SAMPLE PAPER-05 (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. Why a tetrahedral complex of the type $[MA_2B_2]$ does not show geometrical isomerism?

2. What is the Van't Hoff factor for a compound which undergoes tetramerization in organic solvents?

3. Why all other vitamins of group P should be supplied regularly in a diet except for vitamin B_{12}?

4. Give IUPAC name of the following compounds
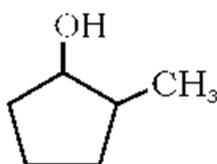
5. Why o-nitrophenol has lower boiling point and lower solubility in water than its p- isomer?

6. Write all the ionic reaction equation that occurs during rusting of iron. Suggest one method of controlling rusting of iron.

7. Calculate the mass of urea, NH_2CONH_2, required in making 2.5kg of 0.25 molal aqueous solutions.

8. What is the effect on rate, if
    a) Concentration of A is tripled.
    b) Concentration of A and B is doubled.

9. An element has body centered cubic structure with unit cell edge length of 288 pm. Density of the element is $7.2g/cm^3$. How many atoms of the element would weigh 208g?

Or

Aluminum crystallizes in cubic close packed structure. Its metallic radius is 125 pm.

a) What is the length of side of its unit cell?

b) How many unit cells would occur in 1.00 cm³ of aluminum?

10. Differentiate the following pair of polymers:

   (i)   Novolac and Bakelite based on their structure

   (ii)   Buna –s and Terylene based on their intermolecular forces of attraction

11. What is semiconductor? Describe the two main types of semiconductors and explain mechanism for their conduction?

12. Calculate the depression in freezing point of water when 20.0 g of $CH_3CH_2CHClCOOH$ is added to 500 g of water.

13. Write the cell formulation and calculate the standard cell potential of the galvance cell in which the following reaction takes place.

$$Fe^{2+}(aq) + Ag^+(aq) \rightarrow Fe^{3+}(aq) + Ag(s)$$

Calculate $\Delta_r G^0$ for the above reaction.

14.

   a) What happens when hydrogen sulphuric gas is passed through acidified potassium permanganate solution?

   b) What is the effect of increasing pH of $Cr_2O_7^{2-}$ solution? Write chemical reaction equations.

15. Classify synthetic detergents giving an example in each case.

Or

What are antihistamines? Give two examples. Explain how they act on the human body.

16.

   a. Write the mechanism involved in the reaction of an optically active compound having molecular formula $C_7H_{15}Br$ with aqueous KOH to give a racemic mixture of products.

   b. Why vinyl chloride is unreactive towards nucleophilic substitution reaction.

17.

   (i) Complete and name the following reactions:

   (a) $RNH_2 + CHCI_3 + 3KOH \rightarrow$

   (b) $RCONH_2 + Br_2 + 4NaOH \rightarrow$

   (ii) Give chemical tests to distinguish between compounds in each of the following pairs:

   (i)   Phenol and Benzyl alcohol

   (ii)   Butane -2-ol and 2-Methyl propan – 2 -ol

18.

   a) What type of plot do you expect for rate Vs time for a zero by flame, it continues to burn?

   b) Why coal does not burn by itself in air but-once initiated by flame, it continues to burn.

19.

   a) How does zinc help in the recovery of silver from its ore?

   b) If the value of $\Delta_f G^0$ for the formation of Cr_2O_3 is -540 Kj/ mol and that of Al_2O_3 is -827 KJ/mol, how is the reduction of Cr_2O_3 possible with Al?

20. How are the following conversions carried out?

   a. Ethylcyanide to ethanoic acid

   b. Butan-1-ol to butanoic acid

    c. Benzoic acid to m-bromobenzoic acid

21. Describe the following giving one example for each
    a. Detergents
    b. Food Preservatives.
    c. Antacids

22. Write the following name reaction with one suitable example.
    a. Gabriel Phthalimide Reaction
    b. Hofmann Bromamide Reaction

23. The term Green chemistry as adopted by the IUPAC working party on synthetic pathways and process in green chemistry is getting awareness even among the common people. My father who retired twenty years ago was working with a laboratory synthesizing aldehydes using.

Myself, working in the same Lab adopted this method but my father advised not to use this method and suggested another one.

Answer the following question based on the above passages

    a. Why did my father advise not to use given method?
    b. What was another method? Did you consider it to be environment friendly or economically?

24.
a) Write the cell reaction involved in recharging of lead storage battery.
b) Write the Nernst equation and emf of the following cells at 298K (E^0 Fe^{2+} / Fe = -0.44V) $Fe_{(s)}/Fe^{2+}$ (0.001M) // H^+ (IM)/H_2 (1bar) / $Pt_{(s)}$.
c) How much electricity in terms of Faraday is required to produce 40.0g of Al from molten Al_2O_3?

Or

a) In a chemistry lab, if a student stores $CuSO_4$ solution in a Zn vessel, what will happen? Why?
b) State two advantage of H_2-O_2 fuel cell over ordinary cell.
c) State Kohlrasusch's law.
d) In the button cells widely used in watches and other devices the following reaction takes place: $Zn_{(s)}$ +$Ag_2O_{(s)}$ + $H_2O_{(l)}$→ Zn^{2+} (aq) + 2$Ag_{(s)}$ + 2$OH^-_{(aq)}$
Determine $\Delta_r G^0$ and E^0 for the reaction.
Assume: $E^0_{Zn^{2+}/Zn}$ = -0.76 V and E^0 Ag^+ / Ag = 0.8 V.

25.

a) An organic compound with the molecular formula $C_9H_{10}O$ forms2,4-DNP derivative, reduces Tollens reagent and undergoes cannizzaro reaction. On Vigorous oxidation, it gives 1,2 benzene dicarboxylic acid. Identify the compound and give equation.
b) Bring out the following conversion:
    i) 4-Methyl acetophenone to Terephethalic acid
    ii) Zcylohexene to adipic acid

Or

a) Explain the following
   i. Etard reaction
   ii. Hell – Volhard Zelinsky reaction
   iii. Clemmensen reduction

b) Which acid of each pair shown here would you expect to be stronger?

   (i) CH_3COOH or $CH_2F\ OOOH$

   (ii) CH_2FCOOH or $CH2ClCOOH$

(i) $CH_2FCH_2CH_2COOH$ or CH_3CHFCH_2COOH
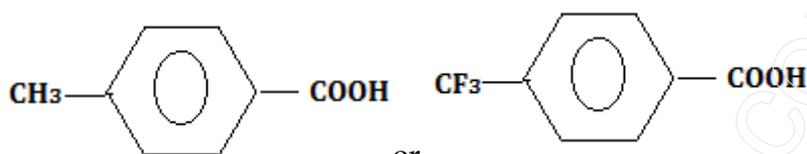
(ii)   or

26.

a) Calculate the equilibrium constant for the reaction:

$Cd^{2+}(aq) + Zn(s) \rightarrow Zn^{2+}(aq) + Cd(s)$ if $E^0\ Cd^{2+}/Cd = -0.403$ V and $E^0\ Zn^{2+}/Zn = -0.763$ V

b) When a current of 0.75 A is passed through a $CuSO_4$ solution for 25 min, 0.369 g of copper is deposited at the cathode. Calculate the atomic mass of copper.

c) Tarnished silver contains Ag_2S. Can this tarnish be removed by placing tarnished silverware in an aluminum pan containing an inert electrolytic solution such as NaCl, if the standard electrode potential for half reaction: $Ag_2S_{(s)} + 2e \rightarrow 2Ag(s) + S^{2-}$ is -0.71V and for $Al^{3+} + 3e \rightarrow Al(s)$ is -1.66V.

Or

a) Calculate the standard free energy change for the following reaction at 25^0 C

$Au(S) + Ca^{2+}(aq,1M) \rightarrow Au^{3+}(aq,1M) + Ca(S)$
$E^0\ Au^{3+}\ |Au = +1.50V$
$E^0\ Ca^{2+}\ |Ca -= -2.87$ V

Predict whether the reaction will be spontaneous or not at 25^0C. Which of the above two half cells will act as an oxidizing agent and which one will be a reducing agent?

a) The conductivity of 0.001M acetic acid is 4×10^{-5} S/ cm. Calculate the dissociation constant of acetic acid, if A_m^0 for the acetic acid is 390.5 S cm^{2+}/ mol .