SAMPLE PAPER-02 (unsolved)
CHEMISTRY (Theory)
Class – XII

Time allowed: 3 hours   Maximum Marks: 70

General Instructions:

a)   All the questions are compulsory.

b)   There are **26** questions in total.

c)   Questions **1** to **5** are very short answer type questions and carry **one** mark each.

d)   Questions **6** to **10** carry **two** marks each.

e)   Questions **11** to **22** carry **three** marks each.

f)   Questions **23** is value based question carrying **four** marks.

g)   Questions **24** to **26** carry **five** marks each.

h)   There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions in five marks each. You have to attempt only one of the choices in such questions.

i)   Use of calculators is **not** permitted. However, you may use log tables if necessary.

1.   Give IUPAC name of the organic compound: $(CH_3)_2\, C = CH - CO - CH_3$

2.   A compound contains two types of atoms – X and Y. It crystallises in a cubic lattice with atom X at the comers of the unit cell and atoms Y at the body centres. What is the simplest possible formula of this compound?

3.   Arrange the following according to increasing order of reactivity towards SN^2 displacement by giving reason.

      2 – bromopentane, 1 – bromopentone, 2-bromo-2-methylbutane, 1-bromo-3-methylbutane, 2-bromo-1-methylbutane.

4.   How will you distinguish propanal and propanol?

5.   The spin only magnetic moment of $[MnBr_4]^2$ is 5.9 BM. Predict the geometry of the complex ion.

6.

      a)   What are isotonic solutions?

      b)   Which type of deviation from ideal behavior is expected for a solution of acetone in ethanol? Why?

7.   Silver forms CCP lattice and X-ray studies of it crystal show that the edge length of its unit cell is 408.6pm. Calculate the density of Silver (At mass of silver is 107.94).

8.

   a) How can you convert an amide into an amine having one carbon less than the starting compound?

   b) Name the reaction.

9. Give reasons: The order of basicity of the following compounds in (i) gaseous phase and (ii) in aqueous solution $(CH_3)_3N$ $(CH_3)_2$ NH CH_3NH_2, NH_3

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

Account for the following:

(a) Aniline does not undergo Friedel Crafts alkylation.

(b) Although – NH_2 group is an ortho and para-directing group, nitration of aniline gives along with ortho & para-derivatives meta-derivation also.

10. A mixed oxide of iron and chromium $FeOCr_2O_3$ is fused with sodium carbonate in the presence of air to form a yellow coloured compound (A). On acidification the compound (A) forms an orange coloured compound (B) which strong oxidizing agent.

   i.   Identify the compound A and B.

   ii.   Write balanced chemical equation for each step.

11. An element X with an atomic mass of 60 g/mol has density of 6.23 g cm^{-3}.

   i.   If the edge length of its cubic unit cell is 400 pm, then identify the type of cubic unit cell.

   ii.   Calculate the radius of an atom of this element.

12. How average rate different from instantaneous rate?

13.

   a) If a current of 1.50A was passed through an electrolytic cell containing $AgNO_3$ solution with inert electrodes and the weight of Ag deposited was 1.50g, then how long did the current flow?

   b) Write the reactions taking place at the anode and cathode in the above cell.

   c) Give reaction taking place at the two electrodes if these are made up of Ag.

14.

   a) What happens when D-glucose is treated with (i) HI (ii) HNO_3

   b) Name the disease of hardening of cornea in the eye. Which vitamin deficiency causes this?

15. Account for the following:

   (a) Oxidizing power of the following anions of: $VO_2^{4}< Cr_2O_7^{2-}< MnO_4^{1-}$

   (b) Highest oxidation state of a transition metal is witnessed in its oxide or fluoride only

   (c) Zirconium and Hafnium exhibit similar properties.

16. Illustrate the splitting of degenerate d-orbital in a tetrahedral complex.

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

An optically active amino acid (A) can exist in three forms depending on the pH of the medium. If the molecular formula of (A) is $C_3H_7NO_2$ write

(i)   Structure of compound (A) in aqueous medium. What are such ions called?

(ii)   In which medium will the cationic form of compound (A) exist?

(iii)   On alkaline medium, towards which electrode will the compound (A) migrate in electric field?

17. Explain the following observation:

   a) Ferric hydroxide sol gets coagulated on addition of sodium chloride solution.

   b) Cottrell smoke precipitator is fitted at the mouth of the chimney used in factories.

   c) Physical adsorption is multilayered, while chemisorption is monolayered.

18.

   a) What is the role of Benzoyl peroxide in polymerization of ethane?

   b) What are LDPE and HDPE? How are they prepared?

19.

   a) Give IUPAC name and draw the structure of $Ni(CO)_4$.

   b) Why $(CoF_6)^{-1}$ form outer orbital complex while $(Co(CN)_6)^{3-}$ forms inner orbital complex?

   c) Draw structure of (i) Mer-triamminetrichlorocobalt(III) and (ii) Fac – triaquatrinitro – N – Cobalt.

20. Account for the following:

(i)   Among the halogens F_2 is the strongest oxidizing agent?

(ii)   Fluorine exhibits only – 1 oxidation state whereas other halogens exhibit higher positive oxidation states also.

(iii)   Acidity of oxo acid of chlorine is $HOCL < HOCIO < HOCIO_2 < HOCIO_3$

21.

   a) The decomposition of N_2O_5 (g) is a first order reaction with a rate constant of 5×10^{-4} sec^{-1} at 45^0C ie $2N_2O_5$ (g) $\rightarrow$ $4NO_2$ (g) + O_2 (g).

   b) If initial concentration of N_2O_5 is 0.25 M, calculate its concentration after 2 min and also calculate half-life for decomposition of N_2O_5(g).

   c)   For an elementary reaction $2A + B \rightarrow 3C$. The rate of appearance of C at time t is 1.3×10^{-4} mol l^{-1} s^{-1}. At this time, calculate:

   (i)   Rate of the reaction.

   (ii)   Rate of disappearance of A.

22. Account for:

   (a) Chlorine water has both oxidizing and bleaching properties

   (b) H_3PO_2 and H_3PO_3 act as good reducing agents while H_3PO_4 does not.

   (c) On addition of ozone gas to KI solution, violet vapours are obtained.

23. Dr. Vivek head of metallurgical department insisted for refining of copper by electrolytic method, instead of other convenient methods.

    (i)   What would be the anode, cathode and the electrolyte?

    (ii)   Why he preferred electrolytic refining method?

    (iii)   Give reactions taking place at anode and cathode.

24.

    a) An organic compound X ($C_3H_8O_2$) on treatment with Zn – Hg/HCl gets reduced to n- pentane. The compound X forms a dioxime with hydroxylamine and gives a positive iodoform test and Tollen's test. Identify the compound X and deduce its structure.

    b) Convert the following:

        i.   Ethyl benzene to benzene

        ii.   Acetaldehyde to butane -1, 3-diol

        iii.   Acetone to propene

                                Or

    a) An organic compound 'A' with molecular formula C_8H_8O gives positive DNP and iodoform tests. It does not reduce tollen's or fehling's reagent and does not decolourise water also. On oxidation with chromic acid (H_2CrO_4) it gives a carboxylic acid (B) with molecular formula $C_7H_6O_2$. Deduce the structure of A and B.

    b) Complete the following reactions by identifying A, B and C.

        i) $A + H_2 (g) \xrightarrow{\text{Pd/BaSO}_4} (CH_3)_2 \text{- CH - CHO}$

        ii) $CH_3 \text{- C } (CH_3)_2 \text{- CO - } CH_3 + NaOI \rightarrow B + C$
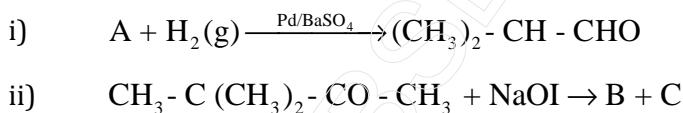
25. An unknown Aldehyde 'A' on reacting with alkali gives a β-hydroxy-aldehyde, which loses water to form an unsaturated aldehyde, 2-butenal. Another aldehyde B undergoes disproportionation reaction in the presence of conc. Alkali to form products C and D. C is an arylalcohol with the formula C_7H_8O.

    (i)   Identify A and B.

    (ii)   Write the sequence of reactions involved.

    (iii)   Name the product when B reacts with zinc amalgam and hydrochloric acid.

   Or

    a) An aldehyde X having molecular formula $C_{11}H_8O$ does not undergo self-aldol condensation, but gives benzaldehyde and two moles of Y on ozonolysis. The compound Y on oxidation with silver ions gives oxalic acid. Identify X and Y.

    b) A primary halide A having molecular formula C_4H_9Br react with hot alcoholic KOH to give compound B which react with HBr to form C, an isomer of A. When A react with Na metal, it gave a compound D having molecular formula C_8H_{18} which was different than the compound when n-

butyl bromide was reacted with Na. Give the structural formula of A and write equations for all the reactions.

26.

    a) Explain the term 'Molecularity of a reaction'.

    b) Express rate of the following reaction in terms of disappearance of hydrogen

$$3H_2(g) + N_2(g) \rightarrow 2 NH_3(g)$$
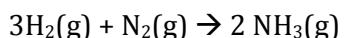
    c) Sucrose decomposes in acid solution into glucose and fructose according to first order rate law with half-life of 3.0 hours. What fraction of sample of sucrose will be left after 8.0 hours?

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

    a) Explain the term 'Effective collisions of molecules'

    b) Give one example of Pseudo first order reaction.

    c) If the rate of a reaction quadruples when the temperature changes from 293K to 313K. Calculate activation energy of the reaction assuming that it does not change with temperature.