**Model Question- 10**
**Chemistry XII**

**Time :3 hours**                                                                        **Full marks: 75**
**Group 'A'**

**Circle the best alternative to the following questions. [11 × 1 = 11]          Time: 25 mins**

1. A commercially available sample of $H_2SO_4$ is 20% by mass (density = 1.1 g/l). The molarity of the solution is

   a.  2.24 M                   b. 36 M                c. 3.6 M              d. 224 M

2. According to Ostwald's dilution law,

a. $\alpha = \sqrt{\dfrac{K_a}{C}}$        b. $\alpha^2 C = K_a$    c. $\sqrt{K.V}$      d. all

3. For the reaction, $N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2} O_2(g)$, the value of the rate of disappearance of $N_2O_5$ is given as $6.5 \times 10^{-2}$ mol $L^{-1}$ $s^{-1}$. The rate of formation of $NO_2$ is

    a. $3.25 \times 10^{-2}$ mol $L^{-1}s^{-1}$          b. $1.3 \times 10^{-1}$ mol $L^{-1}s^{-1}$

    c. $1.3 \times 10^{-2}$ mol $L^{-1}s^{-1}$          d. None of these

4. The cell notation for a reaction, $Pb + 2Ag^+ \longrightarrow Pb^{2+} + 2Ag$
       a. $Ag / Ag^+$ // $Pb^{2+} / Pb$          b. $Ag^{+/} Ag$ // $Pb$ / $Pb^{2+}$
       c. $Pb$ / $Pb^{2+}$ //$Ag+$ / $Ag$          d. $Pb^{2+} / Pb$ // $Ag$ / $Ag^+$

5. Transition metals are complexes act as

    a. Lewis acid          b. Lewis base      c. Neutral          d. none of the above

6. Impurities of sulphur, silicon and phosphorus can be removed from cast iron by adding
    a. carbon which reduces the impurities
    b. water which dissolves the impurities
    c. limestone which changes impurities into oxides and pass into slag
    d. iron oxide which reacts with impurities by forming slag

7. Which of the following does not yield alkyl halide

    a. Diethyl ether + RCOCl     b. Diethyl ether + $PCl_5$

    c. Diethyl ether + HI         d. Diethyl ether + $Cl_2$

8. In organometallic compound, carbon is linked with metal by

    a. ionic bond          b. Vander waal's force

    c. hydrogen bond         d. covalent bond

9. Which of the following is not primary raw materials for cement?
    a. Limestone          b. Sand          c. Clay          d. gypsum
10. Main fibrous raw materials used in paper industry is
    a. wood          b. grass          c. recycling paper   d. sugarcane bagasse
11. Which of the following is the smallest particle of an element that retains the properties of that element?
    a. Isotope          b. Atom          c. Radioisotope     d. None of these
**Attempt all the questions:**

## Group 'B'

**Short Answer Questions: [8×5=40]**

    1. a) What is redox titration. Which indicator do you use in the titration of oxalic acid and potassium permanganate?
            (1+1)
        b) 25 cc of $Na_2CO_3$ solution requires 28 cc of 1/10 N HCl for neutralization. Calculate the strength of $Na_2CO_3$ in terms of, normality, molarity, and g/l. [3]
                 OR
     The following data were obtained at 300K for the reaction   $2 M + N \rightarrow$ product

| Exp. No. | [M] (mol $L^{-1}$) | [N] (mol $L^{-1}$) | Rate of formation (mol $L^{-1}$) |
|----------|--------------------|--------------------|-----------------------------------|
| 1 | 0.10 | 0.20 | $3 \times 10^2$ |
| 2 | 0.30 | 0.40 | $3.6 \times 10^3$ |
| 3 | 0.30 | 0.80 | $1.44 \times 10^4$ |
| 4 | 0.30 | 1.60 | A |
| 5 | 0.60 | 0.80 | B |
| 6 | 0.10 | 0.40 | C |

Calculate:

   a. Overall order of reaction

   b. Calculate the value of A, B, and C                         [1+4]

2. What happens when blue vitriol is heated at 100 °C? Write the anodic and cathodic reactions occured during the rusting of iron according to the electrochemical theory of rusting. Define the terms: i. coordination number  ii. complex ion     [1+2+2]


3. What are volatile metals? How is steel manufactured by open hearth process? Explain with well labelled diagram.                         [1+4]

4. Define internal energy. The heat of formation of carbon dioxide, water and glucose are -395, -269 and -1169KJ respectively. Calculate the heat of combustion of glucose.                                      [1 + 4]

5. A primary alkyl halide (A) $C_4H_9Br$, reacted with alc. NaOH to give compound (B) which when reacted with HBr give (C) which is an isomer of (A). When A was heated with sodium, it gives compound (D) $C_8H_{18}$. (D) was different than the compound produced when n-butyl bromide was reacted with sodium metal. Identify compound (A). Write all concerned reactions.                       [5]

<div align="center">OR</div>

What happens when

   i. The product obtained by heating chlorobenzene with aqueous NaOH is allowed to reacts with $CO_2$ at about $125^0C$ under pressure?              [2]

   ii. The product obtained by treating chlorobenzene with cuprous cyanide in the presence of pyridine is hydrolyzed in the presence of dilute HCl.?        [2]

   iii. Chlorobenzene is sulphonated?                                [1]


6. An organic compound (A) $C_2H_6O$ reacts with sodium to form a compound (B) with evolution of $H_2$ gas and gives a yellow compound (C) when heated with $I_2$ and NaOH. When (A) is heated with conc. $H_2SO_4$ at $140^0C$ it gives a compound (D) $C_4H_{10}O$ which on treatment with excess of conc. HI gives (E). (D) is also obtained when (B) is heated with (E). Identify (A), (B), (C), (D) and (E) and write the reaction involved.

7. Phenol can be identified in the laboratory by $FeCl_3$ test, bromine water test and libermann test. Write reaction involve.

8. A. Distinguish between antibiotic and sulphadrugs. Define tranquilizer with example? [2+1]

   B. Write one application of radioisotope in each of following:

   a. Chemistry  b. Medicine [1+1]

## Group 'C'

**Long Answer Questions** [3 ×8=24]
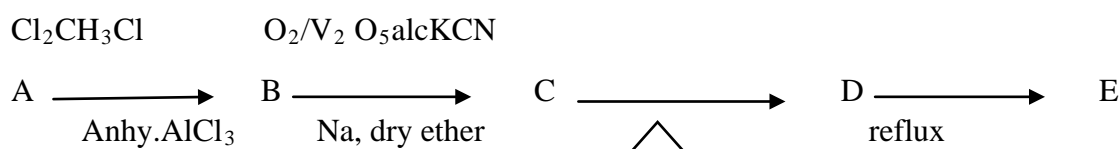
9. a) What is salt hydrolysis? Why is the aqueous solution of CuSO4 acidic? [1+2]

   b) Define the degree of ionization of solution.The equal volume of two solutions having pH =4 and pH =5 is mixed. Calculate the pH of the resulting mixture. (1+4)

   OR

   a). How is single electrode potential originated? [1]

   b). Predict which of the following reaction is spontaneous.
   Given, $Fe^{+1}/Fe^{+2} = 0.77 V$ , $Sn^{+4}/Sn^{+2} = +0.15V$
   i. $2Fe^{+2} + Sn^{+4} \rightarrow 2Fe^{+3} + Sn^{+2}$
   ii. $2Fe^{+3} + Sn^{+2} \rightarrow 2Fe^{+2} + Sn^{+4}$ [3]

   c) Define entropy. Predict in which entropy of the following increases or decreases

   a.Liquid crystallize into solid
   b. Temperature of crystallized solid is raised from 0K to 100K.
   c. $H_2(g) \rightarrow 2H(g)$ [1+3]

. 10. Identify the compounds A, B, C, D and E in the following sequence of reaction.

$Cl_2CH_3Cl$          $O_2/V_2O_5$alcKCN

A $\xrightarrow{\text{Anhy.AlCl}_3}$ B $\xrightarrow{\text{Na, dry ether}}$ C $\xrightarrow{\triangle}$ D $\xrightarrow{\text{reflux}}$ E

Compound (A) is an aromatic hydrocarbon. (5)

ii) Convert benzaldehyde into Cinnamic acid. (1.5)

iii) Give a chemical test to distinguish between benzaldehyde and formaldehyde. (1.5)

11. Organic compounds can be distinguished by the suitable chemical test.

   a. Suggest the suitable chemical test to distinguish ethanol from methanol.

   b. Write the suitable chemical test to distinguish phenol from ethanol

   c. Prepare the drug like aspirin which are used to relieve pain known as analgesics.

   d. Prepare primary alcohol by 'Oxo process' [2+2+2+2]

   OR

   a. Explain why ethylamine is stronger base than ammonia. [2]

b. Convert: aniline into p-sulphanilic acid [2]

c. How would you obtain ethanoic acid from

i. malonic acid    ii. 1,1,1-trichloroethane   iii  Sodium methoxide

iv. Ethanol [1+1+1+1]