6 Marks Questions

AS_1 : Conceptual understanding

1. How can you make a chemical equations more informative.

A. A chemical equation can be made more informative by expressing following characteristic reactants and products.

i) Physical state

ii) Heat changes (Exothermic or endotherm

iii) Gas evolved

iv) Precipitate formed

i) Expressing the physical state:

Gaseous state (g)

Liquid state (*l*)

Aqueous state (aq)

Solid state (s)

Eg : $Fe_2O_{3(s)} + 2Al_{(s)} \xrightarrow{\Delta} 2Fe_{(s)} + Al_2O_{3(s)}$ ..... Δ represents heating.

ii) Expressing the heat changes:

1) $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)} + Q$ (exothermic reaction)

2) $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)} - Q$ (endothermic reaction)

'Q' is heat energy which is shown with plus '+' sign on product side for exothermic re and minus '–' sign on product side for endothermic reactions.

iii) Expressing the gas evolved: If a gas is evolved in a reaction, it is denoted by an upward '↑' or (g)

Eg : $Zn_{(s)} + H_2SO_{4(aq)} \rightarrow ZnSO_{4\,(aq)} + H_{2(g)}\uparrow$

iv) Expressing precipitate formed: If a precipitate is formed in the reactions it is denote downward arrow.

Eg : $AgNO_{3(aq)} + NaCl_{(aq)} \rightarrow AgCl_{(s)}\downarrow + NaNO_{3(aq)}$

2. What information do you get from a balanced chemical equation? (Applications of balanced chemical equation)

A. i) A chemical equation gives information about the reactants and products through their sy and formulae.

ii) It obeys law of conservation of mass.

iii) The relative masses of reactants and products are known from the balanced chemical eq

iv) If the masses are expressed in grams then the equation also gives the molar ratios of rea and products.

v) Based on Avagadro's law we can observe

a) mass - mass relationship

b) mass - volume relationship

c) volume - volume relationship

d) mass - volume - number of molecules relationship etc.

3. **Write the balanced chemical equations for the following reactions.** **(Public : 2025)**
   a) **Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water**
   b) **Zinc + Silver nitrate → Zinc nitrate + Silver**
   c) **Aluminium + Copper chloride → Aluminium chloride + Copper**
   d) **Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride**

A. a) $Ca(OH)_{2(aq)} + CO_{2(g)} \rightarrow CaCO_{3(s)} + H_2O_{(l)}$
   b) $Zn_{(s)} + 2AgNO_{3(aq)} \rightarrow Zn(NO_3)_{2(aq)} + 2Ag_{(s)}$
   c) $2Al_{(s)} + 3CuCl_{2(aq)} \rightarrow 2AlCl_{3(aq)} + 3Cu_{(s)}$
   d) $BaCl_{2(aq)} + K_2SO_{4(aq)} \rightarrow BaSO_{4(s)} + 2KCl_{(aq)}$

4. **Hydrogen reacts with Oxygen to produce water. What will be the mass of water produced if 100 grams of Hydrogen participated in the reaction? Calculate the number of molecules of water produced in this reaction. [Atomic masses : H = 1u, O = 16 u]** **(Public : 2024)**

A. **Chemical Change :** Hydrogen reacts with oxygen to produce water.

Word equation : Hydrogen + Oxygen → Water

Skeleton equation : $H_2 + O_2 \rightarrow H_2O$

Balanced chemical equation : $2H_2 + O_2 \rightarrow 2H_2O$

Mole concept :

$2H_2$	+	O_2	→	$2H_2O$
2 moles		1 mole		2 moles
$2 \times 2g = 4g$		32 g		$2 \times 18 = 36g$
100g				xg

4g of H_2 produces 36g of water

100g of H_2 produces x g, $x = \frac{100 \times 36}{4} = 900g$

∴ 100g of H_2 produces 900 g of water.

Conversion of mass to number of moles :

1 mole H_2O molecular mass - 18g

18 g H_2O means 1 mole of water

900g H_2O means x moles of water, $x = \frac{900}{18} = 50$ moles

Conversion of mole to molecules :

1 mole H_2O $= N_A \times H_2O$ molecules $= 6.023 \times 10^{23}$ H_2O molecules

50 moles $H_2O = 50 \times 6.023 \times 10^{23}$ H_2O molecules

$= 301.15 \times 10^{23}$ H_2O molecules

$= 3.0115 \times 10^{25}$ H_2O molecules

∴ Mass of H_2O produced is 900 g

∴ Number of molecules of H_2O is 3.0115×10^{25} H_2O molecules.

5. Explain with an activity exothermic reaction with quick lime and water?

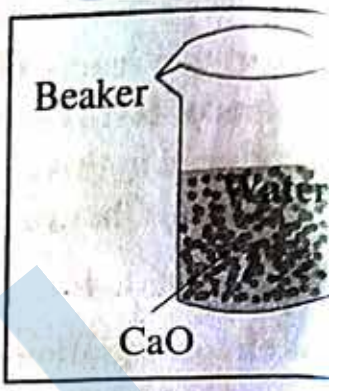
A. **Aim :** Action of calcium oxide with water (OR) Prove Exothermic reaction with quick lime and

Apparatus : 100 m*l* beaker

Materials/Chemicals :

1) 1 gm of quick lime (CaO),
2) Water

Precautions : Reaction will be very fast & hot take care of your hands While checking hotness.



Procedure

1) Take about 1 gm of quick lime (CaO) in a beaker
2) Add 100 m*l* of water to this
3) Touch the beaker with your finger
4) Dip the red litmus paper in it

Observation :

1) The beaker is hot
2) Red litmus changes into blue colour

Result : Its an exothermic reaction

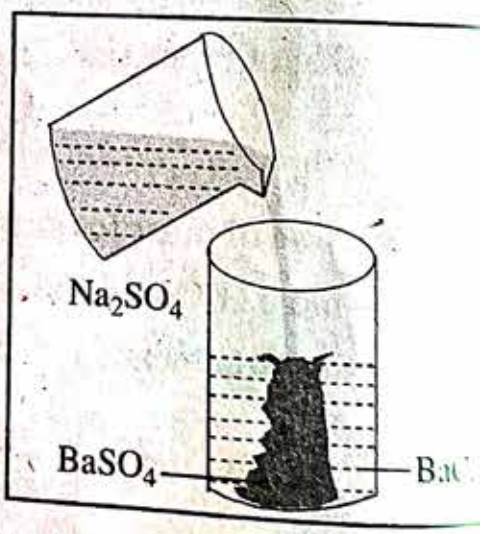
Equation : $CaO_{(s)} + H_2O_{(l)} \rightarrow Ca(OH)_{2(aq)} + \Delta / Heat$

Conclusion : CaO reacts with water and release heat energy

6. Explain with an activity precipitation reaction with sodium sulphate and barium chloride ?

A. **Aim :** To observe what change occurs by mixing sodium sulphate and barium chloride

Apparatus : Two 100 m*l* beakers.



Materials/Chemicals :

1) Sodium sulphate (Na_2SO_4)
2) Barium chloride ($BaCl_2$)
3) Water (H_2O)

Procedure :

1) Take about 100 m*l* of water in a beaker
2) Dissolve small quantity of sodium sulphate (Na_2SO_4)
3) Take about 100 m*l* of water in another beaker
4) Dissolve small quantity of barium chloride ($BaCl_2$) in distilled water.
5) Add two solutions

Observation : A curdy white precipitate is formed

Result : formation of Barium sulphate precipitate

Equation : $Na_2SO_{4(aq)} + BaCl_{2(aq)} \rightarrow \underset{\text{white ppt}}{BaSO_{4(s)}} \downarrow + 2NaCl_{(aq)}$

Conclusion : Sodium sulphate with barium chloride gives barium sulphate precipitate.

4 Marks Questions

AS_1 : Conceptual understanding

7. **Balance the chemical equation by including the physical states of the substances for the following reactions.**

i) **Barium chloride and Sodium sulphate aqueous solutions reacts to give insoluble Barium sulphate and aqueous solution of Sodium chloride.**

A. $BaCl_{2(aq)} + Na_2SO_{4(aq)} \rightarrow BaSO_{4(s)}\downarrow + 2NaCl_{(aq)}$

ii) **Sodium hydroxide reacts with Hydrochloric acid to produce Sodium chloride and Water.**

A. $NaOH_{(aq)} + HCl_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$

iii) **Zinc pieces react with dilute Hydrochloric acid to liberate Hydrogen gas and forms Zinc chloride.**

A. $Zn_{(s)} + 2HCl_{(aq)} \rightarrow ZnCl_{2(aq)} + H_{2(g)}\uparrow$

8. **What is a balanced chemical equation ? Why is it necessary to balance a chemical equation ?** **(Public : 2015)**

A. i) A chemical equation in which the number of atoms of different elements on the reactants side (left side) are same as those on product side (right side) is called a **balanced chemical equation.**

Ex : $Zn + 2HCl \rightarrow ZnCl_2 + H_2\uparrow$

ii) According to the law of conservation of mass, the total mass of the substances that are taking part in chemical reaction must be the same before and after the reaction.

iii) The number of atoms of each element before and after reaction must be same.

iv) All the chemical equations must balance, because atoms are neither created nor destroyed in chemical reactions. And no element should miss from the chemical reaction. So a chemical equation must be balanced.

(2016 Public)

9. **Balance the following chemical equations.**

i) $Zn_{(s)} + AgNO_{3(aq)} \rightarrow Zn(NO_3)_{2(aq)} + Ag_{(s)}$

ii) $Fe_2O_{3(s)} + CO_{(g)} \rightarrow Fe_{(s)} + CO_{2(g)}$

iii) $Ag_{(s)} + H_2S_{(g)} \rightarrow Ag_2S_{(s)} + H_{2(g)}$

iv) $Cu_{(s)} + O_{2(g)} \rightarrow CuO_{(s)}$

A. i) $Zn_{(s)} + 2AgNO_{3(aq)} \rightarrow Zn(NO_3)_{2(aq)} + 2Ag_{(s)}$

ii) $Fe_2O_{3(s)} + 3CO_{(g)} \rightarrow 2Fe_{(s)} + 3CO_{2(g)}$

iii) $2Ag_{(s)} + H_2S_{(g)} \rightarrow Ag_2S_{(s)} + H_{2(g)}$

iv) $2Cu_{(s)} + O_{2(g)} \rightarrow 2CuO_{(s)}$

AS_4 : Information skills and projects

10. Answer the following questions based on the information given in the chemical equation

$N_2 + 3H_2 \rightarrow 2NH_3$ **(Atomic masses : N = 14 U, H = 1 U)**

i) Write the reactants and products in the above chemical reactions?

A. **Reactants :** N_2 (Nitrogen) and H_2 (Hydrogen) ;

Product : NH_3 (Ammonia)

ii) How many moles of ammonia is produced in the above chemical reactions?

A. Two moles of ammonia.

iii) How many hydrogen molecules are present in the above chemical reaction?

A. 18.069×10^{23} H_2 molecules **(OR)**

1.8069×10^{24} H_2 molecules.

iv) Find the molecular mass of NH_3 produced in the above chemical reaction.

A. Molecular mass of NH_3 - 17.

2 Mark Questions

AS_1 : Conceptual understanding

11. Write reactants and products in the following equations and mention their physical sta

i) $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

ii) $CaCO_3 \rightarrow CaO + CO_2$

A. i) **Reactants :** $Na_2SO_{4(aq)}$, $BaCl_{2(aq)}$

Products : $BaSO_{4(s)}$, $NaCl_{(aq)}$

ii) **Reactants :** $CaCO_{3(s)}$

Products : $CaO_{(s)}$, $CO_{2(g)}$

12. Give differences between the exothermic and endothermic reactions.

A.

Exothermic reaction	Endothermic reaction
i) In this reaction heat is given out during the reaction.	i) In this reaction heat is taken into break do the bonds and form new compounds.
ii) **Ex :** Respiration, Combustion	ii) **Ex :** Photosynthesis, Electrolysis of wat
iii) $CaO_{(s)} + H_2O_{(l)} \rightarrow Ca(OH)_{2(aq)} + Q$	iii) $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)} - Q$

AS_2 : Asking questions and making hypothesis

13. Why the white washing gives shine finish to the walls ? Guess and write?

A. During white washing the chemical reaction involved is

$$Ca(OH)_{2(aq)} + CO_{2(g)} \rightarrow \underset{\text{milky white}}{CaCO_{3(s)}}\downarrow$$

(slaked lime) (insoluble product)

The $CaCO_3$ crystals will reflect the light, that produce shiny finish to the walls.

14. Imagine and write, what would happen if chemical equations are not balanced?

A. i) If a chemical equations are not balanced it implies that either mass has been created or destroyed which is a contradiction to law of conservation of mass. Which states that matter can neither be created nor destroyed.

ii) If a chemical equation is not balanced, no information about the relationship b/w products and reactants can be derived.

15. If the chemical reaction are not taken place, what could be the consequences on human lives.

A. If the chemical reactions are not take place, the consequences on human lives:

i) Without chemical reactions nothing would stay atoms

ii) Without chemical reactions atoms would stay atoms

iii) Without chemical reactions no organisms could live

Note : For writting any two points

AS_3 : Experimentation and field investigation

16. What changes do you observe, when aqueous solutions of lead nitrate is added to potassium nitrate solution?

A. When a solution of potassium iodide is added to a solution of lead nitrate, the precipitation of a yellowish solid is observed. This yellowish solid is lead iodide. Potassium nitrate is formed along with lead iodide. This is a double displacement reaction.

$$2KI_{(aq)} + Pb(NO_3)_{2(aq)} \rightarrow \underset{\text{Yellow ppt}}{PbI_2}\downarrow + 2KNO_{3(aq)}$$

17. What changes do you observe, when aqueous solutions of Silver nitrate is added to Sodium chloride solution?

A. i) A white precipitate is formed

ii) Formation of silver nitrate precipitate

iii) $AgNO_{3(aq)} + NaCl_{(aq)} \rightarrow \underset{\text{White ppt}}{AgCl_{(s)}}\downarrow + NaNO_{3(aq)}$.

6 Marks Questions

AS_3 : Experimentation and field investigation

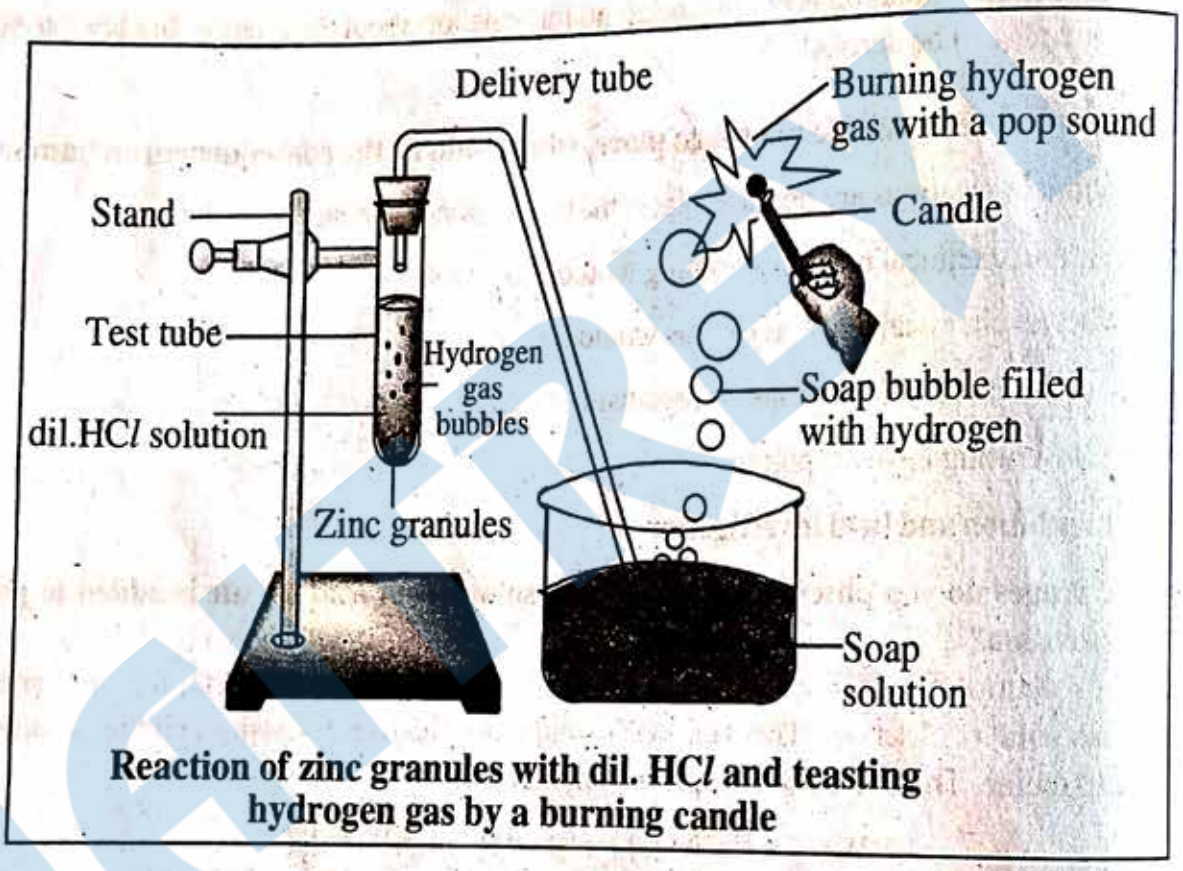
AS_5 : Communication through drawing, model making

1. How do metals reacts with acids ? Explain with an experiment ? (Public : 2017, 22

A. Aim : To observe the reaction between a metal and an acid.

Materials required : Test tubes , delivery tubes , candle , dil. HCl , zinc granules.

Procedure : Take about 10 ml of dil. HCl in a test tube and add few zinc granules to it .



Reaction of zinc granules with dil. HCl and teasting hydrogen gas by a burning candle

Observations :

i) Some gas is produced from the surface of zinc granules.

ii) This gas burns with pop sound and blue flame.

iii) It indicates that H_2 gas is evolved in this reaction.

Result : When acids react with metals H_2 is evolved.

$$\text{Acid} + \text{Metal} \rightarrow \text{Salt} + \text{Hydrogen}$$

$$2HCl + Zn \rightarrow ZnCl_2 + H_2\uparrow$$

2. How do metal carbonates reacts with acids ? Explain with an experiment ? (Public : 2018)

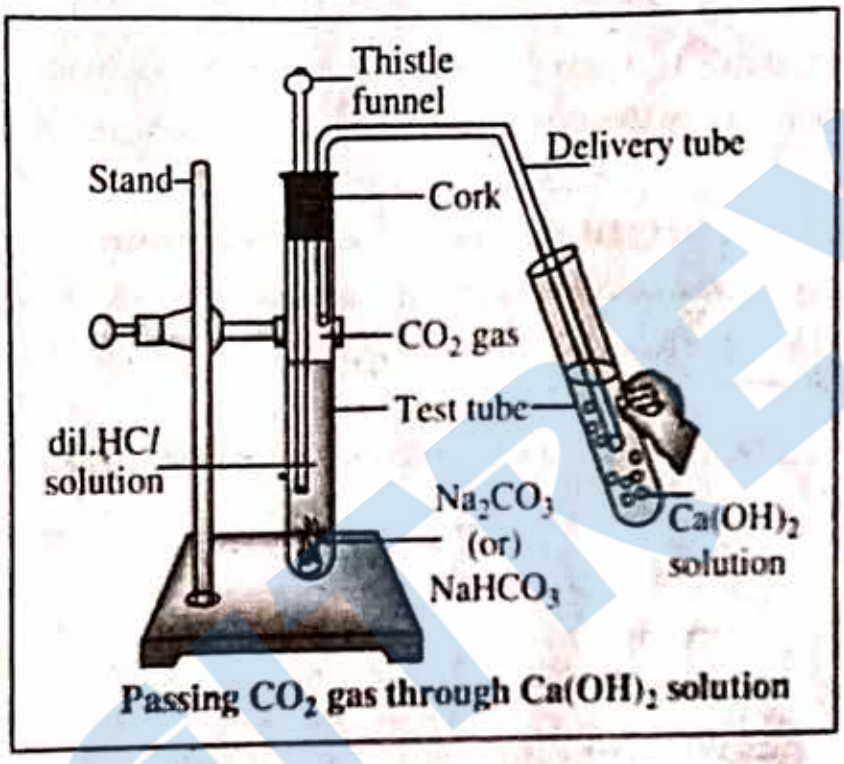
A. Aim : To observe the reaction between a metal carbonate and an acid.

Materials required : Test tubes, delivery tubes, candle, dil. HCl, Na_2CO_3, lime water - $Ca(OH)_2$, thistle funnel.

Procedure :

i) Take about 0.15 gms of Na_2CO_3 (or) $NaHCO_3$ in a test tube and fix a delivery tube, thistle funnel as in figure.

ii) Add 2 ml dil HCl through thistle funnel.



Passing CO_2 gas through $Ca(OH)_2$ solution

Observations :

i) Some gas is produced from the bottom of the test tube.

ii) When this gas is passed through lime water it turns into milky white.

Result :

i) The produced gas is CO_2.

ii) Metal carbonates or bicarbonates reacts with acids and produce CO_2.

iii) Metal carbonates or bicarbonates are basic in nature.

Metal carbonate + Acid $\rightarrow$ Salt + Water + $CO_2\uparrow$

$Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2\uparrow$

Metal bicarbonate + Acid $\rightarrow$ Salt + Water + $CO_2\uparrow$

$NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2\uparrow$

3. **Compounds such as alcohols and glucose contain hydrogen but are not categorizeds acic Describe an activity to prove it? (OR)** **(Public : 2017)**

A. **Aim :** To prove that compounds such as alcohols and glucose contain hydrogen but are not categor... as acids.

Required material :

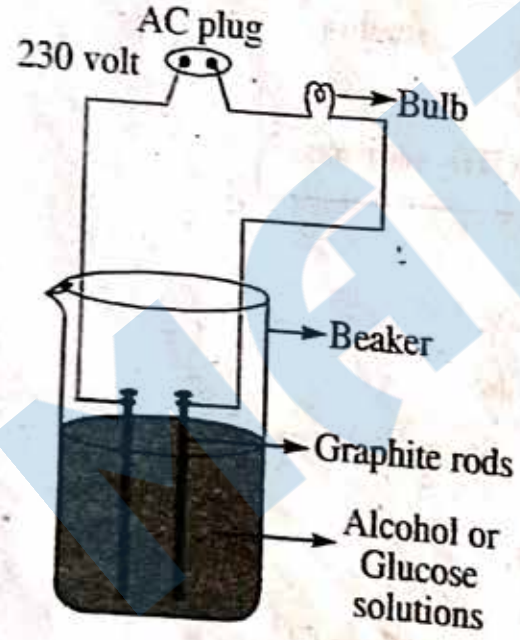
i) Rubber cork, Iron nails
ii) Two different colour electrical wires
iii) 100 ml beaker
iv) Glucose or Sucrose or Alcohol
v) dil. Hydrochloric acid
vi) Electrical bulb with a holder

Precautions :

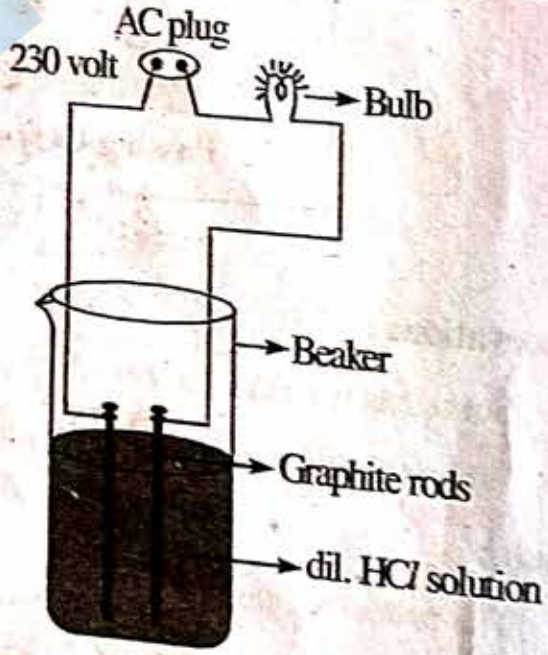
i) Keep nails separately in beaker (should not be touch with each other).
ii) While conducting test with alcohol, glucose pure substances should taken with distilled wa...

Procedure :

i) Take two nails on a cork and place the cork in a 100 ml beaker as shown in figure.
ii) Introduce two different coloured electrical wires into two holes and keep it on a 100 ml beak...
iii) Connect a wire to one terminal of an electrical plug and the other wire to a bulb holder hav... electrical bulb.
iv) Complete the circuit connecting to a switch as shown in the figure.



Glucose and Alcohol solutions doesn't conducts electricity



Acid solution in water conducts electricity

Test - (i) : Now pour glucose or alcohol solution into the beaker and perform same experiment.

Observation - (i) : The bulb does not glow.

Test - (ii) : Pour dilute hydrochloric solution in the beaker and switch on the key.

Observation - (ii) : The bulb glows.

Conclusion :

i) The positive ion (H^+) present in HCl is responsible for conduction of electricity.

ii) In Glucose and Alcohol H^+ ions are absent. So they do not conduct electricity.

Note : In case of strong acid and strong base bulb glows brightly. But in case of weak acid and weak base bulb glows with less intensity.

4. What is meant by "Water of Crystallization" of a substance? Describe an activity to show the water of crystallization? **(Public : 2015, 16)**

A. **Water of Crystallization:-**

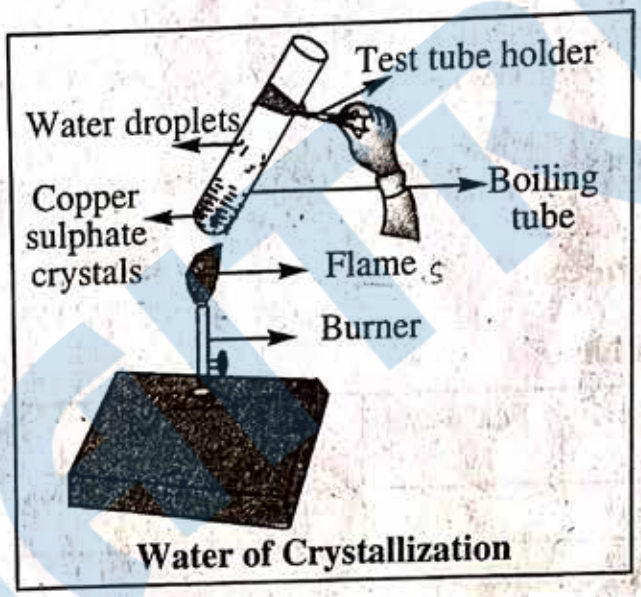
i) Water of crystallization is the fixed number of water molecules present in one formula unit of salt.

ii) The salts which contain water of crystallization are called hydrated salts. Ex:- $CuSO_4.5H_2O$.

Activity:-

i) Take a few crystals of copper sulphate in dry test tube.

ii) Heat the dry crystals strongly over the flame of a burner for some time.



Water of Crystallization

iii) The water present in the crystals are evaporated and the blue colour of salt turns to white.

iv) We also see tiny water droplets on the walls of the test tube.

$$CuSO_4.5H_2O \xrightarrow{\Delta} CuSO_4 + 5H_2O$$

Hydrated copper sulphate (Blue colour) — Anhydrous copper sulphate (White colour)

v) Now cool the test tube and add 2 – 3 drops of water to the sample of anhydrous copper sulphate.

vi) We observe the blue colour of copper sulphate crystals is restored.

vii) From this activity we conclude that some water molecules are fixed in the blue coloured copper sulphate crystals.

4 Marks Questions

AS_1 : Conceptual understanding

5. What are the differences between acids and bases? **(Public : 2023)**

A.

Acids	Bases
i) Sour in taste	i) Bitter in taste
ii) Turns blue litmus red	ii) Turns red litmus blue
iii) Acids change methyl orange to red	iii) Bases change methyl orange to yellow
iv) Phenolpthalein remains colourless	iv) Phenolpthalein give pink colour
v) Acids do not give soapy touch	v) Soapy to touch

6. Rohith wants to do neutralization reaction, what type of the reactants he need? Give example

A. i) Reactants required to do neutralization reaction are acids and bases.

ii) The reaction of an acid with a base to give a salt and water is known as ***neutralization*** reacti

Ex : Acid + Base → Salt + Water

1) $\underset{\text{Hydrochloric acid}}{HCl_{(aq)}} + \underset{\text{sodium hydroxide}}{NaOH_{(aq)}} \rightarrow \underset{\text{Sodium chloride}}{NaCl_{(aq)}} + \underset{\text{water}}{H_2O_{(l)}}$

2) $\underset{\text{nitric acid}}{HNO_{3(aq)}} + \underset{\text{potassium hydroxide}}{KOH_{(aq)}} \rightarrow \underset{\text{potasium nitrate}}{KNO_{3(aq)}} + \underset{\text{water}}{H_2O_{(l)}}$

AS_4 : Information skills and projects

7. Observe the following table

Substance	NaOH	Saliva	Sea Water	HCl	NaCl	Distilled water	Acetic acid	Blood
pH value	13.0	6.0	8.0	1.0	7.0	7.0	6.0	7.4

Now answer the following questions :

i) Write acids and bases in the above table

A. Acids : HCl, Acetic acid, Saliva;
Bases : Blood, Sea water, NaOH

ii) In the above table which substances will produce neutralisation reaction

A. HCl and NaOH

iii) What are strong acid and weak base in the above table.

A. Strong acid : HCl; **Weak bases :** Blood, Sea water

iv) What is the nature of the salt formed when aqueous NaOH solution mixed with acetic acid

A. CH_3COONa salt - Basic nature

8. **Read the information provided in the following table and answer the questions below.**

S.No	Name of the solution	pH Value	Colour change with phenolphthalein solution	Colour change with methyl orange solution
1.	HCl	1	No change	Red colour
2.	Rain water	5.5	No change	Red colour
3.	Distilled water	7	No change	No change
4.	$Mg(OH)_2$	10.5	Pink colour	Yellow colour
5.	Blood	7.5	Pink colour	Yellow colour
6.	Orange juice	3.5	No change	Red colour
7.	NaOH	13	Pink colour	Yellow colour

Now answer the following questions : **(Public : 2016)**

i) What are the indicators used to identify the acids and bases ?

A. Methyl orange and phenolphthalein indicators.

ii) Which is neutral solution in above table ?

A. Neutral solution - distilled water.

iii) Which base is used as an antacid from above table?

A. Antacid - $Mg(OH)_2$

iv) Which colour is formed, when phenolphthalein is added to base solution?

A. Pink colour is formed.

AS_7: Application to daily life, concern to biodiversity

9. **Give any four important uses of baking soda?** **(Public : 2024)**

A. **Baking Soda ($NaHCO_3$) : Chemical Name - Sodium hydrogen carbonate (or) Sodium bicarbona**

Preparation : Baking soda is added for faster cooking. It's chemical name is sodium hydroge carbonate. It is prepared as follows.

$$NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$$

Uses:

i) Making baking powder.

ii) Ingredient in antacids

iii) **Soda acid fire extinguishers**

iv) Acts as mild antiseptic

10. **Give any four important uses of washing soda?** **(Public : 2023)**

A. **Washing Soda ($Na_2CO_3.10H_2O$) : Chemical name - Sodium carbonate deca hydrate**

Preparation: Sodium carbonate can be obtained by heating baking soda.

$$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + CO_2 + H_2O$$

Recrystallisation of sodium carbonate gives washing soda. It is also a basic salt.

$$Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3.10H_2O$$

Uses :

i) Glass, soap and paper industries

ii) Removing **permanent hardness of water**

iii) Domestic cleaning agent

iv) Manufacture of Borax.

(Public : 2025)

11. Write any four uses of Bleaching powder.

A. Bleaching Powder ($CaOCl_2$) : Chemical Name - Calcium oxychloride

Preparation : Bleaching powder is produced by the action of chlorine on dry slaked lime.

$$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$$

Uses :

i) Bleaching cotton and linen cloth.

ii) An Oxidizing agent in many chemical industries.

iii) Disinfecting drinking water to make it free of germs.

iv) Preparation of Chloroform.

12. Write any four uses of Plaster of paris.

A. Plaster of paris ($CaSO_4.\frac{1}{2}H_2O$) : Chemical Name : Calcium sulphate hemi hydrate

Preparation : On heating of gypsum ($CaSO_4.2H_2O$) at 373 K

$$CaSO_4.2H_2O \xrightarrow[\Delta]{at\ 373K} CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O$$

Uses :

i) Manufacture of **toys**

ii) Statues of God

iii) Decoration

iv) Making surface smooth

13. Applications of pH in daily life. (or) Daily life application of Neutralisation.

A. i) Plants and animals are pH sensitive : Living organisms can survive only in a narrow ran... pH changes. When pH of rain water is less than 5.6, it is called acid rain. When acid rain ... in to the rivers the pH of the river water is lowered. The survival of aquatic life in such ... becomes difficult.

ii) pH in stopping tooth decay : The tooth decay starts when the pH of mouth is lower th... We use toothpaste, which is a base to neutralize the excess acid to prevent tooth decay

iii) pH in digestive system : Our stomach produces HCl acid, which helps in digestion o... without harming the stomach. During indigestion, we use bases called antacids. These an... neutralize the excess acid in the stomach.

iv) pH of the soil : Plants require a specific pH range for their healthy growth. It is neces... find out the pH of the soil to use required fertilizers for the healthy growth of the plants

2 Mark Questions

AS_1 : Conceptual understanding

14. While diluting an acid " Acid should be added to water and not water to the acid" ? Why?

A. i) When water is added to acid, there is sudden rise in temperature with explosion due to exothermic nature and the acid being present in bulk, it gets spill on your body and clothes.

ii) When an acid is added to water, the water is in bulk and the acid being heavier settles down and the heat evolved is dissipated in the water itself and hence, the spurting of the liquid is minimised.

iii) For this reason, it is recommended that acid should be added to water in small amounts with stirring to dilute the concentrated acid.

15. Plaster of Paris (POP) should be stored in moisture-proof container. Why?

A. i) Plaster of Paris chemical name is calcium sulphate hemihydrate ($CaSO_4.1/2\,H_2O$).

ii) It is a white powder and on mixing with water, it sets into hard solid mass due to the formation of gypsum ($CaSO_4.2H_2O$).

$$CaSO_4.\frac{1}{2}H_2O + \frac{3}{2}H_2O \rightarrow CaSO_4.2H_2O$$

iii) Because of the above reason plaster of paris should be stored in moisture proof container.

AS_2 : Asking questions and making hypothesis

16. Why does tooth decay start when the pH of mouth is lower than 5.5. Guess and Write? **(Public : 2015)**

A. i) The pH of our mouth is 5.5 which is slightly acidic.

ii) If the pH in our mouth decreases it results in tooth decay due to formation of certain acids.

iii) If we used the paste of acidic, it will speedup toothdecay, if we use the mild base, it neutralises the excess acid and protects from tooth decay.

17. What would happen if an acid is used instead of base in the preparation of tooth paste?

A. i) Tooth past is made basic because the bacteria in our mouth releases acids by action on the leftover food in our mouth.

ii) So to neutralize the acids, toothpaste have to be basic.

iii) Also, our teeth are calcium based, so acidic tooth paste may destroy our teeth due to acidic action.

18. What happens, if sulphuric acid (H_2SO_4) is used instead of Hydrochloric acid (HCl) in the experiment of "acid reacts with metals"? **(Public : 2024)**

A. If sulphuric acid (H_2SO_4) is used instead of Hydrochloric acid (HCl) in the experiment of "acid reacts with metals" Hydrogen gas liberated more vigorously than in case of HCl.

i) $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

ii) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

6 Marks Questions

AS_1 : Conceptual understanding

1. Differenciate Four Quantum numbers in predicting the positions of an electron in an at **(Public : 2015)**

A. Differences between four quantum numbers.

S. No.	Principal quantum number	Azimuthal quantum number	Magnetic quantum number	Spin quant number
1)	Proposed by Neils Bohr	Proposed by Sommerfeld	Proposed by Lande	Proposed by Uhlenbeck and Goudsmit
2)	Denoted by letter 'n'	Denoted by letter 'l'	Denoted by letter 'm_l'	Denoted by lette
3)	It indicates size and energy of a stationary orbit	It indicates shape of the sub shell	It indicates orientation of the orbitals	It indicates the sp electrons in the orbitals
4)	Its values are 1, 2, 3, 4,..... designated by K, L, M, N,...	Its values are 0, 1, 2, 3, ... designated by s, p, d, f , ...	The total values of 'm_l' for a given 'l' value are $m_l = (2l + 1)$	Its values are m_s = (clock wise) $m_s = -1/2$ (anticl wise)
5)	It gives the number of the orbit (or) shell	It depends on 'n' value $l = 0$ to n – 1	It depends on 'l' value $m_l = -l$ through 0 to $+l$	It depends on spin of electron in the particular orbital

2. Explain Bohr's model of atom and its limitations. **(Public : 2022)**

A. **Bohr's atomic model postulates :**

i) Bohr proposed stationary orbits

ii) Each stationary orbit corresponds to a definite energy. These stationary orbits are desig by K, L, M, N .....

iii) When an electron jumps from higher energy orbit to lower energy orbit the difference in en is emitted as radiation.

$E_2 - E_1 = h\upsilon$, where E_2 is energy of second orbit

E_1 is energy of first orbit

h – Planck's constant, υ – Frequency of radiation

iv) The lowest energy state of the electron is known as ground state.

v) The electron moves to a higher energy level, the excited state by gaining energy.

vi) Bohr's model explains line spectra hydrogen atom.

Bohr's atomic model Limitations :

i) Bohr's model could not account for the splitting of lines in the spectra of hydrogen atom into fine lines.

ii) Bohr's theory could not explain the atomic spectra of higher elements such as He, Li, Be, B, C ..... which have more than one electron.

iii) Bohr's model could not account for Zeeman effect and Stark effect

iv) Bohr's model could not justify the quantization of angular momentum.

v) Bohr's theory could not explain the formation of chemical bonds.

3. Explain Hund's rule with an example ? **(Public : 2016)**

A. **Hund's Rule:-** Hund's rule states that electron pairing takes place only after all the available degenerate orbitals are occupied by one electron each.

Example :

i) Consider a carbon atom (Z = 6). It has six electrons.

ii) The first electron goes into the '1s' orbital of the K-shell.

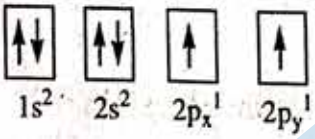
iii) The second electron will be paired up with the first in the same '1s' orbital.

iv) Similarly the third and fourth electrons occupy the '2s' orbital of the L-shell.

v) The fifth electron goes into one of the three '2p' orbitals of the L-shell. Let it be $2p_x$.

vi) Since the three p-orbital's are degenerate (viz. $2p_x$, $2p_y$, $2p_z$), the sixth electron goes into $2p_y$ or $2p_z$ but not $2p_x$.

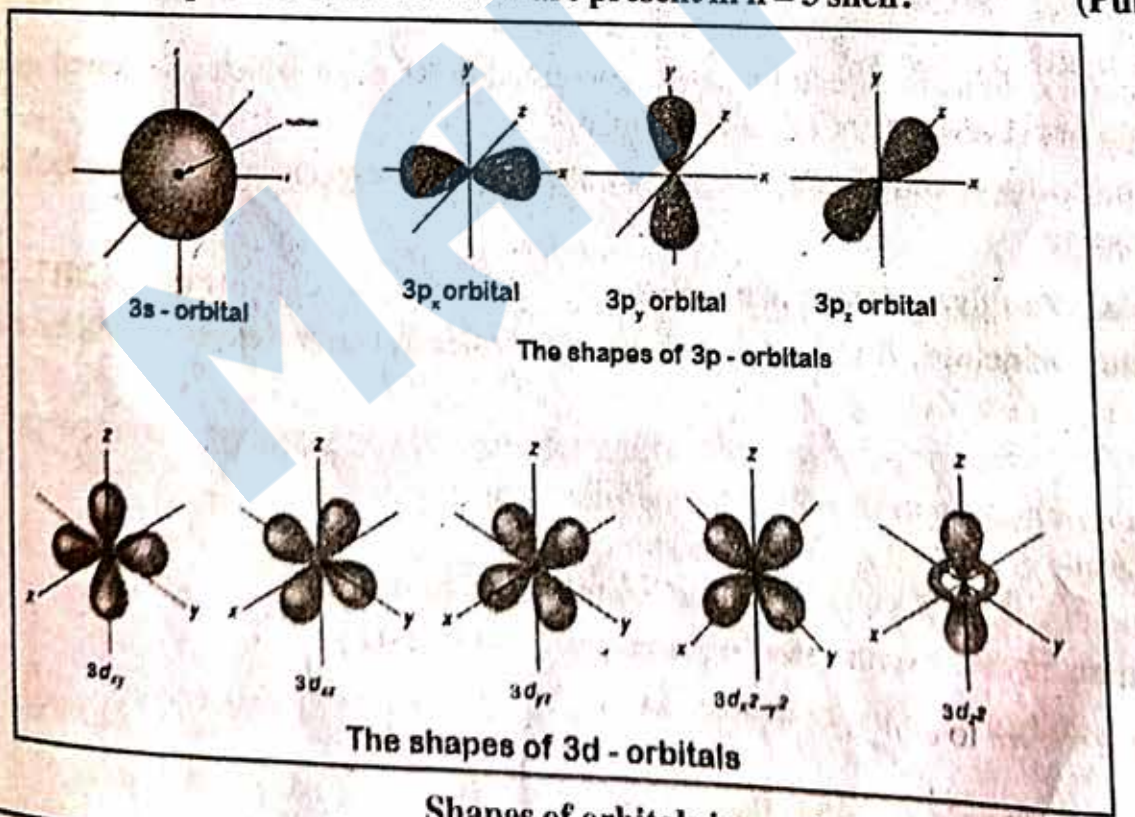
vii) Thus the electronic configuration of carbon can be written as,

$1s^2\ 2s^2\ 2p_x^1\ 2p_y^1$ Or 

AS$_5$: Communication through drawing, model making

4. Draw the shape of all orbitals which are present in n = 3 shell? **(Public : 2023)**

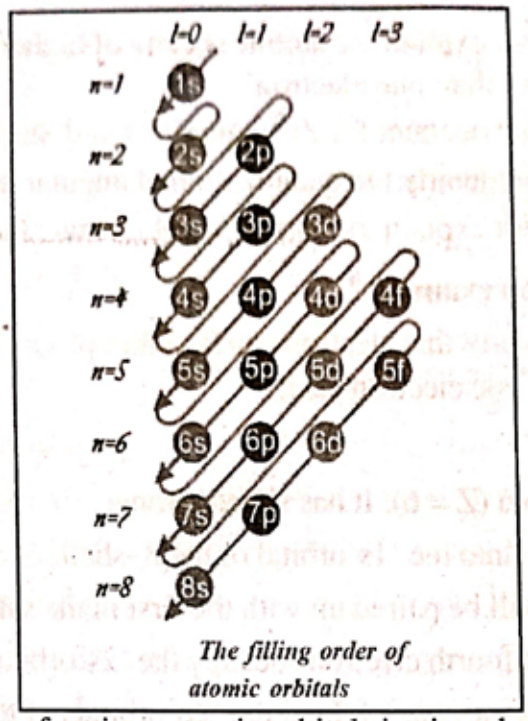
A.



Shapes of orbitals in n = 3 shell

5. Draw a neat diagram to show that increasing order of energy levels of various atomic orbitals.

A. The following diagram shows the increasing value of $(n + l)$ **(Moeller chart)** **(Public : 2017)**



The filling order of atomic orbitals

Ascending order of energies of various atomic orbitals is given below

$1s < 2s < 2p < 3s < 3p < 4s < 3d < 4p < 5s < 4d < 5p < 6s < 4f < 5d < 6p < 7s < 5f < 6d < 7p < 8s$ .....

4 Marks Questions

AS_1 : Conceptual understanding

6. Rainbow is an example for continuous spectrum - Explain. **(Public : 2015)**

A. 1) A rainbow is a spectrum consist of 7 colours with different wave lengths or frequencies merged with each other with out any gap to form a continuous spectrum.

2) **This continuous spectrum arrangement consist of 7 colours (VIBGYOR)** extending from red colour (700 nm) to violet colour (400 nm) wave length.

3) This type of continuous spectrum can be observed in Rainbow which is a natural spectrum appearing in the sky just after a rain is formed.

4) This is due to dispersion of sunlight by tiny water droplets present in atmosphere which act like small prisms.

7. State and explain Pauli's exclusion principle? **(Public : 2017, 18)**

A. **Pauli's exclusion principle :** Pauli's exclusion principle states that no two electrons will have all the four quantum numbers same.

Example :

i) Consider a Helium atom (Z = 2). It has two electrons.

ii) The electronic configuration of helium atom is $1s^2$.

iii) If n, l , and m_l are same for two electrons then m_s must be different.

iv) In the helium atom the spins must be paired.

v) Electrons with paired spins are denoted by '↑↓'.

vi) One electron has $m_s = +\frac{1}{2}$, the other has $m_s = -\frac{1}{2}$. They have anti-parallel spins.

8. **State and explain Aufbau principle (Building up principle) with one example?** **(Public : 2015, 18, 24)**

A. **Aufbau Principle :**

i) According to this principle, the electron occupies the orbital having the lowest energy.

ii) The energy of the orbital was calculated by the formula $(n + l)$.

n = Principle quantum number, l = Angular momentum quantum number.

Example:- Electrons enter into 4s orbital but not 3d after filling the 3p orbital.

i) The $(n + l)$ value of $4s = 4 + 0 = 4$

ii) The $(n + l)$ value of $3d = 3 + 2 = 5$

iii) The $(n + l)$ value of 3d orbital has more than 4s orbital.

iv) According to Aufbau principle electrons are enter into 4s orbital after filling the 3p orbital but not 3d.

AS_4 : Information skills and projects

9. Analyse the given table and answer the following questions : **(2025 Public)**

Shell	n	l	Sub - shell	No. of orbitals
K	1	0	s	1
L	2	0	s	1
		1	p	3
M	3	0	s	1
		1	p	3
		2	d	5
N	4	0	s	1
		1	p	3
		2	d	5
		3	f	7

Observe the table and answer the following questions.

i) **Write all the sub - shell notations present in 'N' shell.**

A. s, p, d, f

ii) **How many total number of orbitals are present in 'L' shell?**

A. 4

iii) **Write the maximum number of electrons that can occupy 'M' shell.**

A. 18

iv) **Mention the maximum number of electrons that can occupy sub - shell - 'f'.**

A. 14

10. The four quantum numbers of distiguished electron of an atom are as follow

n	l	m_l	m_s
2	0	0	$+\frac{1}{2}$

Using the above information answer the following questions.

i) How many electrons present in outer most orbit?

A. One.

ii) Write the electron configuration of this element?

A. $1s^2\ 2s^1$

iii) What is the atomic number of this element?

A. Three.

iv) What is the shape of the last electrons orbitals?

A. Spherically symmetrical.

2 Mark Questions

AS_1 : Conceptual understanding

11. Differenciate between orbital and orbit.

A.

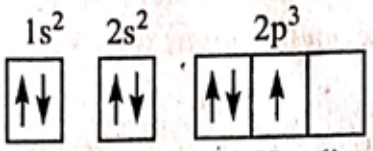
ORBITAL	ORBIT
1) Orbitals are proposed by Schrodinger.	1) Orbits are proposed by Neils Bohr.
2) The region in space where there is finite probability of finding an electron around the nucleus of an atom	2) Bohr's orbit is a well defined circular path around the nucleus in which the electron revolves.
3) An orbital represents the movement of electron in three dimensional space	3) An orbit represents the movement of electron in two dimensional plane.
4) Orbitals have different shapes 's' orbital is spherical and p orbital is dumbell shaped.	4) Orbits are circular shaped.
5) An orbital can accommodate a maximum of two electrons.	5) An orbit can have a maximum number of electrons equal to $2n^2$.
6) Orbitals are disginated by s, p, d and f .	6) Orbits are disignated by K, L, M, N, O etc.

12. **What are the differences between Absorption Spectrum and Emission Spectrum?**

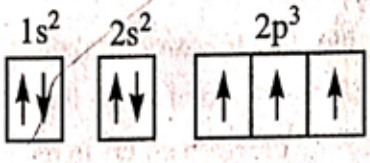
A.

Absorption spectrum	Emission Spectrum
i) Absorption spectrum is spectrum obtained when the substances absorb energy.	i) Emission spectrum obained by radiation emitted by a substance from its excited state.
ii) It contains dark lines on bright background.	ii) It contains bright lines on dark back ground.
iii) **Ex :** Light from hot source	iii) **Ex :** Hydrogen

13. **Following orbital diagram shows the electronic configuration of nitrogen atom which rule does not support this? Write the correct electronic configuration of N (Z = 7) : (Public : 2023)**



A. The given electronic configuration does not support Hund's rule. Correct electronic configuration is



AS_3 : Experimentation and field investigation

14. **When you go on heating iron rod on a flame at high temperature, what changes do you observed? (Public : 2015)**

A. When you heat an iron rod, some of the heat energy is emitted as light. First it burns red (lower energy higher wave length) and as temperature rises it glow with orange, yellow, blue (higher energy, lower wave length) or even white (all visible wave lengths) if the temperature is high enough.

AS_7 : Application to daily life, concern to biodiversity

15. **What is nl^x method? How it is useful ? (Public : 2016)**

A. i) The short hand notation of electronic configuration is nl^x

ii) It gives the information as shown below,

iii) In nl^x method, n = Principal quantum number. x = number of electrons in the subshell. l = Azimuthal quantum number or angular momentum quantum number.

16. **What are the applications of quantum numbers?**

A. **Quantum numbers are useful to explain the structure of atom :**

i) Principle quantum number gives information about size and energy of a stationary orbit

ii) Azimuthal quantum number gives information about shape of the sub shell.

iii) Magnetic quantum number gives information about orientation of the orbitals

iv) Spin quantum number gives information about the spin of electrons in the orbitals.

v) These numbers indicated the probability of finding electron in the space around the nucleus.

6 Marks Questions

AS_1 : Conceptual understanding

1. Define modern periodic law ? Discuss the construction of the long form of the periodic table?

A. **Modern periodic law:-** The physical and chemical properties of the elements are the periodic functions of their electronic configuration.

Description of long form of the periodic table:- The modern periodic table has eighteen vertical columns known as groups and seven horizontal rows known as periods.

Groups:-

i) There are 18 groups in the long form of the periodic table. They are represented by Roman numeral I to VIII as A and B groups.

ii) According to the IUPAC, these groups are numbered from 1 to 18.

iii) In a group elements contains similar outermost electronic configuration.

iv) Depending upon the last coming electron enters in the orbital of the given element, the elements are classified as 's' 'p', 'd' and 'f' block elements.

v) s and p block elements are known as representative elements.

vi) d- block elements are called transition elements.

vii) f-block elements are called inner transition elements.

viii) Lanthanoids and actinoids are placed separately at the bottom of the periodic table.

Periods :-

i) The horizontal rows in the periodic table are called periods. They are seven periods in form of periodic table.

ii) These periods are represented by Arabic numerals 1 through 7.

iii)

Period Number	Number of elements
1	2
2	8
3	8
4	18
5	18
6	32
7	—

2. Explain how the elements are classified into s, p, d and f block elements in the periodic table and give the advantages of this kind of classification?

A. Based upon the electronic configuration the modern periodic table is divided into s, p, d and f- block elements.

s- Block elements :

i) The valence electron enter into s-orbital is called s- block elements.

ii) The general electronic configuration of s-block elements is ns^1 to ns^2.

p- Block elements :

i) The valence electron enter into p-orbital is called p-block elements.

ii) The general electronic configuration of p-block elements is $ns^2\ np^1$ to $ns^2\ np^6$.

d- Block elements :

i) The valence electron enter into d- orbital is called d-block elements.

ii) The general electronic configuration of d-block elements is $(n-1)\ d^{1-10}\ ns^{1\ or\ 2}$.

f- Block elements :

i) The elements in which the last electron enters the f-orbital of their outer most energy level is called f-block elements.

ii) Its valence shell electronic configuration is $(n-2)\ f^{1-14}\ (n-1)\ d^{0\ or\ 1}\ ns^2$.

iii) These are known as inner transition elements.

iv) Lanthanoids and actinoids are belongs to f-block elements.

Advantages :

i) The division of elements into s, p, d, and f blocks is helpful to study the properties of the elements easily.

Ex : s-block elements are soft and reactive metals.

ii) Every group has the elements with same valence electronic configuration. So they have similar chemical properties.

3. Define ionization energy? What are the factors that influence it? (Public : 2017, 19, 25)

A. **Ionization Energy:-**

i) The energy required to remove an electron from the outer most orbit or shell of a neutral gaseous atom is called ionization energy.

ii) Ionization energy is expressed in kJ/mol (or) k.cal/mol (or) ev/atom

iii) Ionization energy is also called the ionization potential but when we use the term the ionization potential, it is better to write the unit ev.

Factors that influence on Ionization energy:-

i) Nuclear charge.

ii) Shielding effect.

iii) Penetrating power of the orbitals.

iv) Electronic configuration.

v) Atomic size.

4. What are the properties of Atomic radius, Ionization energy, Electron affinity, Electro negativity of elements and their trends in the groups and Periods? (Public : 2023, 24)

A. i) **Atomic radius : -** The distance from the centre of the nucleus of the atom to its outermost shell is called atomic radius.

ii) **Ionization energy : -**The energy required remove one electron from the outer most orbit of a neutral gaseous atom of the element is called ionization energy.

iii) **Electron affinity:** - It is the energy liberated when an electron is added to its neutral gaseous atom.

iv) **Electro negativity:** - The electro negativity is the relative tendency of its atom to attract electrons towards it when it is bonded to the atom of another element.

Periodic property	Trend in	
	Groups From top to bottom	Periods From left to right
Atomic radius	Increasing	Decreasing
Ionisation energy	Decreasing	Increasing
Electron affinity	Decreasing	Increasing
Electronegativity	Decreasing	Increasing

5. Explain the factors affecting electron affinity of elements in periodic table. (Public : 2017)

A. **Electron affinity:** The electron affinity of an element is defined as the energy liberated when an electron is added to its neutral gaseous atom.

The units of electron affinity are KJ/mole (or) KCal/mole (or) eV/atom.

Factors influencing Electron affinity:

1) **Nuclear charge :** Greater the nuclear charge, greater is the electron affinity value because of greater attraction for incoming electron.

2) **Atomic size :** As the atomic size increases, the attractive force of the nucleus on the electron decreases. So electron affinity decreases.

3) **Electronic configuration :** The elements having stable electronic configuration of half filled or completely filled valence sub-shells show very small tendency to accept additional electron. So the electron affinity is low or almost zero for these elements.

4) **Penetrating power of the orbitals :** As the penetrating power of the orbitals increases the electron affinity increases.

5) **Screening effect or shielding effect :** More the screening effect of orbitals, less is the electron affinity value.

4 Marks Questions

AS_1 : Conceptual understanding

6. State Mendeleeff's periodic law? What are the salient features of Mendeleeff's periodic table?

A. **Mendeleeff's periodic law :-** The physical and chemical properties of elements are the periodic functions of their atomic weights.

i) Groups and subgroups :- Eight vertical columns as groups. Sub groups A and B. Ex:- IA, IB

ii) Periods: - Horizontal rows 7 as periods.

iii) Predicting the properties of missing elements.

iv) Correction of atomic weights of Be, In, Au.

v) Anomalous series: Te, I; Ar, K and Co, Ni are not placed in the right place.

7. **Comment on the position of hydrogen in periodic table?** **(Public : 2015)**

A. i) The atomic number of the hydrogen is 1. Its electronic configuration is $1s^1$.

ii) Hydrogen can losses one electron and behave electropositive ion (H^+) like alkali metals.

iii) Hydrogen can gain one electron and behave electronegative element (H^-) like halogens.

iv) Its properties resembles with both Alkali metals (IA) and halogens (VIIA) because it can lose one electron like alkali metals as well as gain one electron as halogens

v) So, it is placed at the top of both alkali metals and halogens.

AS_4 : Information skills and projects

8. **Answer the following question by using the above data** **(Public : 2023)**

2nd period elements	Li	Be	B	C	N	O	F
Atomic number	3	4	5	6	7	8	9
Atomic radius (in pm)	152	111	88	72	74	66	64
Electro negativity (in ev).	1.0	1.47	2.0	2.5	3.0	3.5	4.0

i) How does the capacity of loosing electrons changes in the 2nd period from left to right.

A. Decreases

ii) How does atomic size changes in the 2nd period?

A. Atomic size decreases in the 2nd period .

iii) Mention the valance shell of the elements from Li to F.

A. 2nd shell (or) L - shell (or) n = 2 shell.

iv) Mention the position of the element 'N' in the periodic table.

A. 2nd period, 15th (or) VA Group.

9. **Observe the information given in the table. Answer the questions given below :** **(Public : 2024)**

Element	Electronic configuration
Be	$1s^2$ $2s^2$
Mg	$1s^2$ $2s^2$ $2p^6$ $3s^2$
P	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^3$
Ne	$1s^2$ $2s^2$ $2p^6$

i) Which of the given are s - block elements?

A. Be, Mg

ii) Which of the given has least valency?

A. Ne

iii) Which of the given is 15th Group element?

A. P

iv) Which of the given are of same Period?

A. Be, Ne and Mg, P

10. Observe the given table and answer the following

Atomic Number	11	12	13	14	15	16	17
Name of the Elements	Na	Mg	Al	Si	P	S	Cl

i) Which period does the elements belongs ?

A. Third period

ii) Mention the non- metals in the above.

A. P, S, Cl

iii) Which element has more atomic radius in the above ?

A. Sodium

iv) From left to right how is the metallic character changes ?

A. Decreases

11.

Group / Periods	Name of the elements (Atomic No.)							
	IA	II A	III A	IVA	VA	VI A	VIIA	VIII A
II	Li (3)	Be (4)	B (5)	C (6)	N (7)	O (8)	F (9)	Ne (10)
III	Na (11)	Mg (12)	Al (13)	Si (14)	P (15)	S (16)	Cl (17)	Ar (18)
IV	K (19)	Ca (20)	Ga (21)	Ge (32)	As (33)	Se (34)	Br (35)	Kr (36)

(2018 Publi

Answer the following from the above information.

i) Which element posses the higher atomic radius in the above table ?

A. IA group elements

ii) Mention two pair of elements which forms ionic bond.

A. Na, Cl and Mg, O

iii) Name the two elements having valency 2.

A. Magnesium, Calcium or Oxygen, Sulphur

iv) Which element has electronic configuration of $1s^2\ 2s^2\ 2p^4$.

A. Oxygen

12. In periods : Atomic radius decreases form left to right? Ex:

2^{nd} period element	Li	Be	B	C	N	O	P
Atomic radius (pm)	152	111	88	77	74	66	64

Based on above information compare the following properties in the given elements

i) Ionisation energies of N, O.

ii) Electron affinity of F, C.

iii) Metallic character of Li, Be.

iv) Elecronegativity of O, F.

A.

Periodic property	Low	High	Relation
iii) Metallic character	Be	Li	MC of Li > Be
i) Ionisation energy	O	N	IP of N > O
ii) Electron affinity	C	F	EA of F > C
iv) Electronegativity	O	F	EN of F > O

13. Observe the table and answer the following questions

	Electron affinity in Kj mol^{-1}
VIIA (Halogens)	F(-328); Cl(-349); Br(-325); I(-295); At(-270)
VIA (Chalcogens)	O(-141); S(-200); Ge(-195); Te(190); Po(-174)

i) Explain how electron affinity changes in a group from top to bottom?

ii) Explain how electron affinity changes in period from left to right?

iii) What does the -ve sign in the table indicates?

iv) Write any 2-factors which influences the electron affinity

A. i) Decreases

ii) Increases

iii) Elergy is liberated or lost.

iv) Nuclear change, atomic radius, screening effect.

2 Mark Questions

AS_1 : Conceptual understanding

14. An element with atomic number 35. What is the place of the element in the periodic table? Why?

A. Atomic number 35 element is Bromine, it belongs to VIIA group, 4^{th} period. **(Public : 2015)**
Bromine is a p-block element.

15. Define Dobereiner's law of triads. Give two examples for Dobereiner's triad ?

A. In a specific set of three elements the atomic weight of the middle element is the average of the atomic weights of the first and third elements. This statement is called the Dobereiner's law of triads.

i) Li , Na , K ii) Ca , Sr , Ba

AS_2 : Asking questions and making hypothesis

16. Which one between Na and Na^+, Cl and Cl^- would have more size? Imagine and write?

A. **Size Na > Na^+, Reason:** Na having less nuclear charge on electrons than Na^+ ion. **(Public : 2016)**
Size Cl^- > Cl, Reason: Cl^- have less nuclear charge on electrons and more internal repulsion.

17. What would happen if the elements had been not classified?

A. If all the elements are not arranged in a particular table, the consequences are

i) If all the elements are not arrangement on the periodic table, we can't visualize certain trends among the atoms.

ii) It is very difficult to study the chemistry of 118 elements.

5. CHEMICAL BONDING

6 Mark Questions

AS_1 : Conceptual understanding

AS_5 : Communication through drawing, model making

1. Explain the formation of O_2 molecules using valence bond theory. **(Public : 2017)**

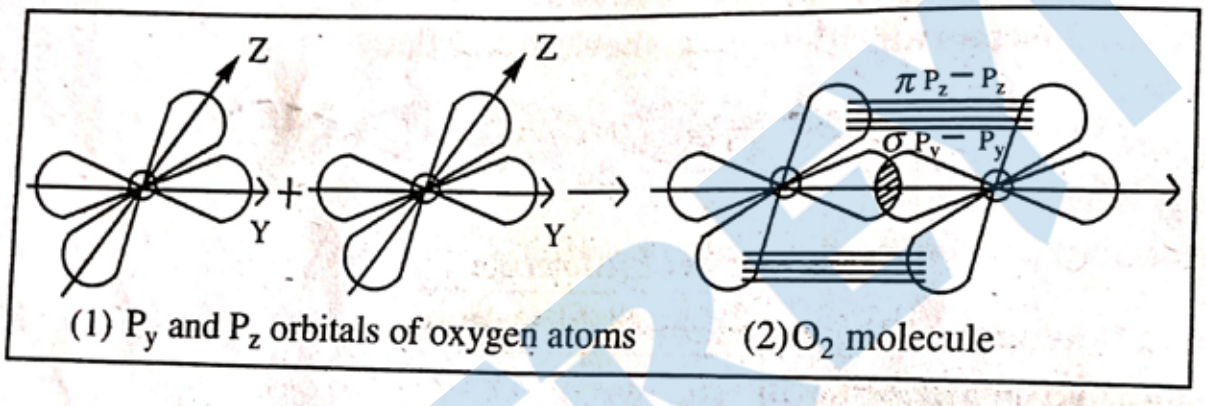
A. Formation of O_2 molecule:

i) The atomic number of oxygen is 8.

ii) Its electronic configuration is $1s^2 2s^2 2p_x^{\ 2} 2p_y^{\ 1} 2p_z^{\ 1}$

iii) When two oxygen atoms approach each other, the bond formed in between two oxygen at by overlapping the p-orbitals of one 'O' atom with another 'O' atom.

iv) Therefore, there is a double bond between two oxygen atoms in O_2 molecule.



(1) P_y and P_z orbitals of oxygen atoms (2) O_2 molecule

2. Explain the formation of N_2 molecules using valence bond theory. **(Public : 2018, 23)**

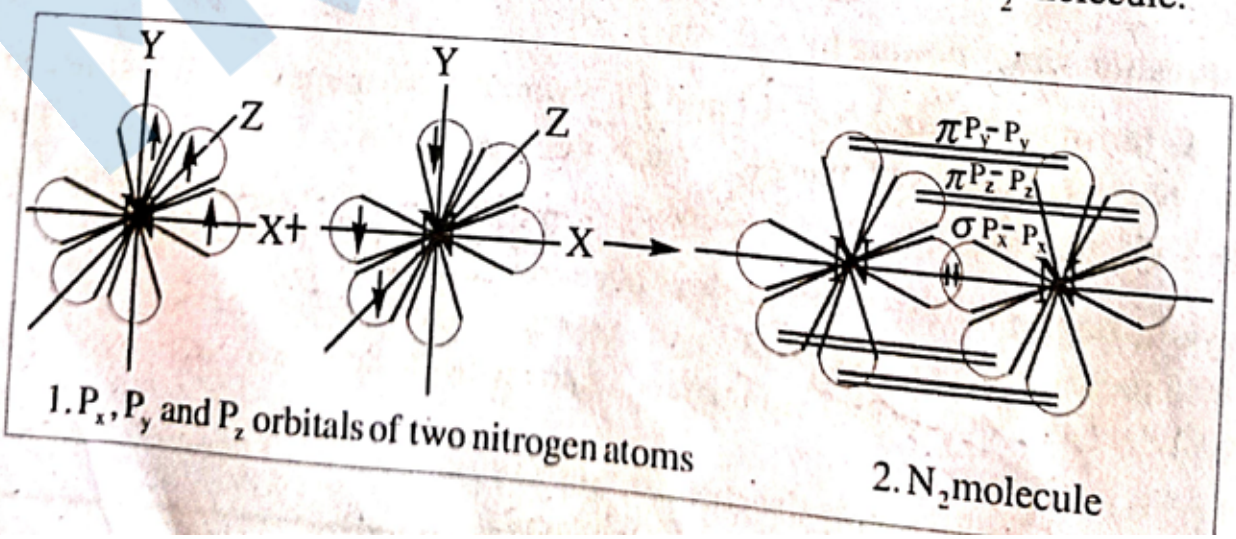
A. Formation of N_2 molecule:

i) The atomic number of Nitrogen is 7.

ii) It electronic configuration is $1s^2 2s^2 2p_x^{\ 1} 2p_y^{\ 1} 2p_z^{\ 1}$

iii) When two nitrogen atoms approach each other, the bond is formed in between two nitrog atoms by overlapping of the orbitals of one 'N' atom with another 'N' atom.

iv) Therefore, there is a triple bond between two nitrogen atoms in N_2 molecule.



1. P_x, P_y and P_z orbitals of two nitrogen atoms 2. N_2 molecule

What is hybridzation ? Explain the formation of $BeCl_2$ molecules using hybridization.

Hybridization: The process of mixing of atomic orbital's of nearly same energy to produce a set of entirely new orbital's of equivalent energy is known as hybridisation.

Formation of beryllium chloride ($BeCl_2$) : **(Public : 2015, 17)**

i) The atomic number of beryllium = 4.

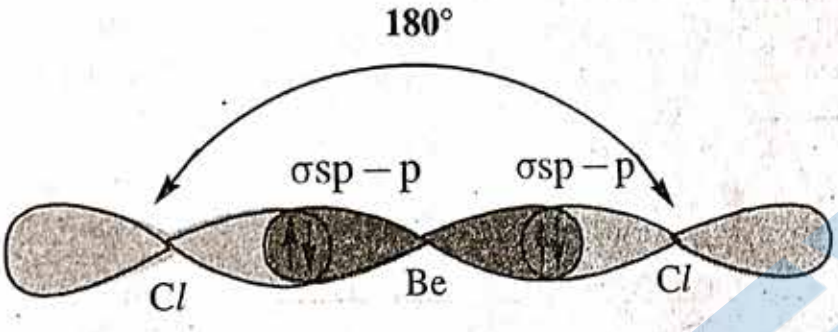
ii) Ground state electronic configuration of 'Be' is $1s^2\ 2s^2\ 2p_x^0 2p_y^0 2p_z^0$

iii) Excited state electronic configuration of 'Be' is $1s^2 2s^1 2p_x^1 2p_y^0 2p_z^0$

iv) Now there is hybridization between one's' and p-orbital and forms two sp-orbitals.

v) The overlap with p-orbital of each two chlorine atoms with two sp-orbitals of beryllium form two sigma (σ) bonds.

vi) The molecule formed is linear with a bond angle 180°.



$BeCl_2$ Molecule

Explain the formation of BF_3 molecules using hybridization. **(Public : 2016, 18)**

Formation of boron trifluoride (BF_3) :-

i) The atomic number of Boron is 5.

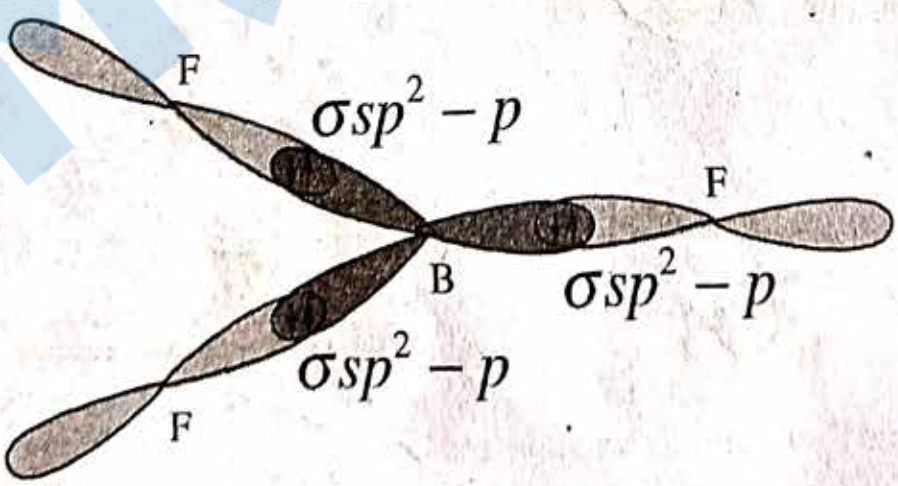
ii) Ground state electronic configuration of 'B' is $1s^2\ 2s^2\ 2p_x^1 2p_y^0\ 2p_z^0$

iii) Excited state electronic configuration of 'B' is $1s^2\ 2s^1\ 2p_x^1\ 2p_y^1 2p_z^0$

iv) Now in excited state the three unipaired orbitals undergo hybridisation giving rise to three sp^2 hybrid orbitals which are 120° apart.

v) The three hybrid orbitals overlap with three p-orbitals from three Fluorine atoms forming three sigma bonds.

vi) The molecule formed is triangonal planar and bond angle is 120°.



BF_3 Molecule

AS_1 : Conceptual understanding

5. Explain the formation of sodium chloride on the basis of the concept of electron transfer from one atom to another atom? (Public : 2018)

A. **Formation of sodium chloride (NaCl):-** Sodium chloride is formed from the elements sodium (Na) and chlorine (Cl). It can be explained as follows.

Cation formation : When sodium (Na) atom loses one electron to get octet electronic configuration, it forms a cation (Na^+) and gets electronic configuration that of Neon (Ne) atom.

$$_{11}Na_{(g)} \rightarrow {}_{11}Na^+_{(g)} + e^-$$

E.C. 2,8,1 2, 8 (or)

(or)[Ne]$3s^1$ [Ne]

Anion formation : Chlorine has shortage of one electron to get octet in its valence shell. So it gains the electron from Na atom and gets electronic configuration as that of Argon (Ar).

$$_{17}Cl_{(g)} + e^- \rightarrow Cl^-_{(g)}$$

E.C 2, 8, 7 2, 8, 8 (or)

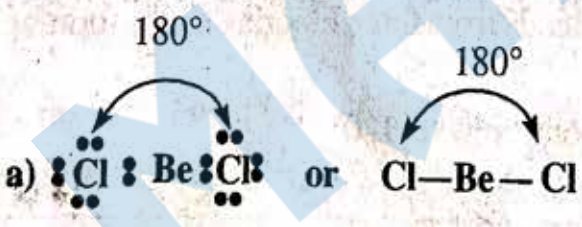
(or) [Ne]$3s^2 3p^5$ [Ne] $3s^2 3p^6$ or [Ar]

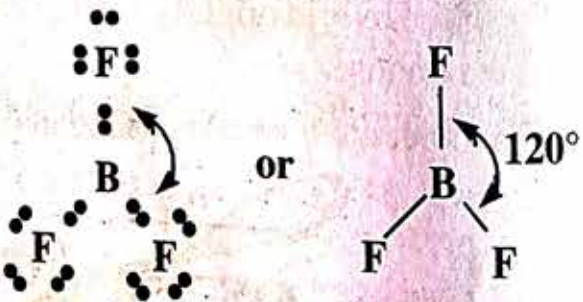
Transfer of electrons between 'Na' and 'Cl' atoms, results in the formation of 'Na+' and 'Cl–' ions. These oppositely charged ions get attracted towards each other due to electrostatic forces and form the compound sodium chloride (NaCl). $Na^+ + Cl^- \rightarrow Na^+ Cl^-$ (or) NaCl

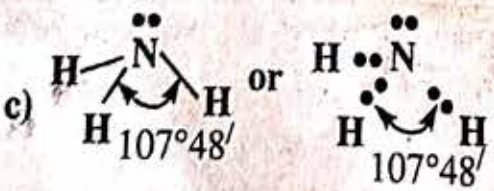
AS_5: Communication through drawing, model making

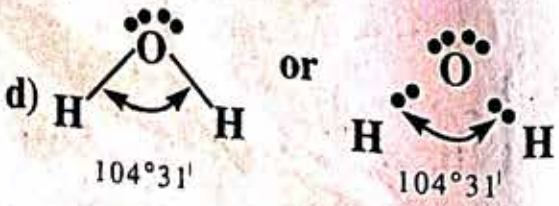
6. Draw the VSEPRT structures of the following molecules

a) $BeCl_2$ **b) BF_3** **c) NH_3** **d) H_2O**

a) 

b) 

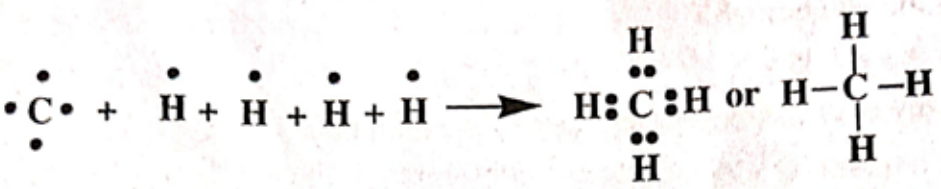
c) 

d) 

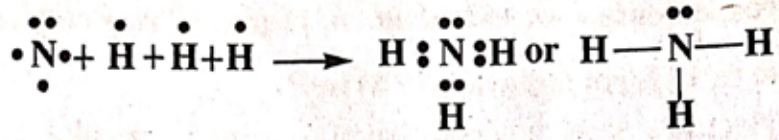
7. **Represent following molecules using Lewis notation ?**

a) CH_4 b) NH_3 c) H_2O

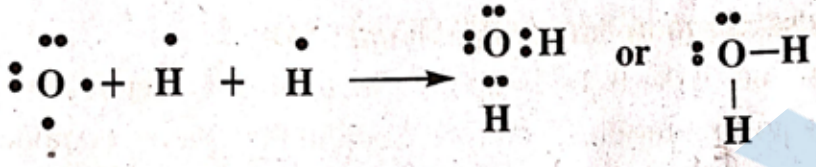
A. a) CH_4



b) NH_3



c) H_2O



4 Marks Questions

AS_1 : Conceptual understanding

. **Write the difference between ionic and covalent compounds ?**

Ionic compounds	Covalent compounds
i) They are formed by the transfer of electrons between two atoms.	i) These are formed by the mutual sharing of electrons between the atoms
ii) These are having high melting and boiling points.	ii) These are having low melting and boiling points
iii) These are soluble in polar solvents like water.	iii) These are soluble in non-polar solvents like CCl_4
iv) These are highly reactive in polar solvents	iv) These are less reactive in polar solvents.
v) **Ex :** $NaCl$, MgO, $AlCl_3$, ...etc.,	v) **Ex :** H_2, O_2, N_2, Cl_2, HCl, H_2O, NH_3, .. etc.

Distinguish between a sigma (σ) and a pi (π) bond ?

Sigma (σ) bond	pi (π) bond
i) It is formed by end to end overlap of orbitals.	i) It is formed by the lateral overlap of orbitals.
ii) It is a strong bond	ii) It is a weak bond
iii) The orbitals involved in the overlapping are s-s, s-p and p-p	iii) pi is formed by the overlapping of p-p orbitals only
iv) It is denoted by σ	iv) It is denoted by π.

AS_4 : Information skills and projects

10. A chemical compound has the following Lewis notation?

a) How many valence electrons does element Y have ?

b) What is the valency of Y?

c) What is the valency X ?

d) How many covalent bonds are there in the molecule ?

e) Suggest a name for elements X and Y ?

A. a) 8 b) 2 c) 1 d) 2 bonds e) X = Halogen, Y = Oxygen

11. A, B and C are three elements with atomic no. 6, 11 and 17 respectively

A. i) Which of these can't form ionic bond ? Why ?

A. Carbon has 4 electrons in its outermost shell, it neither loses nor gains electrons. So, it forms covalent bonds but not Ionic.

ii) Which of these cannot form covalent bond ? Why ?

A. The configuration of Na is $1s^2 2s^2 2p^6 3s^1$. So, to obtain octet, it can easily lose electron in $3s^1$ and gets neon configuration. Therefore, Sodium forms ionic compounds.

iii) Which of these can form ionic as well as covalent bonds ?

A. The configuration of *Cl* is $1s^2 2s^2 2p^6 3s^2 3p^5$. Chlorine can gain electron to obtain octet. It can also share electrons. So chlorine forms both ionic and covalent compounds.

12. Electronic configuration of atoms "A" and "B" are

A : $1s^2, 2s^2, 2p^6, 3s^1$ B : $1s^2, 2s^2, 2p^1$

By observing above information answer the following questions.

i) Which atom forms negative ion?

ii) What is the valency of atom "B" ?

iii) Write the molecular formula of the compound formed by atoms "A" and "B".

A. i) "B" atom forms negative ion.

ii) The valency of atom "B" is Three.

iii) The molecular formula of the compound formed by atoms "A" and "B" is A_3B.

13.

Element	$_1H$	$_{11}Na$	$_{17}Cl$	$_{18}Ar$
Shell configuration	1	2, 8, 1	2, 8, 7	2, 8, 8

Based on the above table, answer the following questions.

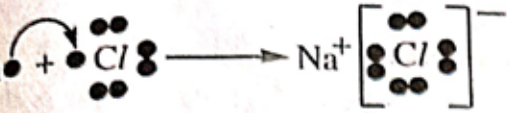
i) Which element has '8' electrons in the outer most orbit?

ii) Represent the formation of NaCl molecule using Lewis dot structure.

iii) If sodium loses one electron, it attains which inert gas configuration?

iv) Represent the valence electron of hydrogen using Lewis dot structure.

A. i) Argon has 8 electrons in the outer most orbit

ii) 

iii) If sodium looses one electron it attains 'Ne' inert gas configuration

iv) Lewis dot structure of hydrogen is H•

AS_1: Application to daily life, concern to biodiversity

14. What are the applications of covalent compounds. **(Public : 2015)**

A.
1) Covalent compounds form 99% of our body.
2) Water is a covalent compound. We know its many uses.
3) Sugars, food substances, tea and coffee are all covalent compounds
4) Air we breath in contains covalent molecules of oxygen and nitrogen
5) Almost everything on the earth other than most simple inorganic salts are covalent.
6) Most of the organic compounds are having covalent bonds they are used for making medicines polymers, soaps and detergents.

2 Mark Questions

AS_2: Asking questions and making hypothesis

15. Why covalent compounds having less m.p and b.p than ionic compounds? (OR) Predict the reasons for low melting point for covalent compounds when compared with ionic compounds?

A. i) In ionic compounds the ions are bounded by strong electrostatic force of attractions.
ii) Therefore they are strong solids with high melting points and boiling points.
iii) In covalent compounds the atoms are bounded by weak forces of attraction.
iv) Hence covalent compounds have low melting and boiling points.

16. Predict and write "bond angle" of $BeCl_2$ is 180°, why in H_2O is 104°31?

A. Bond angle of $BeCl_2$ is 180°, this is due to sp hybridisation of Be atom and bond pair and bond pair repulsions.

Bond angle of H_2O is 104°31, this is due to sp^3 hybridisation of O atom and lone pair and bond pair repulsions.

17. Predict the reason for special properties of salts for dissolve in water and not in kerosene in terms of polar structures ?

A. "Like dissolves like" means **polar solutes** dissolves in **polar solvents** and non-polar solutes dissolve in non-polar solvents.

Ionic compounds being highly polar, soluble in polar solvents.

Ex : NaCl dissolves in water.

Covalent compounds being non polar nature, soluble in non polar solvents.

Ex : Napthalene dissolves in water.

6. PRINCIPLES OF METALLURGY

6 Marks Questions

AS_3 : Experimentation and field investigation

1. Suggest an experiment to prove that presence of air and water is essential occurrences of corrosion and explain the procedure? **(Public : 2015, 16, 19, 25)**

A. **Aim:-** To prove that the presence of air and water are essential occurrences of corrosion.

Apparatus:- Three test tubes, three corks, Distilled water, anhydrous calcium chloride, clean iron nails and oil etc.

Precautions: Try to take fresh iron nails, Keep rubber corks tightly to the test tubes

Procedure:

i) Take 3 test tubes and place clean iron nails in each of them. Label the test tubes A, B and C.

ii) Pour some water in test tube A and cork it.

iii) Pour boiled distilled water in test tube B, and about 1ml of oil and cork it.

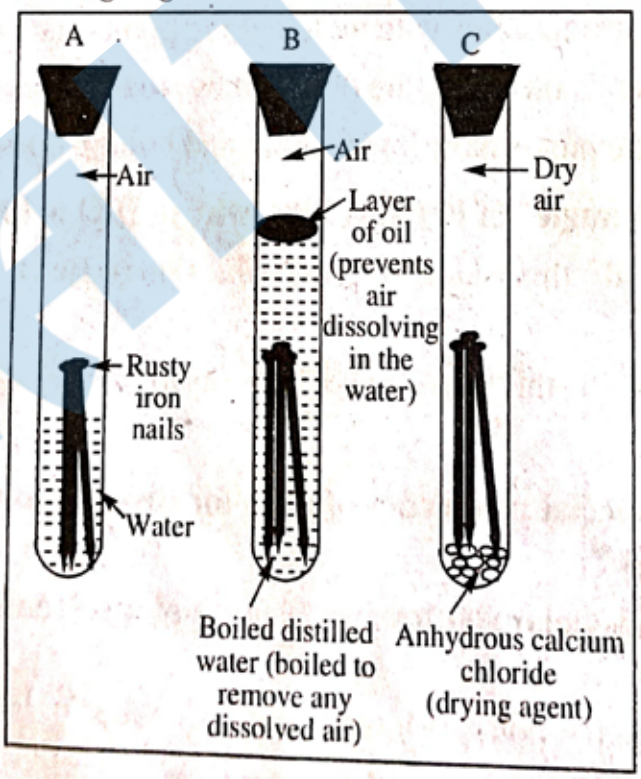
iv) Put some anhydrous calcium chloride in test tube C and cork it.

v) Leave these test tubes for a few days and then observe.

Observation: After a few days, we will observe that iron nails rust in test tube A, but they do not rust in test tubes B and C.

Preventive methods of corrosion : Painting, Galvanization, Oiling, Electro plating.

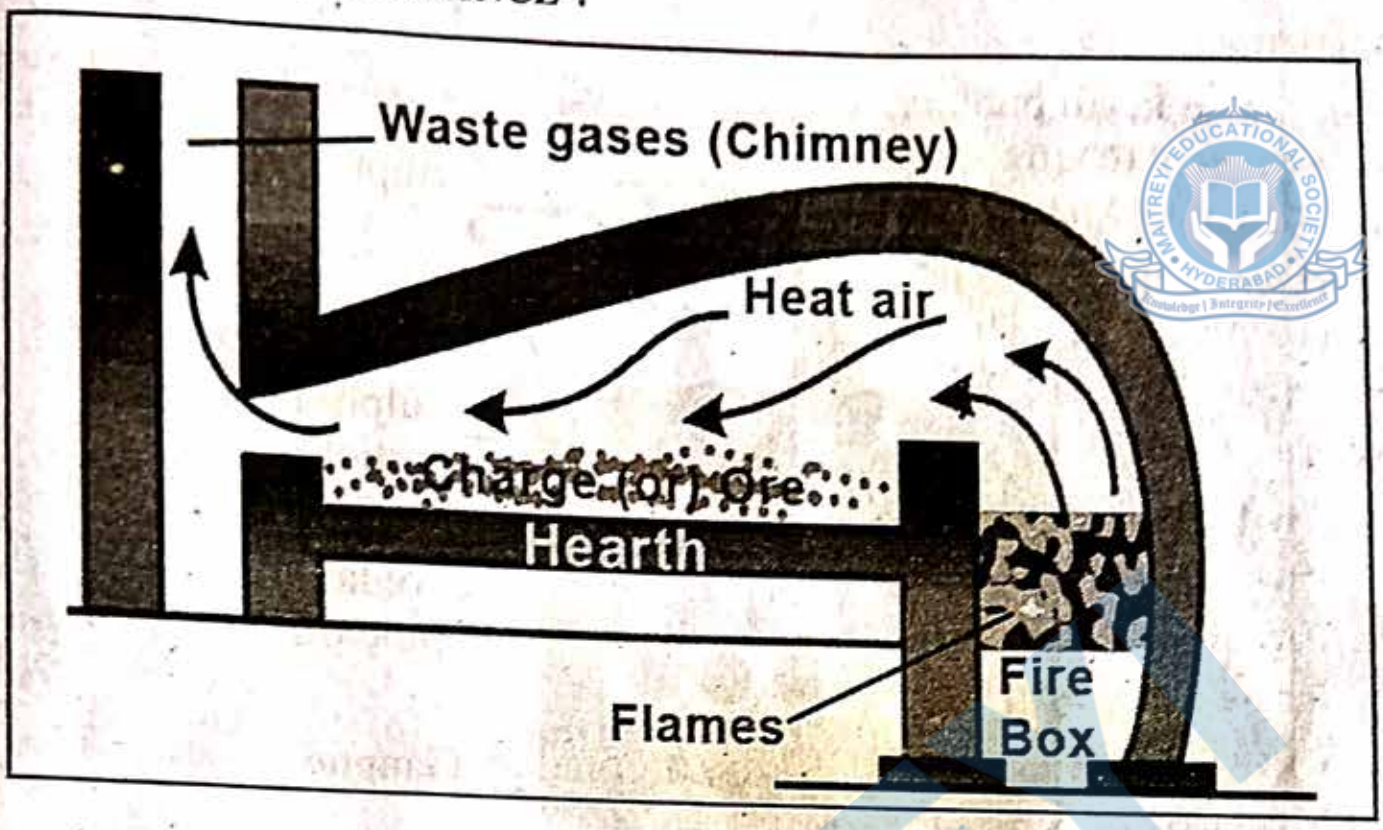
Investigating the conditions under which iron rusts



Conclusion:- From the above experiment, we can prove that air and water are essential for corrosio

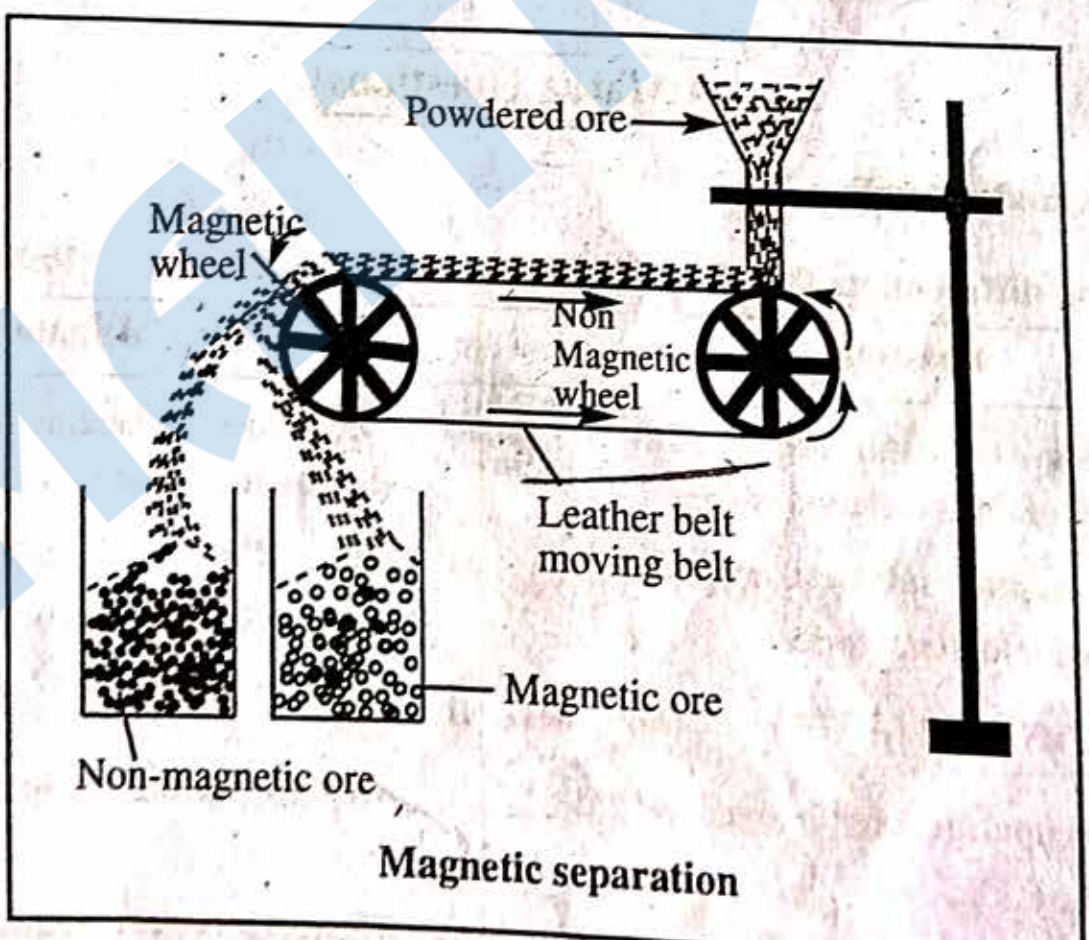
2. **Draw a neat diagram of Reverberatory furnace and label it neatly? (Public : 2015, 18)**

A. **REVERBERATORY FURNANCE :**



3. **Draw a neat diagram of Magnetic separation and label it neatly?**

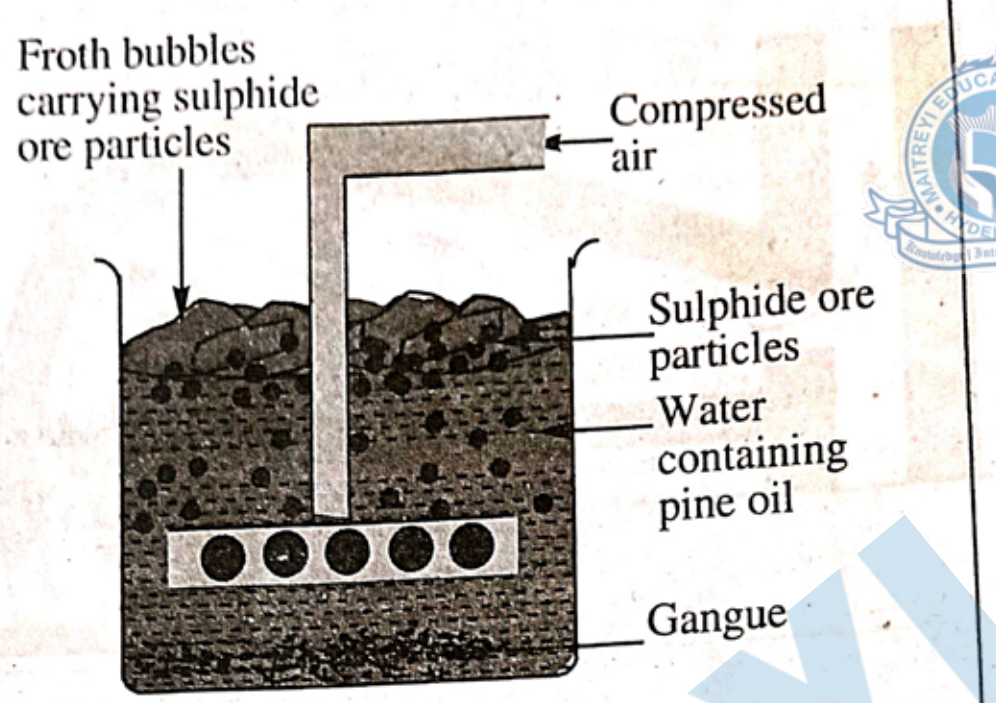
A. **MAGNETIC SEPARATION :**



Magnetic separation

4. **Draw a neat diagram of Froth floatation and label it neatly?**

A. **FROTH FLOATATION :-**



Froth floatation process for the concentration of suphide ores

4 Marks Questions

AS_1 : Conceptual understanding

5. **How can you differentiate Roasting with Calcination ?** **(Public : 2017)**

A.

Roasting	Calcination
i) The process of heating the ore in the presence of air is called roasting.	i) The process of heating the ore strongly in the absence of air is called calcination.
ii) During roasting, sulphide ores are converted into their oxides.	ii) During calcination, carbonate ores are converted into their oxides.
iii) **Ex :** $\underset{(Zinc\,blende)}{2ZnS} + 3O_2 \xrightarrow{roasting} \underset{(zinc\,oxide)}{2ZnO} + 2SO_2$	iii) $\underset{(calmine)}{ZnCO_3} \xrightarrow{heat} \underset{(zinc\,oxide)}{ZnO} + CO_2 \uparrow$
iv) Volatile impurities are removed as oxides **Ex :** SO_2, P_2O_5.	iv) Moisture and organic impurities are removed
v) The oxide ores are reduced with suitable reducing agents	v) The oxide ores are reduced with suitable reducing agents

6. What are the Concentration or Dressing of the ore methods. Explain any two of them?

A. Concentration or dressing of the ore: **(Public : 2017, 24)**

i) Hand picking, ii) Washing,

iii) Froth flotation, iv) Magnetic separation.

i) **Froth flotation :** This method is mainly useful for sulphide ores which have no wetting property whereas the impurities get wetted. The ore with impurities is finely powdered and kept in water taken in a flotation cell. Air under pressure is blown to produce froth in water. Froth so produced, takes the ore particles to the surface whereas impurities settle at the bottom. Froth is separated and washed to get ore particles.

ii) **Magnetic separation :** If the ore or impurity, one of them is magnetic substance and the other non-magnetic substance they are separated using electromagnets.

7. What are the methods of Refining or purification of the metal? Explain any two of them?

A. **Refining or purification of the metal** **(Public : 2015)**

The process of obtaining the pure metal from the impure metal is called refining of the metal. Some refining methods are:

i) Distillation, **ii) Polingm,**

iii) Liquation, **iv) Electrolytic refining**

i) **Distillation :** On distillation, low boiling metals like zinc and mercury can be separated from high boiling impurities. The pure metal is obtained as distillate.

ii) **Poling :** The molten metal is stirred with logs(poles) of green wood. The impurities are removed either as gases or they get oxidized and form scum over the surface of the molten metal. Blister copper is purified by this method.

iii) **Liquation :** In this method a low melting metal like tin can be made to flow on a slopy surface to separate it from high melting impurities.

8. What is refining of metals ? Explain with labelled diagram the process of electrolytic refining of copper. Write equations of the reactions involved.

A. **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 electricity.

$CuSO_4 \rightarrow Cu^{2+} + SO_4^{2-}$

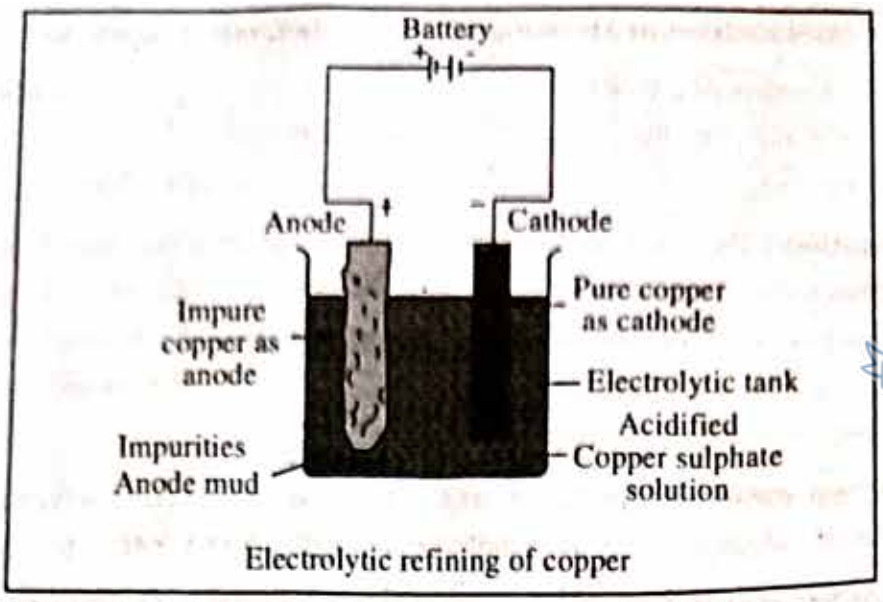
At anode : $Cu \rightarrow Cu^{2+} + 2e^-$

(from anode) (in solution)

At cathode : $Cu^{2+} + 2e^- \rightarrow Cu$

(from solution) (to cathode)

In soluble impurities settle down as anode mud.



Electrolytic refining of copper

AS_4 : Information skills and projects

9. Observe the table and answer the questions given below. **(Public : 2024)**

S.No.	Name of the Ore	Formula
1.	Bauxite	$Al_2O_3.2H_2O$
2.	Zinc blende	ZnS
3.	Epsom salt	$MgSO_4.7H_2O$
4.	Cinnabar	HgS
5.	Rock salt	NaCl
6.	Pyrolusite	MnO_2
7.	Galena	PbS

i) Which ores are oxides among the table?

A. Bauxite ($Al_2O_3.2H_2O$) and pyrolusite (MnO_2)

ii) How many Sulphate ores are there in the given table? What are they?

A. One. i.e., Epsom salt ($MgSO_4.7H_2O$)

iii) Which ore are concentrated by froth flotation method in the given table?

A. Zinc blende (ZnS), cinnabar (HgS) and galena (PbS)

iv) Which ores are extracted by electrolysis method in the given table?

A. Rock salt (NaCl)

AS_7 : Application to daily life, concern to biodiversity

10. What is thermite process? Mention its applications in daily life? **(Public : 2015, 17)**

A. **Thermite process:-**

i) The reaction of Iron Oxide (Fe_2O_3) with aluminium produces molten iron is known as th thermite reaction.

ii) This reaction is exothermic and the state of metal is in molten form.

$2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe + Heat$

iii) Here Al is reducing agent

iv) Fe_2O_3 is oxidising agent

Applications in daily life:

1) To join railings of railway track
2) To join cracked machine parts.

11. What are the applications metal activity series?

A. **Applications of activity series in the extraction of metals :**

1) High reactive metals like K, Na, Ca, Mg and Al are so reactive that they never found in nature in free state. They can be extracted by **electrolysis of their fused compounds.**
2) The moderate reactive metals like Zn, Fe, Pb etc., are found in the earth's crust. In the form of **sulphides and carbonates** .
3) The sulphide ore metals can be extracted by **Roasting** and reducing to metal.
4) The carbonate ores are extracted by **calcination** followed by reducing the metal oxide to metal
5) The least reactive metals like Au, Ag, Pt are found even in free state in nature and are extracted by displacement of metal from their aqueous solutions.

2 Mark Questions

AS_2 : Asking questions and making hypothesis

12. Imagine and write what happend if corrosion is not prevented (Public : 2023)

A. Metals like iron, silver and copper get corroded on exposure to air. If corrosion of metals does not prevent the consequences are

i) It will destroy the metal over time and can become a **saftey hazard to human health and the environment.**
ii) Due to corrosion purity of metal is lost, the metal loses its strength and tendency to undergo **structural collapse.**
iii) Due to corrosion metal looses its **lustre.**
iv) When metal looses strength and stability **bridges** will be easily collapsed, **building** will be **collapsed, vehicles parts will be damaged.**

13. If alloys were not discovered, what happend? Imagin and write? (Public : 2016)

A. If alloys were not discovered

i) There will be more possibility to get rust.
ii) More precautions would have been taken to prevent the corrosion.
iii) We cannot obtain desirable qualities such as hardness, lightness and strength.
iv) We may face problems like rusting of iron, tarnishing of silver and blackening of copper etc.

7. CARBON AND ITS COMPOUNDS

6 Marks Questions

AS_3 : Experimentation and field investigation

AS_5 : Communication through drawing, model making

1. Write the experimental procedure for preparation of ester. **(Public : 2017, 23)**

Aim : To prepare ester by using ethanol and acetic acid.

Material required :

i) Beaker ii) Water iii) Bunsen burner iv) Tripod stand

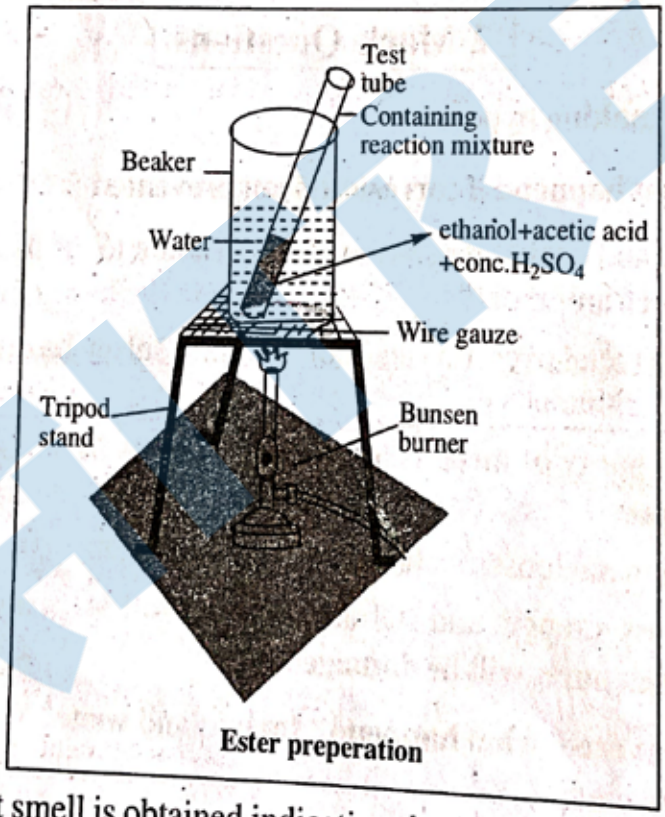
v) Test tube vi) Reaction mixture (ethanol + acetic acid + conc. H_2SO_4)

Procedure :

i) Take 1 m*l* of pure ethanol (absolute alcohol) in a test-tube and add 1 m*l* of glacial **ethanoic acid** to it. Then add 2 or 3 drops of concentrated sulphuric acid to the mixture.

ii) Warm the test-tube containing above reaction mixture in hot water bath (a beaker containing hot water) for about 5 minutes

iii) Pour the warm contents of the test-tube in about 50 m*l* of water taken in another beaker and smell it.



Ester preperation

Observation : A sweet smell is obtained indicating the formation of an ester .

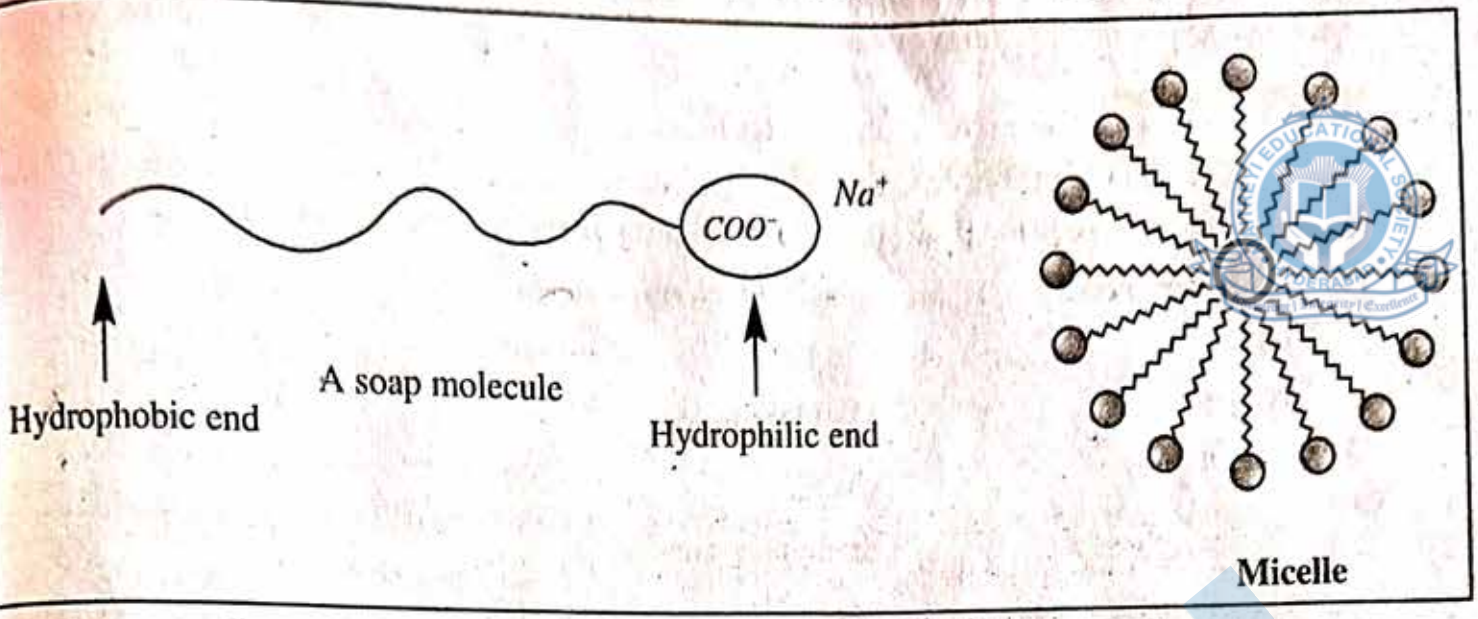
Chemical equation :

$$\underset{\text{acetic acid (ethanoic acid)}}{CH_3COOH} + \underset{\text{ethyl alcohol (ethanol)}}{C_2H_5OH} \xrightarrow{\text{Conc.}H_2SO_4} \underset{\text{ethyl ethanoate (ethyl acetate)}}{CH_3COOC_2H_5} + \underset{\text{water}}{H_2O}$$

Conclusion : The alcohols react with carboxylic acids in the presence of a little amount of concentrated sulphuric acid to form **sweet smelling esters.**

2. **Explain the mechanism of cleansing action of Soap?** **(Public : 2023)**

A. 1) Suppose that we put dirty cloth in the soap solution. Dirt is mainly greasy matte.



2) Soap has one polar end (the end with $-\overset{\overset{O}{\|}}{C}-OH$ carboxyl) and one non-polar end (the end with hydrocarbon chain) as shown here.

3) The polar end is hydrophilic in nature and attracted towards water.

4) The non-polar end is hydrophobic in nature and attracted towards grease or oil on the cloth, but not towards water.

5) When soap dissolves in water, its hydrophobic ends attach themselves to dirt and remove it from cloth.

3. **How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties?**

A.

Ethanol	Ethanoic acid
Physical Properties : i) Colourless liquid ii) Plesent odour iii) Burning taste iv) Bolilng point 78.3°C v) Used in tonics	i) Colourless liquid ii) Unplesent odour iii) Sour taste iv) Bolilng point118°C v) Used in vinegar
Chemical Properties : i) $2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2$ ii) $C_2H_5OH + Na_2CO_3 \rightarrow$ No reaction iii) $C_2H_5OH + NaOH \rightarrow$ No reaction iv) C_2H_5OH + Blue litmus $\rightarrow$ No reaction	i) $2CH_3COOH + 2Na \rightarrow 2CH_3COONa + H_2$ ii) $2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + H_2O + CO_2$ iii) $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$ iv) CH_3COOH + Blue litmus $\rightarrow$ Red

AS_1 : Conceptual understanding

4. Alkanes are considered as paraffins. So they undergo susstitution reactions but not addition reactions. Explain with suitable example? **(Public : 2016, 17)**

A. **Substitution reactions :**

1) Alkanes undergo substitution reactions.

2) For example Methane (CH_4) reacts with chlorine in the presence of sunlight.

3) Hydrogen atoms of CH_4 are replaced by chlorine atoms.

$CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$

Methane — Methyl chloride

$CH_3Cl + Cl_2 \rightarrow CH_2Cl_2 + HCl$

Methyl chloride — Methylene chloride

$CH_2Cl_2 + Cl_2 \rightarrow CHCl_3 + HCl$

Methylene chloride — Chloroform

$CHCl_3 + Cl_2 \rightarrow CCl_4 + HCl$

Chloroform — Carbon tetrachloride

5. Explain the following chemical properties of carbon :

i) Combustion **ii) Oxidation**

iii) Addition **(Public : 2016)**

A. i) **Combustion :** The process of burning of a carbon compound in air to give carbon dioxide, water, heat and light, is known as combustion

Ex : $C + O_2 \rightarrow CO_2 + \text{Energy}$

ii) **Oxidation : Oxidation** means controlled **combustion**. When ethanol is heated with alkaline potassiuim permanganate solution (or acidified potassium dichromate solution), it gets oxidised to **ethanoic acid**.

Ex: $\underset{\substack{\text{Ethanol}\\\text{(Ethyl alcohol)}}}{CH_3CH_2OH} + \underset{\substack{\text{Nascent oxygen}\\\text{(From oxidising agent)}}}{2[O]} \xrightarrow[(or\ Acidified\ K_2Cr_2O_7)]{Alkaline\ KMnO_4:Heat} \underset{\substack{\text{Ethanoic acid}\\\text{(Acetic acid)}}}{CH_3COOH} + \underset{\text{Water}}{H_2O}$

iii) **Addition :** The reaction in which an unsaturated hydrocarbon combines with another substance to give a single product is called an addition reaction.

$\underset{\text{But-2-yne}}{CH_3C\equiv C-CH_3} \xrightarrow[H_2]{\text{Ni catalyst}} \underset{\text{But-2-ene}}{CH_3CH=CH-CH_3} \xrightarrow[H_2]{\text{Ni catalyst}} \underset{\text{n-Butane}}{CH_3-CH_2-CH_2-CH_3}$

4 Marks Questions

AS_1 : Conceptual understanding

6. Differences between Diamond and Graphite.

A.

Diamond	Graphite
i) Shape is tetrahedral	i) Shape is hexagonal
ii) sp^3 hybridisation	ii) sp^2 hybridisation
iii) C–C bond length 1.54 Å	iii) C – C bond length 1.42 Å
iv) Hardest material	iv) Soft and smooth material
v) Used to cut the glass	v) Used as electrodes

7. Difference between Alkanes, Alkenes, Alkynes **(Public : 2017, 23)**

A.

Saturated Hydrocarbons	Unsaturated Hydrocarbons	
Alkanes	**Alkenes**	**Alkynes**
1) Hydro carbon contains only single bond	Hydro carbon contains atleast one double bond	Hydro carbon contains atleast one triple bond
2) Paraffins	Oleffins	Acetylenes
3) Undergo substitution reactions	Undergo addition reactions	Undergo addition reactions
Ex : CH_4, C_2H_6	**Ex :** C_2H_4, C_3H_6	**Ex :** C_2H_2, C_3H_4
4) GF : C_nH_{2n+2}	GF : C_nH_{2n}	GF : C_nH_{2n-2}

8. Name the following carbon compounds according to IUPAC nomenclature.

i) $CH_3-\underset{\underset{Cl}{|}}{CH}-\underset{\underset{Cl}{|}}{CH}-CH_3$ A) 2, 3 - dichlorobutane

ii) $CH_3-\underset{\underset{Cl}{|}}{CH}-CH=CH_2$ A) 3 - chlorobut-1-ene

iii) $CH_3-CH=CH-\underset{\underset{Cl}{|}}{CH}-\underset{\underset{OH}{|}}{CH_2}$ A) 2 - chloropent-3-en-1-ol

iv) $\overset{1}{C}H_3-\overset{2}{\underset{\underset{O}{\|}}{C}}-\overset{3}{C}H_2-\overset{4}{C}H_2-\overset{5}{C}H_2-\overset{6}{C}H_2-OH$ A) 6-hydroxyhexan-2-one

AS_4 : Information skills and projects

9. **In the table given below, fill the information in the empty boxes and give answer to the following questions.** **(2015 Public)**

S.No.	Alkane	Molecular formula	Structure	Number of Carbons
1)	Methane	CH_4		1
2)	Ethane	C_2H_6	$-\overset{\vert}{\underset{\vert}{C}}-\overset{\vert}{\underset{\vert}{C}}-$	2
3)	Propane	C_3H_8	$H - (CH_2)_3 - H$	3
4)	Butane	C_4H_{10}	$H_3C - CH_2 - CH_2 - CH_3$	4

i) Write the general formula of alkanes from the table.

A. **General formula of Alkanes : C_nH_{2n+2}**

ii) How many σ bonds are there in C_2H_6.

A. The number of σ bonds in C_2H_6 is 7.

iii) What sequential order did you notice in the molecular formulae?

A. Two successive compounds differ by CH_2 group or by mass 14 units.

iv) There exists single bonds between carbon atoms of alkanes. Do you agree with this statement? Give reasons.

A. Yes, alkanes undergoes substitution reactions due to the presence of single bonds between carbon atoms.

10.

Organic compound	Methane	Ethane	Propene	Butene	Pentyne	Hexyne
Formula	CH_4	C_2H_6	C_3H_6	C_4H_8	C_5H_8	C_6H_{10}

Observe the above table and answer the following questions. **(2019 Public)**

i) Write the general formula of Alkanes.

A. **General formula of Alkanes : C_nH_{2n+2}**

ii) Mention the names of unsaturated hydrocarbons.

A. Propene, Butene, Pentyne and Hexyne

iii) Write the homologous series of Alkynes.

A. Ethyne, Propyne, Butyne, Pentyne and Hexyne etc.,

iv) Write the formula of Hexyne.

A. **Formula of Hexyne : C_6H_{10}**

11.

Hydrocarbon	Alkane	Alkene	Alkyne
General molecular formula	C_nH_{2n+2}	C_nH_{2n}	C_nH_{2n-2}

Answer the following questions based on the above table.

i) Write the name of the Alkene formed when n = 3 ?

ii) What is the formula of Ethyne?

iii) Mention the saturated Hydrocarbon in the following table.

iv) Which Hydro Carbon forms a double bond?

A. i) The name of the Alkene formed when n = 3 is butene.

ii) The formula of Ethyne is C_2H_2.

iii) The saturated Hydrocarbon in the given table are Alkanes.

iv) Hydro Carbon forms a double bond are Alkenes.

AS_7: Application to daily life, concern to biodiversity

12. **What are the applications of Allotropes of carbon ?** **(Public : 2017, 23, 25)**

A.

Compound	Uses
1) Diamond	1) Jewellary, glass cutter, ornaments, bad conductor of electricity, hard and compact
2) Graphite	1) Electrodes, lids in pencil, lubricant, good conductor of electricity, soft and smooth to touch
3) C_{60}	1) Melenoma cancer treatment, anti-oxidant, protect against aging skin 2) Contains 12 pentagonal, 20 hexagonal rings
4) Nano tubes	1) Used in integrated circuits, good conductor of electricity, introduced biomolecules into human body
5) Graphene	1) Good conductor of electricity, transparent to light, paints, anti-corrosion coating, sensors

13. **What are the applications of Ethanol, Acetic acid, Ester, Soap ?** **(Public : 2018)**

A.

Compound	Formula	Uses
1) Ethanol	C_2H_5OH	1) Cough syrup, tincture of iodine, solvent, motor fuel
2) Acetic acid	CH_3COOH	1) Vinegar (5 - 8% of Acetic acid in water) 2) Preservative for pickles
3) Ester	$CH_3COOC_2H_5$	1) Sweet smelling compound, paints, sweets, dyes
4) Soap	$C_{17}H_{35}COONa$	1) Cleaning body, clothes
5) Detergent	Na Salt of ABS	1) Washing clothes

2 Mark Questions

AS_1 : Conceptual understanding

14. Define homologous series of carbon compounds. Mention any two characteristics of homologous series. **(Public : 2016)**

A. Two successive compounds differ by $-CH_2$ unit is called homologous series.

Homologous series of organic compounds have following characteristic features.

i) They have one general formula

Ex : alkanes C_nH_{2n+2}

ii) They possess similar chemical properties due to the same functional group

AS_2 : Asking questions and making hypothesis

15. Saturated hydrocarbons burns with a blue flame, while unsaturated and aromatic hydrocarbons burns with a sooty flame ? **(Public : 2015)**

A. i) Saturated hydrocarbons undergoes complete combustion but unsaturated and aromatic compounds undergoes incomplete combustion.

ii) The percentage composition of carbon is higher in unsaturated and aromatic compounds and atmospheric oxygen is not enough to burn all the carbon present it.

iii) The yellow flame (sooty) is caused by the glow of hot unburnt carbon particles produced du to the incomplete combustion of unsaturated and aromatic compounds.

iv) The blue flame of saturated hydrocarbons is caused by the complete combustion.

16. What happens, "In combustion process, if oxygen is insufficient"? **(Public : 2015)**

A. i) In combustion process, if oxygen is insufficient incomplete combustion takes place.

ii) Instead of carbon dioxide carbon monoxide is produced as a by product.

iii) $2C + O_2 \rightarrow 2CO$.

17. A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne ar air is not used? **(Public : 2015)**

A. i) Ethyne is an unsaturated hydrocarbon, atmospheric oxygen is not sufficient to comple combustion.

ii) But, the mixture oxygen and ethyne gives large amount of heat in the combustion.

LIST OF CHEMICAL REACTIONS

CHEMICAL EQUATIONS

Respiration :

$$\underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6O_2} \longrightarrow \underset{\text{carbondioxide}}{6CO_2} + \underset{\text{water}}{6H_2O} + Q(\text{Energy})$$

Photosythesis :

$$\underset{\text{carbondioxide}}{6CO_2} + \underset{\text{water}}{6H_2O} + Q(\text{Energy}) \longrightarrow \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6O_2}$$

Exothermic reaction (combination) :

$$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)} + \text{Heat energy}$$

Endothermic reaction (combination) :

$$N_{2(g)} + O_{2(g)} \longrightarrow 2NO_{(g)} - \text{Heat energy}$$

Endothermic reaction (thermal decomposition) :

$$CaCO_{3(s)} \xrightarrow{\text{Heat}} CaO_{(s)} + CO_{2(g)}$$

Exothermic reaction (combination) :

$$CaO_{(s)} + H_2O_{(l)} \longrightarrow Ca(OH)_{2(aq)} + \text{Heat}$$

Photochemical recation (decomposition) :

i) $2AgBr_{(s)} \xrightarrow{\text{Sun light}} 2Ag_{(s)} + Br_{2(g)} \uparrow$

ii) $2AgCl_{(s)} \xrightarrow{\text{Sun light}} 2Ag_{(s)} + Cl_{2(g)} \uparrow$

Precipitation reactions (double displacement) :

i) $Na_2SO_{4(aq)} + BaCl_{2(aq)} \rightarrow BaSO_{4(s)} + 2NaCl_{(aq)}$

ii) $AgNO_{3(aq)} + NaCl_{(aq)} \rightarrow AgCl \downarrow + NaNO_{3(aq)}$

iii) $\underset{\text{lead nitrate}}{Pb(NO_3)_{2(aq)}} + \underset{\text{potassium iodide}}{2KI_{(aq)}} \rightarrow \underset{\text{lead iodide}}{PbI_{2(s)}} \downarrow + \underset{\text{potassium nitrate}}{2KNO_{3(aq)}}$

ACIDS, BASES AND SALTS

Reaction of metals with acids : Acid + Metal → Salt + Hydrogen

i) $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$ (or) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

ii) $2NaOH_{(aq)} + Zn_{(s)} \rightarrow \underset{\text{(sodium zincate)}}{Na_2ZnO_{2(s)}} + H_{2(g)} \uparrow$

2. **Reaction of carbonates dilute HCl :**

Metal carbonate + Acid → Salt + Carbon dioxide + Water

i) $Na_2CO_{3(s)} + 2HCl_{(aq)} \longrightarrow 2\ NaCl_{(aq)} + CO_{2(g)} + H_2O_{(l)}$

ii) $CaCO_{3(s)} + 2HCl_{(aq)} \longrightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$

3. **Reaction of bicarbonates with dilute HCl :**

Metal hydrogen carbonate + Acid → Salt + Carbondioxide + Water

$NaHCO_{3(s)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + CO_{2(g)} + H_2O_{(l)}$

4. **Neutralisation reaction :** Base + Acid → Salt + Water

$$\underset{\text{sodium hydroxide}}{NaOH_{(aq)}} + \underset{\text{Hydrochloric acid}}{HCl_{(aq)}} \rightarrow \underset{\text{Sodium chloride}}{NaCl_{(aq)}} + \underset{\text{water}}{H_2O_{(l)}}$$

5. **Reaction of metal oxide with acids :**

Metal oxide + Acid → Salt + Water

$CuO + 2HCl \rightarrow CuCl_2 + H_2O$

Blue - green

6. **Reaction of non - metal oxide with base :**

Non metal oxide + Base → Salt + Water

$CO_{2(g)} + Ca(OH)_2 \rightarrow CaCO_{3(s)} \downarrow + H_2O_{(l)}$

7. **Production of H^+ ions only in aqueous solution :**

$2\ NaCl_{(s)} + H_2SO_{4(l)} \rightarrow 2\ HCl_{(g)} + Na_2SO_{4(s)}$

8. **Chlor alkali process :**

i) at anode : $2Cl^- \rightarrow Cl_2 + 2e^-$ (Oxidation)

ii) at cathode : $2H^+ + 2e^- \rightarrow H_2$ (Reduction)

Near cathode : $2Na^+ + 2OH^- \rightarrow 2NaOH$

$2\ NaCl_{(aq)} + 2H_2O_{(l)} \rightarrow 2\ NaOH_{(l)} + Cl_{2(g)} + H_{2(g)}$

9. **Production of baking soda :**

$NaCl + H_2 + NH_3 + CO_2 \rightarrow NaHCO_3 + NH_4Cl$

10. **Production of washing soda :**

i) $2\ NaHCO_3 \xrightarrow{\text{Heat}} Na_2CO_3 + CO_2 + H_2O$

ii) $Na_2CO_3 + 10\ H_2O \rightarrow Na_2CO_3 \cdot 10H_2O$

11. **Bleaching Powder :**

$$\underset{\substack{\text{calcium hydroxide slaked lime}}}{Ca(OH)_2} + \underset{\text{chlorine}}{Cl_2} \rightarrow \underset{\substack{\text{calcium oxychloride}\\(\text{bleaching powder})}}{CaOCl_2} + \underset{\text{water}}{H_2O}$$

12. **Production of Zypsum :**

$$CaSO_4 \cdot \frac{1}{2} H_2O + 1\frac{1}{2} H_2O \rightarrow CuSO_4 \cdot 2H_2O.$$

13. **Water of crystallization :**

$$\underset{\text{(Blue)}}{CuSO_4 \cdot 5H_2O} \rightarrow \underset{\text{(White)}}{CuSO_4} + 5H_2O.$$

14. **White washing walls :**

$$Ca(OH)_{2(aq)} + CO_{2(g)} \rightarrow CaCO_{3(s)} \downarrow + H_2O_{(l)}$$

$$Ca(OH)_{2(aq)} + CO_{2(g)} + H_2O_{(l)} \rightarrow CaHCO_{3(aq)} \downarrow + H_2O_{(l)}$$

CHEMICAL BONDING

1. **Formation of ionic compounds :**

i) $Na_{(s)} + \frac{1}{2} Cl_{(g)} \rightarrow NaCl_{(s)}$

ii) $Mg_{(s)} + Cl_{2(g)} \rightarrow MgCl_{(l)}$

iii) $2Al_{(s)} + 3Cl_{2(g)} \rightarrow 2AlCl_{3(s)}$

iv) $4Na_{(s)} + O_{2(g)} \rightarrow 2Na_2O_{(s)}$

v) $2Mg_{(s)} + O_{2(g)} \rightarrow 2MgO_{(s)}$

vi) $4Al_{(s)} + 3O_{2(g)} \rightarrow 2Al_2O_{3(s)}$

PRINCIPLES OF METALLURGY

1. **Metal activity series (chemical displacement) :**

i) $CuSO_{4(aq)} + Zn_{(s)} \rightarrow ZnSO_{4(aq)} + Cu_{(s)}$

ii) $Fe_{(s)} + CuSO_{4(aq)} \rightarrow FeSO_{4(aq)} + Cu_{(s)}$

iii) $Zn_{(s)} + FeSO_{4(aq)} \rightarrow ZnSO_{4(aq)} + Fe_{(s)}$

2. **Copper rust :**

$$2Cu_{(s)} + CO_{2(g)} + O_{2(g)} + H_2O_{(l)} \rightarrow \underset{\text{(Green)}}{CuCO_3 \cdot Cu(OH)_2}$$

3. **Silver Tarnishing :**

$$4Ag_{(s)} + 2H_2S_{(g)} + O_{2(g)} \rightarrow \underset{\text{(Black)}}{2Ag_2S} + 2H_2O_{(l)}$$

4. **Iron rust :**

$$4Fe_{(s)} + 3O_{2(g)} \rightarrow 2Fe_2O_{3(s)} + XH_2O_{(l)} \rightarrow Fe_2O_3 \cdot XH_2O$$

(brown rust)

5. **Mechanism of corrosion :**

Anode : $2Fe_{(s)} \rightarrow 2Fe^{2+} + 4e^-$

Cathode : $O_{2(g)} + 4H^+_{(aq)} + 4e^- \rightarrow 2H_2O_{(l)}$

The over all reactions is : $2Fe_{(s)} + O_{2(g)} + 4H^+_{(aq)} \rightarrow 2Fe^{2+}_{(aq)} + 2H_2O_{(l)}$

6. **Electrolysis of fused NaCl :** $2NaCl_{(l)} \rightarrow 2Na_{(s)} + Cl_{2(g)}$

at anode : $2Cl^- \rightarrow Cl_2 + 2e^-$ (Oxidation)

at cathode : $2Na^+ + 2e^- \rightarrow 2Na$ (Reduction)

7. **Electrolysis of fused $MgCl_2$:** $MgCl_{2(l)} \rightarrow Mg_{(s)} + Cl_{2(g)}$

at anode : $2Cl^- \rightarrow Cl_2 + 2e^-$ (Oxidation)

at cathode : $Mg^{2+} + 2e^- \rightarrow Mg$ (Reduction)

8. **Refining of copper :** $CuSO_4 \rightarrow Cu^{2+} + SO_4^{2-}$

At anode $Cu \rightarrow Cu^{2+} + 2e^-$
(from anode) (in solution)

At cathode $Cu^{2+} + 2e^- \rightarrow Cu$
(from solution) (to cathode)

9. **Extraction of lead :**

i) $2PbS + 3O_2 \rightarrow 2PbO + 2SO_2$

ii) $PbO + C \xrightarrow{1400°C} Pb + CO$

10. **Extraction of copper:**

i) $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$

ii) $2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$

11. **Extraction of Mercury :**

i) $2HgS_{(s)} + 3O_{2(g)} \xrightarrow{Heat} 2HgO_{(s)} + 2SO_{2(g)}$

ii) $2HgO_{(s)} \xrightarrow{Heat} 2Hg + O_{2(g)}$

12. **Extraction of silver:**

i) $Ag_2S_{(s)} + 4KCN_{(aq)} \rightarrow 2K[Ag(CN)_2]_{(aq)} + K_2S_{(aq)}$

ii) $2K[Ag(CN)_2]_{(aq)} + Zn_{(s)} \rightarrow K_2[Zn(CN)_4] + 2Ag_{(s)}$

13. **Reduction of ores by more reactive metals :**

i) $TiCl_4 + 2Mg \xrightarrow{850°C} Ti + 2MgCl_2$

ii) $TiCl_4 + 4Na \xrightarrow{850°C} Ti + 4NaCl$

14. **Thermite Reaction :**

i) $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe + Heat$

ii) $Cr_2O_3 + 2Al \rightarrow Al_2O_3 + 2Cr + Heat$

15. **Blast Furnace Reactions :**

i) $2C_{(s)} + O_{2(g)} \rightarrow 2CO_{(g)}$

ii) $\underset{\text{haematite}}{Fe_2O_{3(s)}} + 3CO_{(g)} \rightarrow 2Fe_{(l)} + 3CO_{2(g)}$

iii) $\underset{\text{Limestone(flux)}}{CaCO_{3(s)}} \rightarrow \underset{\text{lime}}{CaO_{(s)}} + \underset{\text{carbon dioxide}}{CO_{2(g)}}$

iv) $\underset{\text{(calcium oxide)}}{CaO_{(s)}} + \underset{\text{(silicon dioxide)}}{SiO_{2(s)}} \rightarrow \underset{\text{(calcium silicate)(slag)}}{CaSiO_{3(s)}}$

16. **Roasting :**

i) $2ZnS_{(s)} + 3O_{2(g)} \rightarrow 2ZnO_{(s)} + 2SO_{2(g)}$

ii) $2PbS_{(s)} + 3O_{2(g)} \rightarrow 2PbO_{(s)} + 2SO_{2(g)}$

17. **Calcination :**

i) $MgCO_{3(s)} \rightarrow MgO_{(s)} + CO_{2(g)}$

ii) $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$

18. **Reaction of Metals with Cold water / hot water / steam :**

i) $2Na_{(s)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + H_{2(g)}$

ii) $Mg_{(s)} + 2H_2O(hot) \rightarrow Mg(OH)_{2(aq)} + H_{2(g)}$

iii) $2Al_{(s)} + 3H_2O_{(g)} \rightarrow Al_2O_{3(s)} + 3H_{2(g)}$

CARBON AND ITS COMPOUINDS

Ester formation equation :

$$\underset{\substack{\text{acetic acid}\\\text{(ethanoic acid)}}}{CH_3COOH} + \underset{\substack{\text{ethyl alcohol}\\\text{(ethanol)}}}{C_2H_5OH} \xrightarrow{Conc.H_2SO_4} \underset{\substack{\text{ethyl ethanoate}\\\text{(ethyl acetate)}}}{CH_3COOC_2H_5} + \underset{\text{water}}{H_2O}$$

2. **Oxidation :**

i) $\underset{\text{ethanol}}{CH_3CH_2OH} + (O) \xrightarrow[\Delta]{\text{alk. } KMnO_4} \underset{\text{ethanal}}{CH_3CHO} + H_2O$

ii) $\underset{\text{ethanal}}{CH_3CHO} + (O) \xrightarrow[\Delta]{\text{alk. } KMnO_4} \underset{\text{ethanoic acid}}{CH_3COOH}$

3. **Combustion :**

i) $CH_{4(g)} + O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(l)}$

ii) $C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 4H_2O_{(l)}$

iii) $2C_2H_{6(g)} + 7O_{2(g)} \rightarrow 4CO_{2(g)} + 6H_2O_{(l)}$

iv) $C_2H_{4(g)} + 3O_{2(g)} \rightarrow 2CO_{2(g)} + 2H_2O_{(l)}$

v) $2C_2H_{2(g)} + 5O_{2(g)} \rightarrow 4CO_{2(g)} + 2H_2O_{(l)}$

vi) $C_2H_5OH_{(l)} + \frac{7}{2}O_{2(g)} \rightarrow 2CO_{2(g)} + 3H_2O_{(l)}$

4. **Substitution :**

i) $\underset{\text{Methane}}{CH_4} + Cl_2 \xrightarrow{\text{sunlight}} \underset{\text{Methyl Chloride}}{CH_3Cl} + \underset{\text{Hydrogen Chloride}}{HCl}$

ii) $\underset{\text{Methyl Chloride}}{CH_3Cl} + Cl_2 \xrightarrow{\text{sunlight}} \underset{\text{Methylene Chloride}}{CH_2Cl_2} + \underset{\text{Hydrogen Chloride}}{HCl}$

iii) $\underset{\text{Methylene Chloride}}{CH_2Cl_2} + Cl_2 \xrightarrow{\text{sunlight}} \underset{\text{Chloroform}}{CHCl_3} + \underset{\text{Hydrogen Chloride}}{HCl}$

iv) $\underset{\text{Chloroform}}{CHCl_3} + Cl_2 \xrightarrow{\text{sunlight}} \underset{\substack{\text{Carbon}\\\text{Tetrachloride}}}{CCl_4} + \underset{\text{Hydrogen Chloride}}{HCl}$

5. **Addition :**

$\underset{\text{But-2-yne}}{CH_3C \equiv C - CH_3} \xrightarrow[H_2]{\text{Ni catalyst}} \underset{\text{But-2-ene}}{CH_3CH = CH - CH_3} \xrightarrow[H_2]{\text{Ni catalyst}} \underset{\text{n-Butane}}{CH_3 - CH_2 - CH_2 - CH_3}$

6. **Preparetion of ethene :**

$\underset{\text{Ethanol}}{C_2H_5 - OH} \xrightarrow[\substack{H_2SO_4\\160^\circ C}]{\text{Hot conc}} H_2C = \underset{\text{Ethene}}{CH_2} + H_2O$

Ethanol preparation and chemical properties :

Preparation :

i) $CH_2 = CH_2 + H_2O \xrightarrow[100-300\ atm\ at\ 300^\circ C]{Catalyst} CH_3CH_2OH$

ii) Cooking grain (Starch) + Sperated barley (Malt) $\longrightarrow$ glucose $\xrightarrow[enzymes]{Yeast}$ ethanol + CO_2

Chemical properties :

i) $2\underset{Ethanol}{C_2H_5OH} + 2Na \rightarrow 2\underset{Sodiumethoxide}{C_2H_5ONa} + H_2$

ii) $CH_3CH_2OH \xrightarrow[Conc.H_2SO_4]{at\ 170^\circ C} CH_2 = CH_2 + H_2O$

Ethanoic acid chemical properties :

i) $2\underset{acetica\ acid}{CH_3COOH} + 2\underset{Sodium}{Na} \longrightarrow 2\underset{Socium\ acetate}{CH_3COONa} + H_2$

ii) $\underset{acetica\ acid}{CH_3COOH} + \underset{\substack{Sodium\\hydroxide}}{NaOH} \longrightarrow \underset{Socium\ acetate}{CH_3COONa} + H_2O$

iii) $2\underset{acetica\ acid}{CH_3COOH} + \underset{\substack{Sodium\\bicarbonate}}{Na_2CO_3} \longrightarrow \underset{Socium\ acetate}{2CH_3COONa} + H_2O + CO_2$

9. **Perment hardness of water :** $MgCl_{2(aq)} + Na_2CO_{3(s)} \longrightarrow MgCO_{3(s)} \downarrow + 2NaCl_{(aq)}$

10. **Temporary hardness of water :**

i) $Mg(HCO_3)_{2(aq)} \longrightarrow Mg(OH)_{2(aq)} \downarrow + 2CO_{2(g)}$

ii) $Mg(HCO_3)_{2(aq)} + Ca(OH)_{2(aq)} \longrightarrow MgCO_{3(s)} \downarrow + CaCO_{3(s)} \downarrow + 2H_2O_{(l)}$

11. **Saponification :**

Fat + Base $\longrightarrow$ Soap + Alcohol

Triglyceride + NaOH/KOH $\longrightarrow$ Soap + Glyecerol

Olive oil + NaOH/KOH $\longrightarrow$ Olive oil soap + Glycerol

$$\begin{array}{l} CH_2-O-\overset{\overset{O}{\|}}{C}-C_{17}H_{35} \\ | \\ CH-O-\overset{\overset{O}{\|}}{C}-C_{17}H_{35} \\ | \\ CH_2-O-\overset{\overset{O}{\|}}{C}-C_{17}H_{35} \end{array} + 3NaOH \rightarrow \begin{array}{l} CH_2OH \\ | \\ CHOH \\ | \\ CH_2OH \end{array} + 3C_{17}H_{35}COONa$$

Tristearin Glycerol Sodium stearate (soap)

MOST EXPECTED PUBLIC EXAM QUESTIONS FOR SET - 5 STUDENTS

AS_1 Conceptual understanding

1. Balancing chemical equation.
2. Solving mole concept problem.
3. Four quantum numbers
4. Electronic configuration rules
5. Bohr's atomic model
6. Construction of Modern Periodic Table.
7. Classification of s, p, d, f – blocks.
8. Periodic properties : AS, IP, EN, EA
9. Factors affecting Ionisation Potential
10. Formation of O_2 and N_2 (VBT)
11. Formation of $BeCl_2$ and BF_3 (Hybridisation)
12. Formation Ionic bond : NaCl or $MgCl_2$
13. Differences b/w ionic compounds and covalent compounds
14. Formation of Polar covalent bond with an example (HF, HCl)
15. Differences between Calcination and Roasting
16. Concentration methods of Ore
17. Extraction of highly reactive metals
18. Purification methods
19. Substitution reactions and Addition reactions
20. Cleaning action of soap
21. Differences between Alkanes and Alkenes
22. Homologous series, IUPAC nomenclature
23. Differences between Diamond and Graphite

AS_3 Experimentation and field investigation

1. Reaction of Acids and Bases with metals. **(Metal + Acid → Metallic salt + Hydrogen)**
2. Reaction of Carbonates and bicarbonates with acids.
   (Acid + Carbonate/bicarbonate → Metallic salt + CO_2 + H_2O)
3. Water of crystallisation. **($CuSO_4.5H_2O \rightarrow CuSO_4 + 5H_2O$)**
4. Alcohol and glucose does contain hydrogen but are not categorized as acids. **($H^+ + H_2O \rightarrow H_3O^+$)**
5. Neutralisation reaction. **(Acid + Base → Salt + Water)**
6. Corrosion : Rusting of Iron : Requires both moisture and air. **(Iron + Moisture + Air → Rust)**
7. Esterification reaction. **(Acid + Alcohol → Ester + Water)**

AS_5 Communication through drawing and model making

1. Reverberatory furnace
2. Magnetic separation
3. Forth floatation (Conc. of Sulphide ore)
4. Shapes of s, p, d – orbitals
5. Moeller diagram (n + *l* rule)
6. Reaction of Acids with metals
7. Acids with carbonates/bicarbonates
8. Acids/Base(Glucose)conducts electricity
9. Chemical bonding structures
10. pH scale

AS_7 Application to daily life, concern to biodiversity

1. Washing soda
2. Baking soda
3. Bleaching powder
4. Plaster of Paris (POP)
5. Neutralisation or pH.
6. Nanotubes
7. Buckminister fullerene (C_{60})
8. Graphite and Diamond
9. Ethyl alcohol or Ethanol
10. Acetic acid (Vinegar) or Ethanoicacid
11. Ester
12. Thermite process
13. nl^x method
14. Covalent compound