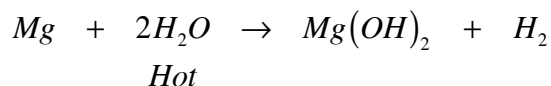
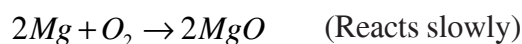
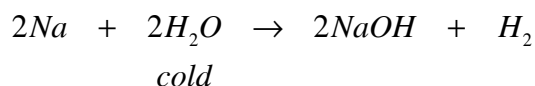
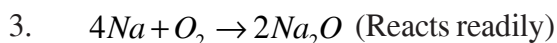
1. i) $4Al + 3O_2 \rightarrow 2Al_2O_3$ (Aluminium oxide)

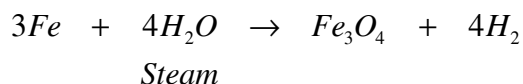


H₂ gas liberated is stick to the surface of calcium and makes it float on water.

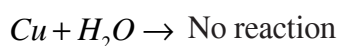
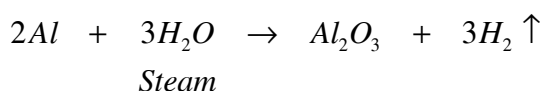
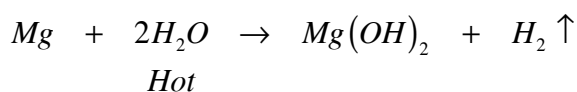
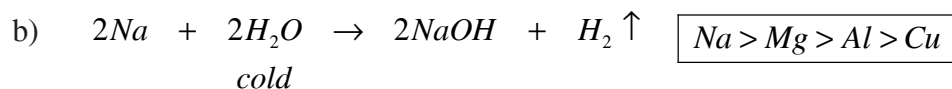
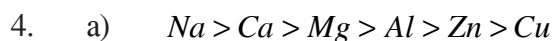
II. ACADEMIC SKILL - UNDERSTANDING :

2.
 - i) Due to thermal conductivity
 - ii) Malleability
 - iii) High melting point.





III. ACADEMIC SKILL - APPLYING :



IV. ACADEMIC SKILL - CREATING :

5. The hydrogen gas liberated sticks to the surface of metal and makes them to float on water.

6. Because it is used for making certain war equipment, Bridges etc.

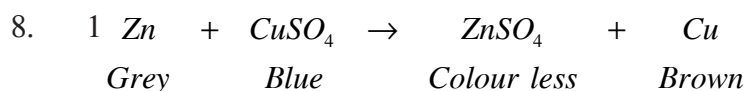
Properties : low density, high strength

7. Given reasons

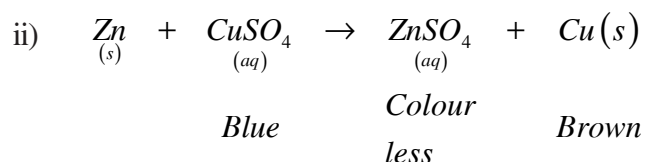
i) Due to mobile electrons

ii) Because 24 carat gold is soft in nature and cannot be used to make ornaments, so 22 carat gold with Cu like alloy is used for ornaments as its is harder than pure gold.

V. PRACTICAL SKILL BASED QUESTION :



i) Zn is more reactive than copper, So displacement reaction takes place



PART – II

PRIORITY – I

I. ACADEMIC SKILL - REMEMBERING :

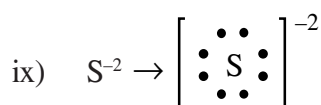
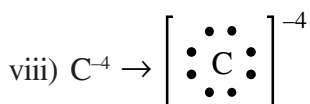
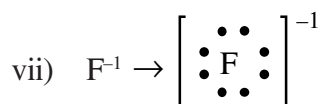
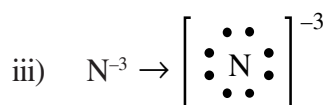
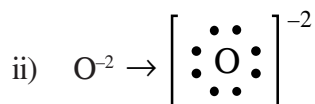
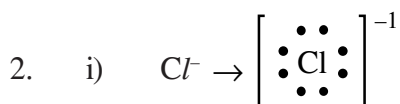
1. The force of attraction which hold two (or) more atoms (or) ions together in a molecule is called chemical bond.

Ionic Compound

- 1) They are crystalline solids at room temperature
- 2) They have High M.P and B.P
- 3) They are good conductor of electricity in aqueous state (or) molten state
- 4) They are Hard in nature
- 5) They are soluble in H₂O

Covalent Compound

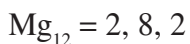
- 1) They are solid, liquid, gases at room temperature
- 2) They have low M.P and B.P
- 3) They are bad conductor of electricity in solid, liquid and gaseous state.
- 4) They are soft in nature.
- 5) They are soluble in organic solvents



3. i) Electron dot structure sodium
Na₁₁ = 2, 8, 1 it has 1 valence electron.



Electron dot structure Magnesium



It has 2 valence electrons



Electron dot structure of oxygen

$O_8 = 2, 6$

It has 6 valence electrons



ii) Na_2O

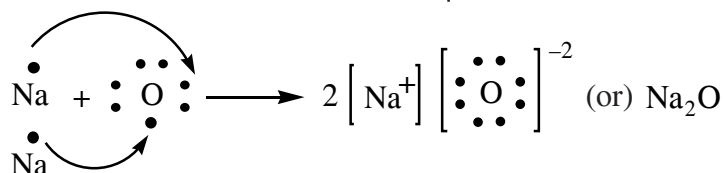
$\text{Na}_{11} = 2, 8, 1$

It has only one valence electron



$O_8 = 2, 6$

It has 6 valence electrons



MgO

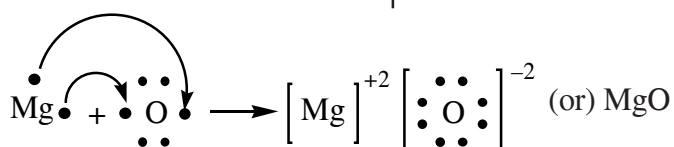
$\text{Mg}_{12} = 2, 8, 2$

It has 2 valence electrons



$O_8 = 2, 6$

It has 6 valence electrons



iii) Na_2O contain Na^+ and O^{-2} ions

MgO contain Mg^{+2} and O^{-2} ions.

4. A chemical bond formed by sharing of electrons is called covalent bond or covalent bonds are formed by sharing of electrons.

II. ACADEMIC SKILL - UNDERSTANDING :

5. The given ionic compound is CaO .

a) $\text{Ca}_{20} = 2, 8, 8, 2$

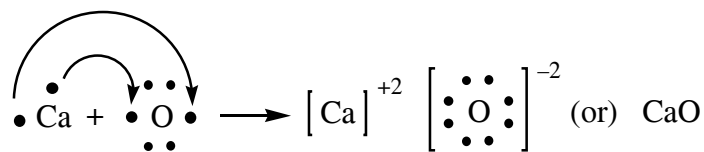
It has 2 valence electrons



$O_8 = 2, 6$

It has 6 valence electrons



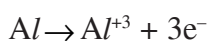


b) Bronze contain – Copper and tin

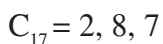
6. Generally covalent compounds are poor conductor of electricity due to absence of free ions.

7. a) $\text{Al}_{13} = 2, 8, 3$

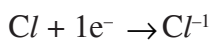
It has three valence electrons



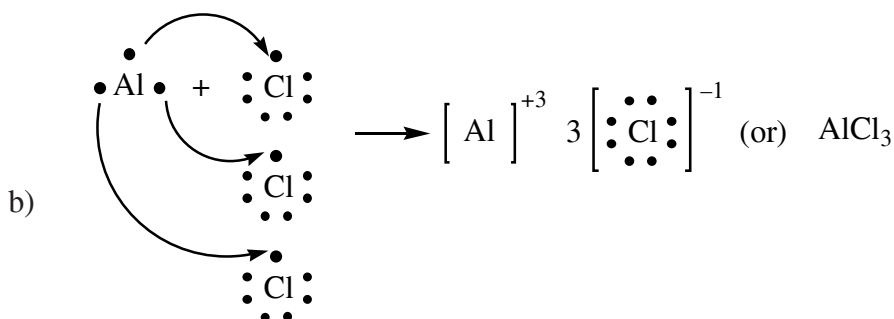
\therefore Valency of Al = 3



It has 7 valence electrons



Valency of “Cl” = 1



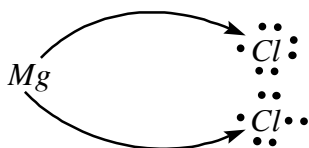
Formula = AlCl_3

Nature of compound is “Ionic compound”

- * They are crystalline solid at room temperature due to strong electrostatic force of attraction is present in between opposite charged ions.
- * They are good conductor of electricity due to presence of free ions.
- * They have high M.P and B.P due to strong force attraction is present in between opposite charged ions.

8. i) $\text{Mg}_{12} = 2, 8, 2$

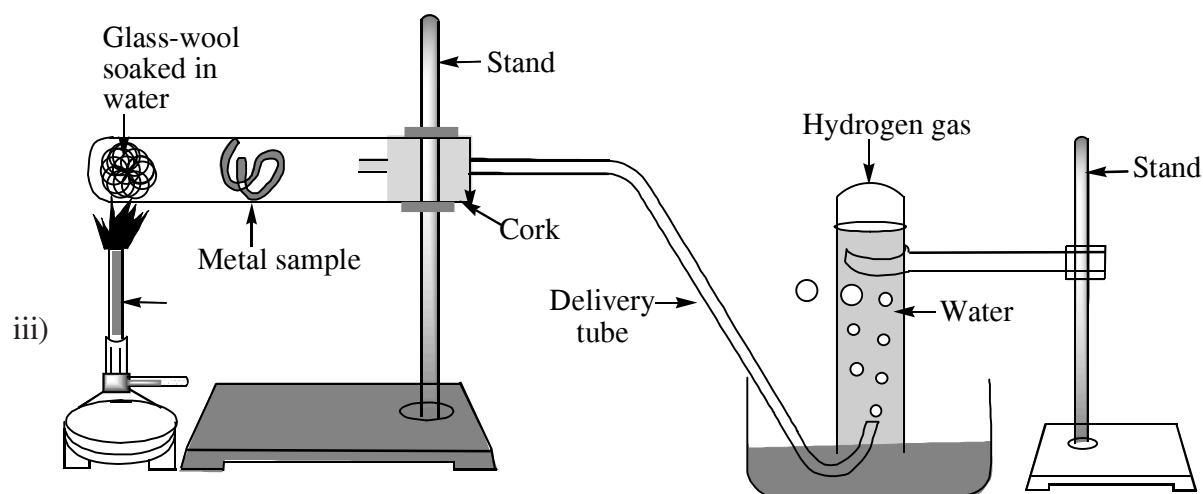
$_{17}\text{Cl} = 2, 8, 7$



MgCl_2

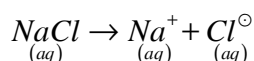
Ions present in the compound $\text{Mg}^{2+}, \text{Cl}^{-}$

- ii) Strong electrostatic force act on Ionic compounds since they are tightly packed with each other to form a crystal lattice.



III. ACADEMIC SKILL - APPLYING :

9. Ionic compounds are conducting electricity in aqueous state (or) in molten state due to presence of free ions.



10. *
- * Generally metals with more electro positivity show tendency to loose electrons and form cations.
 - * Non-metals with more electro negativity show tendency to gain electrons and form anions.
 - * The factors which will effect formation of cation and anion.

i) Atomic size	ii) Ionisation potential
iii) Electron affinity	iv) Electro negativity

IV. ACADEMIC SKILL - CREATING :

11. a) Strong electrostatic force of attraction is presents in between oppositely charged ions.
 b) Due to presence of free ions
 c) Due to strong electro static force of attraction is present in between oppositely charged ions.

PRIORITY - II

I. ACADEMIC SKILL - REMEMBERING :

1. **Ionic bond :** The electro static force of attraction is present in between oppositely charged ions which are formed by transfor of one (or) more electrons from one atom to another atom is called Ionic bond.
- * The compounds formed by the transfor of electrons from a metal to a non-metal are called ionic compounds.
 - * Ionic compounds in the solid state do not conduct electricity because movement of ions in the solid is not possible due to their rigid structure.
 - * But in the molten state ions move freely because the electro static force of attraction between the oppositely charged ions are overcome due to melting.

- | | |
|-----------------------------|---------------------------|
| 6. $C_{19} = 2, 8, 8, 1$ | $D = 2, 7$ |
| It has one valence electron | It has 7 valence electron |
| Valency = 1 | Valency = 1 |
| Nature = Metal | Nature = Non - metal |
| a) Ionic bond | |
| b) B | |

PRIORITY - III**I. ACADEMIC SKILL - REMEMBERING :**

1. Polar solvents (Water).

II. ACADEMIC SKILL - APPLYING :

2. i) a) Element A atomic number is 6. Its electronic configuration is $1s^2 2s^2 2p^2$.
b) Element 'A' cannot form ionic bond. Its electronic configuration is 2, 4. Its valence electrons are 4. It is difficult to lose or gain $4e^-$ to get octet configuration. So it can form covalent bond [atomic number of A is 6 this element is carbon (C)].
- ii) a) Element 'B' atomic number is 11 its electronic configuration is $1s^2 2s^2 2p^6 3s^1$.
b) B element cannot form covalent bond. Its valence electrons are 1 only. So it is easy to donate this one electron to other atom and become an ion. So it can form ionic bond [atomic number of B is 11, so this element is sodium (Na)].
- iii) a) Atomic number of elements is 17 its electron configuration is $1s^2 2s^2 2p^6 3s^2 3p^5$.
b) Element 'C' can form ionic as well as covalent bonds to satisfy its octet configuration. It is able to combine with Na in ionic bond and with hydrogen in HCl molecule as covalent bond.

III. ACADEMIC SKILL - ANALYSING AND EVALUATING :

3. Two non - metals combine with each other by the sharing of electrons to form a compound X.
- a) What type of chemical bond is present in X ? : Covalent bond
b) State whether X will have a high melting point or low melting point. : Low melting point
c) Will it be a good conductor of electricity or not ? : No
d) Will it dissolve in an organic solvent or not ? : Yes
4. A metal combines with a non - metal by the transfer of electrons to form a compound Y.
- i) State the type of bonds in Y. : Ionic bond
ii) What can you say about its melting point and boiling point ? : High melting point and boiling point
iii) Will it be a good conductor of electricity ? : Yes
iv) Will it dissolve in an organic solvent or not ? : No

5. The electronic configuration of three elements X, Y and Z are as follows :

X 2, 4

Y 2, 7

Z 2, 1

a) Which two elements will combine to form an ionic compound ? : Y and Z

b) Which two elements will react to form a covalent compound ? : X and Y

6. X – Na, Y – NaOH, Z – H₂

IV. ACADEMIC SKILL - CREATING :

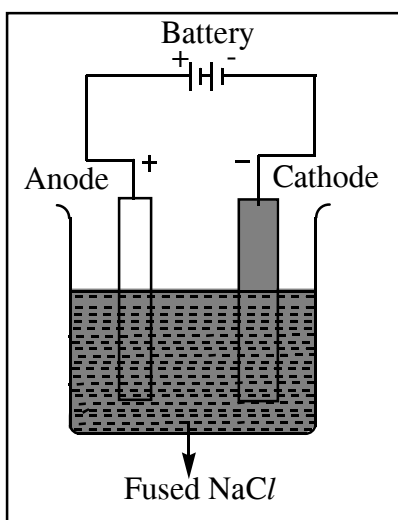
7. X – Carbon , Y – Diamond, Z – Graphite.

PART - III

PRIORITY – I

I. ACADEMIC SKILL - REMEMBERING :

1.

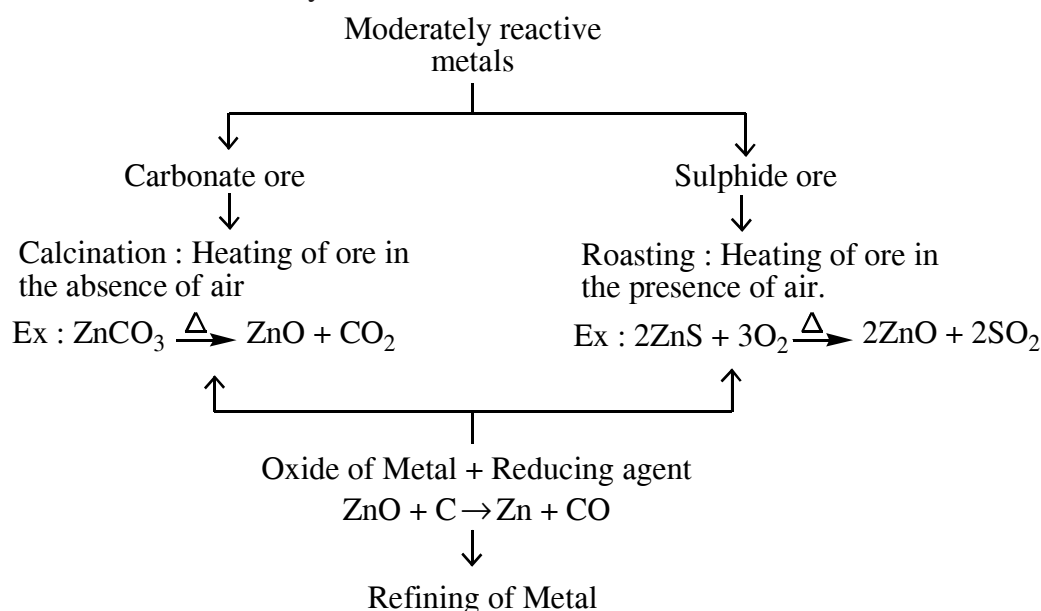


Metals high up in reactivity series are extracted by electrolytic reduction. While those in the middle are extracted by first converting into oxide and then reducing by carbon. Same method cannot be used for higher metals because they have more affinity for oxygen than carbon. Molten Sodium chloride is taken for electrolytic reduction. The metal is deposited at the cathode and chlorine is liberated at anode.

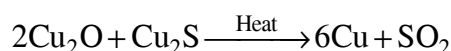
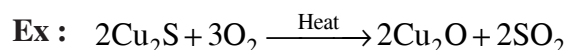
At cathode $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$

At anode $2\text{Cl}^- \rightarrow 2\text{e}^- + \text{Cl}_2$

2. Extraction of Moderately reactive metals :



3. **Auto Reduction :** The auto reduction is the process in which sulphide ores of less electropositive metals are heated in air to convert that some part of ore into oxide (or) sulphide which then reacts with remaining sulphide one in absence of air which gives pure metal and sulphur dioxide.



4. **Corrosion :** The process of eating up of metals by the action of air and moisture and chemicals on then metallic surface is called corrosion.

Metal	Original Colour	Colour after Corrosion	Chemical formula after corrosion
1. Fe	Grey	Reddish brown	$\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$
2. Al	Grey (shiny appearance)	Dull appearance	Al_2O_3
3. Cu	Reddish brown	Green	$\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
4. Silver (Ag)	Silvery white	Black	Ag_2S

5. i) **Minerals :** These are the combined states of metals generally with non - metals.
 ii) **Ores :** The minerals from which metals can be conveniently and profitably extracted are called ores.
 iii) **Gangue:** It represents the earthy impurities such as mud, sand, clay associated with the ore.
6. a) Iron : Ferric oxide, Brown
 Silver : silver sulphide, black
 Copper : copper carbonate, green
 b) Oiling, greasing, painting, galvanisation, chrome plating, anodising, making alloys.

7. Minerals are naturally occurring materials found inside earth's crust containing metals in their combined state whereas minerals from which metals can be extracted profitably are ores.
8. The process of depositing a thin layer of zinc on the surface of iron is called galvanization. Galvanization prevents iron from rusting since it does not allow air and moisture to come in contact with iron.
9. a) **Anodising** : Anodising is a process for producing decorative and protective films on articles made of aluminium and its alloys.

$$2Al + 3H_2O \rightarrow Al_2O_3 + 6H^+ + 6e^-$$
- b) **Aqua regia** : It is a mixture of 3 parts of Conc. HCl and 1 part of Conc. HNO₃
 Conc. HCl : Conc. HNO₃ = 3 : 1

II. ACADEMIC SKILL - UNDERSTANDING :

10. Homogeneous mixture of two or more Molten metals or a metal and a non-metal is called an Alloy. Alloys are prepared by Melting the primary metal and dissolving the other elements in definite proportion.

Improves properties, prevents corrosion

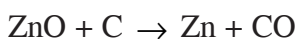
- a) Bronze : Copper and Tin
 b) Solder : Lead and Tin
 c) Brass : Copper and zinc.
11. a) **Calcination** :
- Heating the ore in limited supply of air.
 - Used for carbonate ores.

Roasting :

- Heating the ore in excess supply of air.
- Used for sulphide ores.



Metal oxide is reduced by using a reducing agent



- b) Sodium, Calcium, Aluminium,

(OR)

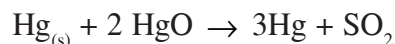
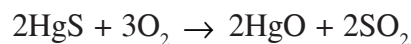
- a) A - CO₂
 Substance formed of green coating CuCO₃
- b) Roasting and Electrolytic refining

$$2Cu_2S_{(s)} + 3O_{2(g)} + heat \rightarrow 2Cu_2O_{(s)} + 2SO_{2(g)}$$

$$2Cu_2O_{(s)} + Cu_2S_{(s)} + heat \rightarrow 6Cu_{(s)} + SO_{2(g)}$$

12. Cinnabar HgS is an ore of mercury when Cinnabar HgS is heated in air it is first converted into HgO HgO is then reduced to Hg on further heating.

Cinnabar HgS is an ore of Mercury. The metals being less reactive can be obtained by reducing their oxides to metals by heating alone. So when Cinnabar is heated in air it first changes into its oxide and then into mercury metal.



13. a) **Alloy** : A homogeneous mixture of two (or) more metals (or) metals and non metals is called alloy.

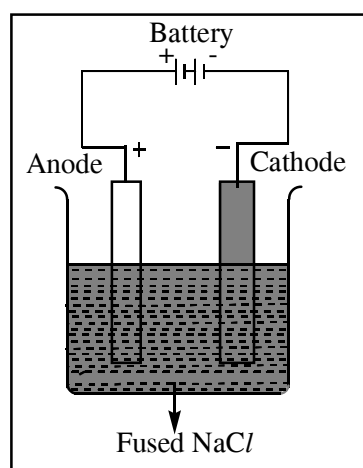
Amalgam : An Alloy of mercury with one (or) more metals is called amalgam.

* The alloy used for soldering electrical wires is solder it is an alloy of lead and tin.

- b) i) Brass - [Cu - 66%, Zn - 34%]
 ii) Stainless steel - [Cr - 15%, Ni - 1%, Fe - 83%, C - 1%]
 iii) Bronze - [Cu - 88%, tin - 12%]

III. ACADEMIC SKILL - APPLYING :

14.



Metals high up in reactivity series are extracted by electrolytic reduction. While those in the middle are extracted by first converting into oxide and then reducing by carbon. Same method cannot be used for higher metals because they have more affinity for oxygen than carbon. Molten Sodium chloride is taken for electrolytic reduction. The metal is deposited at the cathode and chlorine is liberated at anode.

At cathode $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$; At anode $2\text{Cl}^- \rightarrow 2\text{e}^- + \text{Cl}_2$

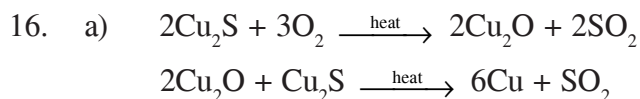
15. The reaction in which Iron (III) oxide is heated with Aluminum powder to give Iron and Aluminum oxide.



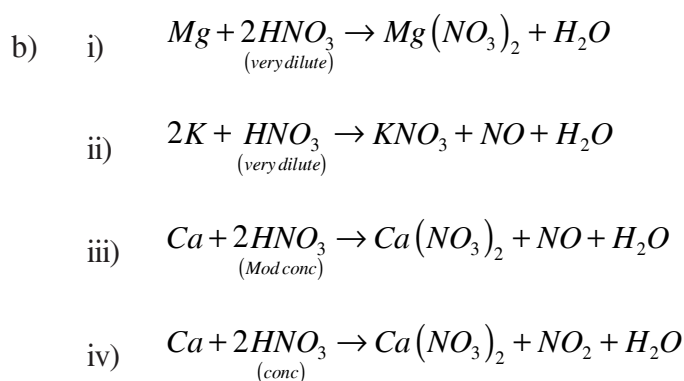
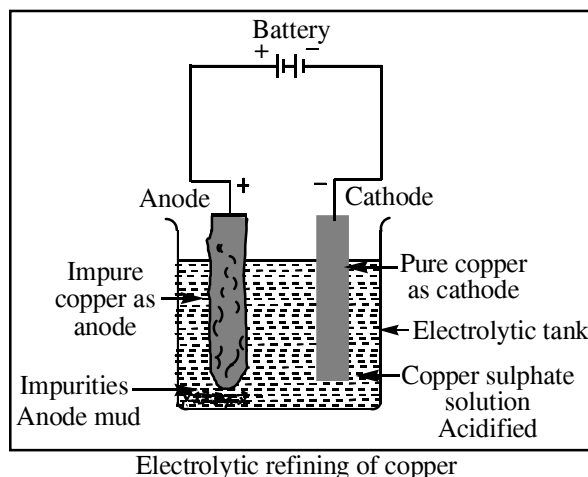
i) Displacement reaction ii) Exothermic reaction

It is used to join railway tracks/ cracked machine parts

Reason : Since it is highly exothermic reaction, iron is produced in the molten state which may be allowed to trickle down to weld two iron objects.



On passing current through electrolyte, the pure metal from the anode dissolves into the electrolyte.
 An equivalent amount of pure metal from the electrolyte is deposited at the cathode.



17. a) Amalgam is an alloy in which one of the constituent is the mercury
 b) Solder used for making electrical fuse because of its lower melting point
 c) Galvanisation is the process of coating of iron with layer of Zinc to protect it from rusting.
 d) Anode – Impure copper
 Cathode – Pure copper
 Electrolyte – Acidified copper sulphate solution

IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

18. i) When mercuric oxide (HgO), a red solid, is heated at a very high temperature, it decomposes to give mercury (Hg), a grey residue and Oxygen gas (O_2) liberates.
 $2\text{HgO} \rightarrow 2\text{Hg} + \text{O}_2$
- ii) When a mixture of cuprous oxide and cuprous sulphide is heated, copper metal is produced as residue along with the evolution of SO_2 gas.
 $2\text{Cu}_2\text{O} + 2\text{Cu}_2\text{S} \rightarrow 6\text{Cu} + \text{SO}_2$

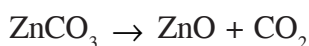
- iii) When Aluminium is reacted with manganese dioxide, Aluminium oxide (Al_2O_3) and Manganese (Mn) is produced as a residue.



- iv) When Ferric oxide is reduced with aluminium, Aluminium oxide (Al_2O_3) and iron (Fe) is produced as a residue.



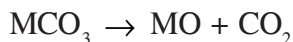
- v) When Zinc carbonate undergoes calcination (heated in the absence of air), zinc oxide, ZnO (yellow when hot and white when cold) is formed as residue along with the evolution of CO_2 gas.



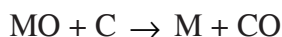
19. a) Ore X gives CO_2 gas, hence, it is a metal carbonate.

Calcination :

Metal carbonate heated strongly in the presence of limited supply of air it gives us :-



Reduction : The oxide ore is reduced with carbon (coke).

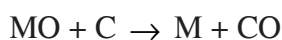


- b) ore Y gives SO_2 gas, hence, it is a metal sulphide.

Roasting– Metal sulphide heated in the presence of excess air, then it gives us :-

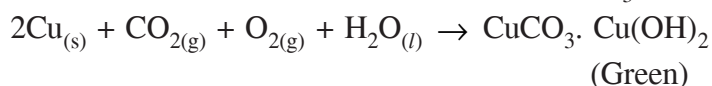


Reduction : The metal oxide is reduced to metal by a most common reducing agent called carbon or coke.



VI. ACADEMIC SKILL - CREATING :

20. When Copper vessels are exposed to moist air, they get tarnished (or corroded) by the formation of a green coating of basic Copper carbonate, $CuCO_3 \cdot Cu(OH)_2$.



Now lemon juice contains Citric acid and tamarind contains Tartaric acid. When tarnished Copper vessels are rubbed with lemon juice or tamarind, the weak acids present in them dissolve the basic Copper carbonate and the original shine of the Copper vessel returns.

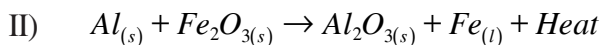
21. An alloy is a homogeneous mixture of two or more metals having some times a non – metal component also 22 – carat gold is an alloy of gold and copper having 22 parts gold and two parts copper 24 – carat gold is very soft. It is converted into 22 – carat gold to provide it some hardness so that ornaments made from it be durable.

22. a) Cinnabar – HgS

Mercury is found in the sulphide state.

- b) $ZnCO_{3(s)} \rightarrow ZnO_{(s)} + CO_{2(g)}$

- c) I) Metal A = Al ; Thermite reaction.



(OR)

Because sodium has more affinity for oxygen than carbon. During electrolytic reduction of NaCl

At cathode : $\text{Na}^+ + e^- \rightarrow \text{Na}$

At anode : $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2e^-$

VI. PRACTICAL SKILL BASED QUESTION :

23. a) The reactivity series is a list of metals arranged in the order of their decreasing activities. The following series is known as the reactivity series
 $\text{K} > \text{Na} > \text{Ca} > \text{Mg} > \text{Al} > \text{Zn} > \text{Fe} > \text{Pb} > [\text{H}] > \text{Cu} > \text{Hg} > \text{Ag} > \text{Au}.$
- b) i) Blue colour of Copper sulphate solution would slowly disappear.
 ii) No change would be noticed

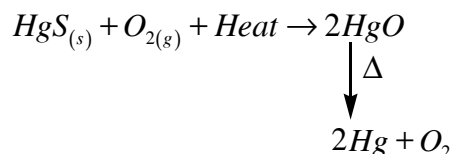
PRIORITY – II

I. ACADEMIC SKILL - REMEMBERING :

1. K, Na, Ca, Mg

II. ACADEMIC SKILL - UNDERSTANDING :

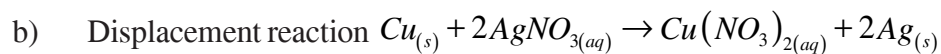
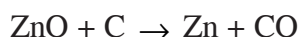
2. Calcium and magnesium are two metals that start floating after some time when immersed in water. The bubbles of the hydrogen gas so formed in the reaction stick to the surface of the metal surface, and thus the metals float on water.
3. Reaction of cinnabar with oxygen:
- When cinnabar (HgS) is heated in presence of atmospheric oxygen (O_2) then Mercury (II) oxide (HgO) and Sulfur dioxide (SO_2) are formed. Then further mercury oxide is heated and elemental mercury (Hg) is obtained.
 - The chemical reaction can be depicted as :



III. ACADEMIC SKILL - APPLYING :

4. a) It must be a carbonate ore because the reaction is releasing carbon di oxide.
 reaction which takes place, $\text{ZnCO}_3 + \text{HCl} \rightarrow 2\text{ZnCl}_2 + \text{H}_2\text{O} + \text{CO}_2$
 let us take an example of calcinating zinc calamine(ZnCO_3)
 first of all, it is calcinated with insufficient oxygen
 $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$

than, the ZnO obtained is reduced using carbon in form of coke.



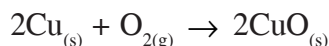
IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

5. i) The metal 'X' is aluminium (Al)
 ii) $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe} + \text{heat}$.

This reaction is useful in thermite welding.

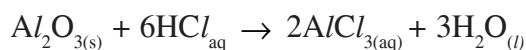
6. Copper is heated in air

- Copper is heated in the presence of air to produce black copper oxide.
- The balanced equation is as follows:



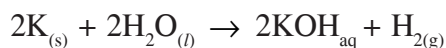
Aluminum oxide is reacted with hydrochloric acid

- Aluminum oxide is treated with hot dilute hydrochloric acid to produce aluminum chloride and water.
- The balanced equation is as follows :



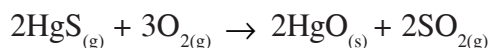
Potassium reacts with water

- When potassium combines with water, potassium hydroxide and hydrogen gas are formed.
- The balanced equation is as follows :



Cinnabar is heated in air

- When cinnabar is burned in air, it is converted to mercuric oxide, which produces sulfur dioxide gas.
- The balanced equation is as follows :



Aluminum oxide reacts with sodium hydroxide

- Sodium aluminate and water are formed when aluminum oxide combines with sodium hydroxide.
- The balanced equation is as follows : $\text{Al}_2\text{O}_3 + 2\text{NaOH} \rightarrow 2\text{NaAlO}_2 + \text{H}_2\text{O}$

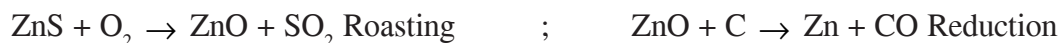
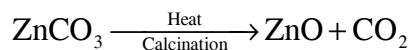
7. Gold and platinum.

- a) A thin layer of aluminium oxide forms a protective layer which protects the aluminium metal from further damage. Here, corrosion is an advantage
- b) Corrosion of iron is a serious problem. Every year enormous amount of money is spent to replace damage iron structures. Here, corrosion is a serious problem

PRIORITY – III

I. ACADEMIC SKILL - REMEMBERING :

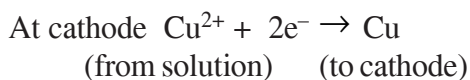
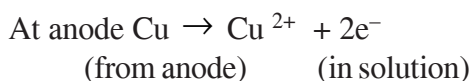
1. Metals cannot be obtained directly from carbonates and sulphides. It is easier to reduce oxides with carbon :



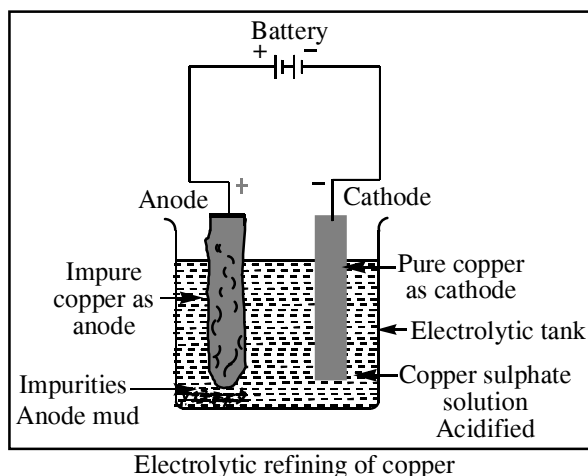
2. i) Reducing agents like carbon cannot break strong affinity between metal and non-metal.
 ii) Electrolytic reduction.
3. **Refining of metals :** The process of removing impurities from a reduced metal to obtain its pure state is called refining of metals.

Electrolytic refining of copper -

An impure metal is made the anode and a thin strip of pure metal is made the cathode. A solution of metal salt is used as an electrolyte. On passing



In soluble impurities settle down as anode mud.



4. i) $2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$ (Roasting)
 ii) $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$ (Calcination)
 iii) $3\text{MnO}_2 + 4\text{Al} \rightarrow 3\text{Mn} + 2\text{Al}_2\text{O}_3$ (Reduction)

II. ACADEMIC SKILL - UNDERSTANDING :

5. a) In test tube A
b) $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$
c) Displacement reaction.

III. ACADEMIC SKILL - APPLYING :

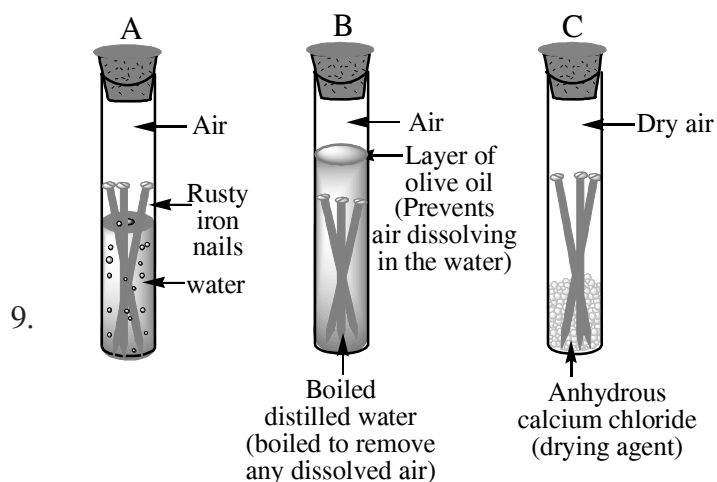
6. Reducing agents like carbon cannot break strong affinity between metal and non-metal, electrolytic reduction.
- i) Molten sodium chloride and at cathode.
 - ii) Chlorine at anode
 - iii) $2\text{Na}^+ + 2\text{e}^- \rightarrow 2\text{Na}$ (cathode), $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$ (anode)
 - iv) Potassium and Magnesium

IV. ACADEMIC SKILL - ANALYSING AND EVALUATING :

7. i) X is copper and the process is corrosion
ii) Basic copper carbonate - $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
iii) Galvanisation and painting

VI. ACADEMIC SKILL - CREATING :

8. Yes, copper metal is converted into copper oxide.

VI. PRACTICAL SKILL BASED QUESTION :

The boiled distilled water in the test tube B did not have any oxygen and the layer of oil also prevented oxygen which being dissolved in the water. Since there was no oxygen and the nail was not affected by rust. The anhydrous calcium chloride in the test tube C absorbed moisture from the air in the test tube and therefore the nails were not affected by rust. In the test tube A, the nails are exposed to both air and water and therefore the nails got coated with reddish-brown rust.

PATH TO 100/100

- 1) a 2) a 3) c 4) c 5) d 6) b 7) d 8) b 9) c 10) d
11) c 12) b 13) b 14) c 15) b

Assertion and Reason :

- 16) a 17) d 18) d 19) c 20) b 21) c 22) d 23) d 24) c 25) d
-