Sample paper - 1

GENERAL INSTRUCTION

1. You will not be allowed to write during the 15 minutes. This time is being spent in reading the question paper.

2. The time given at the head of this paper is the time allowed for writing the answer.

3. Attempt all questions from **Section A** and any 4 questions from **Section B.**

4. The intended marks for questions or parts of questions are given in brackets [ ]

Time: 2Hrs   **Max. Marks:80**

SECTION A   [40 marks]

1.

(a) **Fill in the blanks from the choices given in brackets.**

(i)   **An element with atomic number 17 belongs to…….period.(first, third)**
Sol:
Third

(ii) **Write the electronic configuration of magnesium atom after losing 2 electrons……(neon, argon)**
Sol:
Neon

(iii) **Whose example is ammonium hydroxide…….? (weak, strong)**
Sol:
Weak

(iv) **Write the oxidized product when the H_2S reacts with dil. HNO_3………..**
(sulpher, nitrogen)
Sol:
Sulpher

(v)   **Write the molecular formula of the compound when ethyne reacts with chlorine ……..$\left(C_2H_4Cl_2, C_2H_2Cl_2\right)$**
Sol:
$C_2H_2Cl_2$

(b) **Choose the correct answer from the option**

(i)   **Which law groups the elements in family of threem**
   (a) Law of traids

(b) Newland's law of octaves

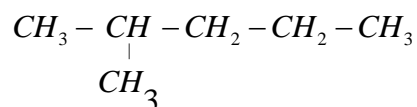(c) MAndeleev's periodic law

(d) None of the above

Sol: a

Law of traids

(ii) Which of the following is the greenhouse gas?

(a) Propane

(b) Methane

(c) Phosgene

(d) None of these

Sol: b

Methane

(iii) Write the IUPAC name of the following compound

$$CH_3 - CH - CH_2 - CH_2 - CH_3$$
$$\qquad\quad |$$
$$\qquad\quad CH_3$$

(a) 2-methyl pentane

(b) Hexane

(c) 4-methyl pentene

(d) Pentane

Sol: a

2-methyl pentane

(iv) Heat energy is evolved in which energy?

(a) Enthalpy change reaction

(b) Exothermic reactions

(c) Endothermic reactions

(d) None of the above

Sol: b

Exothermic reaction

(v) What is the number of moles of HCl present in 16.5g of it?

(a) 0.45mol

(b) 2mol

(c) 3.0mol

(d) 4mol

Sol: a

0.45mol

(c) Determine the substance which is underlines in each of the following.

(i) An <u>alkene</u> that shows both chain and position isomers.

Sol:

Butene

(ii) <u>Acid</u> also known as aqua fortis.

Sol:

HNO_3

(iii) An <u>unsaturated hydrocarbon</u> used for cutting and welding metals.

Sol:

Ethyne

(iv) A <u>gas</u> is evolved when liquor ammonia is kept exposed to air.

Sol:

Ammonia

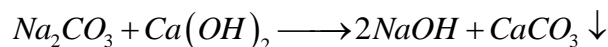**(v)** A <u>gas</u> is evolved when zinc metal reacts with dil. HCl,
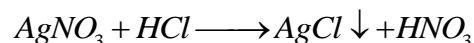
Sol:

bH_2

(d) Give the balanced chemical equation.

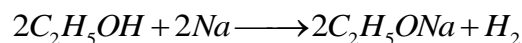**(i)** Sodium carbonate reacts with calcium hydroxide

Sol:

$$Na_2CO_3 + Ca(OH)_2 \longrightarrow 2NaOH + CaCO_3 \downarrow$$

(ii) Silver nitrate reacts with aqueous HCl

Sol:

$$AgNO_3 + HCl \longrightarrow AgCl \downarrow + HNO_3$$

(iii) Sodium reacts with ethyl alcohol.

Sol:

$$2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2$$

(iv) Ammonium chloride is exposed to heat.

Sol:

$$NH_4Cl + \xrightarrow{\quad Heat \quad} NH_3 + HCl$$
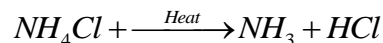
(v) Copper reacts with silver nitrate solution.

Sol:
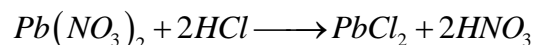
$$Cu + 2AgNO_3 \longrightarrow 2Ag + Cu(NO_3)_2$$
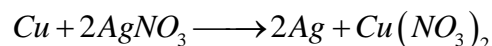
(e) Give one relevant observation for each of the following

(i) Action of dilute hydrogen chloride on lead nitrate solution.

Sol:

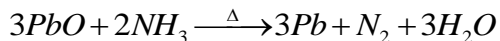A white precipitate of lead chloride $(PbCl_2)$ is obtained that is soluble in hot water but insoluble in cold water.

$$Pb(NO_3)_2 + 2HCl \longrightarrow PbCl_2 + 2HNO_3$$

(ii) **Reaction of ammonia with lead with heated yellow lead oxide**

Sol:

On passing ammonia through yellow lead oxide, it changes to silver white lead with evolution of N_2 gas

$$3PbO + 2NH_3 \xrightarrow{\Delta} 3Pb + N_2 + 3H_2O$$

(iii) **When ammonia hydroxide solution is added to a solution if Iron(III) chloride.**

Sol:

A reddish brown precipitate of ferric hydroxide is formed which is insoluble in axcess of NH_4OH.

$$FeCl_3 + 3NH_4OH \longrightarrow Fe(OH) \downarrow + 3NH_4Cl$$
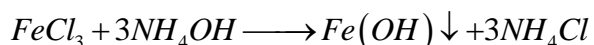
(iv) **Action of dilute sulphuric acid on barium chloride.**

Sol:

On action of dilute sulphuric acid with barium chloride solution, a thick white precipitate of barium sulphate which is insoluble in all mineral acids is formed. Hydrochloric acid is also obtained.

$$BaCl_2 + Dil.H_2SO_4 \longrightarrow BaSO_4 \downarrow + 2HCl$$
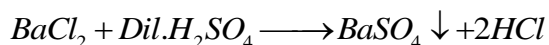
(v) **When acetic acid and ethyl alcohol reacts in the presence of sulphuric acid**

Sol:

Process of esterification takes place and ethyl acetate is formed.

$$CH_3COOH + C_2H_5OH \underset{\xleftarrow{\hspace{1cm}}}{\xrightarrow{H_2SO_4}} CH_3COOC_2H_5 + H_2O$$
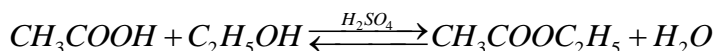
(f) Draw the structural formula for each of the following.

(i) **But-2-yne**

Sol:

$$\begin{array}{ccccc} H & & & H & \\ | & & & | & \\ H-C-C &\equiv& C-C-H \\ | & & & | & \\ H & & & H & \end{array}$$

(ii) **Propan-2-ol**

Sol:

$$\begin{array}{ccccccc} H & & OH & & H \\ | & & | & & | \\ H-C- & & C & -C-H \\ | & & | & & | \\ H & & H & & H \end{array}$$
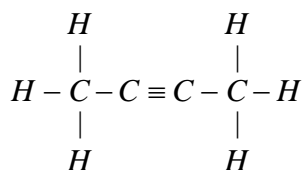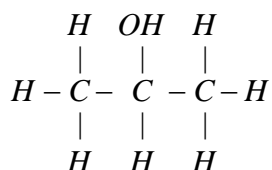
(g)

(1) Determine the number of molecules present in 2.2g of carbon dioxide.

Sol:

$\because$ 44g of CO_2 contains 6×10^{23}

$\therefore 22.2g$ of CO_2 will contains $= \dfrac{6 \times 10^{23}}{44} \times 2.2$

$= 3 \times 10^{22} \, molecules$

(2) Determine the number of moles of sulpher and oxygen atoms is present in one mole of each of H_2SO_4 and H_2SO_3.

Sol:

One mole of H_2SO_4 contains 1 mole of sulphur atoms and 4 moles of oxygen atoms.

One mole of H_2SO_3 contains 1 mole of sulphur atoms and 3 moles of oxygen atoms.

(h) Match the columns.

(1) A metal with atomic number 3 (a) **Boron**

(2) A metal with electronic configuration 2, 2. (b) **Lithium**

(3) An element which has highest electronegativity (c) **Beryllium**

(4) A metal with the valiancy 3 (d) **Fluorine**

(5) A noble gas element (e)**Neon**

Sol:

(1) Lithium

(2) Beryllium

(3) Fluorine

(4) Boron

(5) Neon

SECTION B

2.

(a) Arrange the following as per the instruction.

(I) Na, Mg, Al, Si, Cl (increasing order of non-metallic character)
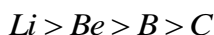
Sol:

$Na < Mg < Al < Si < Cl$

(II) Li, Be, C, O, F (decreasing order of metallic character)

Sol:

$Li > Be > C > O > F$

(III) Mg, Al, Na, Si (increasing order of atomic size)

Sol:

$Si < Al < Mg < Na$

(IV) Li, Be, B, C (decreasing order of atomic size)

Sol:

$$Li > Be > B > C$$

(b) Explain the following.

**(1) Pure nitric acid takes a yellowish brown color when exposed to light**

Sol:

Pure nitric acid gets decomposed in the presence of light to give a reddish brown NO_2 which dissolved in un-decomposed nitric acid to give yellowish brown colour.

(2) A nitrate which does not decompose o heating.

Sol:

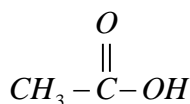Nitric oxide is oxidized by the oxygen of air to form coloured nitrogen dioxide.

$$4HNO_3 \xrightarrow[\text{or heat}]{Sunlight} 4NO_2 + 2H_2O + O_2$$
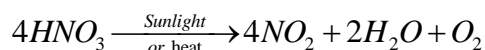
3.

(a) Write the structural formula and identify the functional group

(I) Ethanoic acid

Sol:

$$\begin{array}{c} O \\ \| \\ CH_3 - C - OH \end{array}$$

(II) Ethanol

Sol:

$$\begin{array}{c} O \\ \| \\ CH_3 - C - OH \end{array}$$
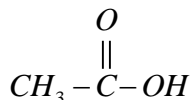
**(b) Determine which of the following will get preferentially discharged at cathode and anode, respectively?**

(I) Cu^{2+} OR Zn^{2+}

Sol:

As the electrolysis is carried out, weight of cathode increases as copper metal deposits on the surface of cathode and weight of anode decreases as copper atoms would be oxidized to copper ions in enters in the solution
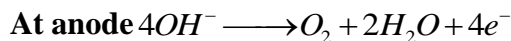
At cathode $Cu^{2+} + 2e^- \longrightarrow Cu$

At anode $Cu + 2e^- \longrightarrow Cu^{2+}$
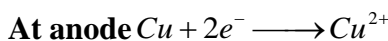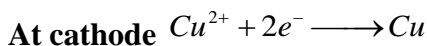
(II) OH^- SO_4^{2-}

Sol:

At cathode hydrogen gas is liberated while at anode oxygen gas is liberated.

At cathode $2H_2O + 2e^- \longrightarrow H_2 + 2OH^-$
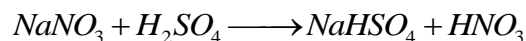
At anode $4OH^- \longrightarrow O_2 + 2H_2O + 4e^-$
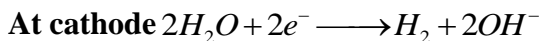
4.

(a) Give the balanced chemical equation for the following.

(1) Sodium nitrate and concentrated sulphuric acid.

Sol:

$NaNO_3 + H_2SO_4 \longrightarrow NaHSO_4 + HNO_3$

(2) Potassium Hydrogen Carbonate sulphuric acid.

Sol:

$2KHCO_3 + H_2SO_4 \longrightarrow K_2SO_4 + 2H_2O + CO_2 \uparrow$
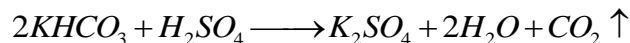
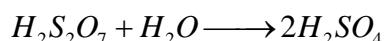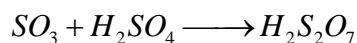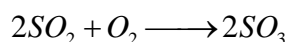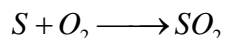**(b) Give the balanced chemical equations for the three chemical reactions that take place during the conversion of sulpher dioxide to sulphuric acid in the contact process.**

Sol:

The chemical equations are given below

$S + O_2 \longrightarrow SO_2$

$2SO_2 + O_2 \longrightarrow 2SO_3$

$SO_3 + H_2SO_4 \longrightarrow H_2S_2O_7$

$H_2S_2O_7 + H_2O \longrightarrow 2H_2SO_4$

5.

(a) Deduce the chemical formula (P=31, Cl=35.5). if an organic compound has the following percentage composition P=22.4%, 77.45%.

Sol:

Element	%	Atomic weight	Relative number of atoms	Simplest ratio
P	22.45	31	22.45+31 =0.72	$0.72 \div 0.72 = 1$
Cl	77.45	35.5	77.45+35.5 =2.18	$2.18 \div 0.72 = 3$

Hence, the formula of compound is PCL$_3$

(b) $AgNO_3 + NaCl \longrightarrow AgCl + NaNO_3$ **. How many gram of silver nitrate is required to precipitate 287g of silver chloride? (N=14, O=16, Cl=35.5, Ag=108)**

Sol:

Molar mass of $AgNO_3 = 108 + 14 + 48 = 170g$

Molar mass of $AgCl = 108 + 35.5 = 143.5g$

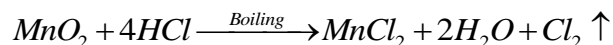143.5g $AgCl$ was precipitated by 173g of $AgNO_3$

287g of $AgCl$ will be precipitated by $\dfrac{170}{143.5} \times 287$

$340g$ $AgNO_3$

6.

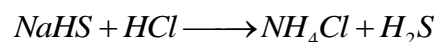**(a) Write the balanced chemical equations for the dilute hydrochloric acid with each of the following.**

(1) Manganese dioxide

Sol:

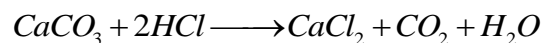$$MnO_2 + 4HCl \xrightarrow{\text{Boiling}} MnCl_2 + 2H_2O + Cl_2 \uparrow$$

(2) Sodium hydrogen sulphide

Sol:

$$NaHS + HCl \longrightarrow NH_4Cl + H_2S$$

(3) Ammonium hydroxide

Sol:

$$NH_4OH + HCl \longrightarrow NH_4Cl + H_2O$$

(4) Calcium carbonate

Sol:

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

(b) Write the name the following:

(1) A hydrocarbon used as an industrial fuel in chemical industries.

Sol:

Ethane

(2) The next higher homologue of ethyl alcohol.

Sol:

Propyl alcohol

(3) An acid used for removing ink stains.

Sol:

Oxalic acid

7.

(1) Write the name of the following

(a) Name the chief ore of aluminium

Sol:

Bauxite

(b) Name the process used to concentrate the aluminium ore.

Sol:

Baeyer's process

(c) Name a process used for concentration of zinc blende.

Sol:

Froth flotation

(2) Answer the following questions with reference to HIber's process:

(a) What are reactants

    Sol:

    Sources of reactants

    Nitrogen gas Obtained by the fractional distillation of liquid air.

    Hydrogen gas Obtained from water gas

(b) What is favorable condition?

    Sol:

    Temperature Optimum temperature is 450-500^{0}C

    Pressure above 200 atm

    Catalyst Finely divided iron

    Promoter Al_2O_3