SAMPLE QUESTION PAPER

BLUE PRINT

Time Allowed : 2 hours **Maximum Marks :** 35

S. No.	Chapter	Section-A (2 Marks)	Section-B (3 Marks)	Section-C (5 Marks)	Total
1.	Electrochemistry	1(2)	1(3)*	–	4(13)
2.	Chemical Kinetics	–	–	1(5)	
3.	Surface Chemistry	–	1(3)*	–	
4.	*d*- and *f*-Block Elements	–	1(3)	–	3(9)
5.	Coordination Compounds	–	2(6)#	–	
6.	Aldehydes, Ketones and Carboxylic Acids	1(2)	2(6)#	–	5(13)
7.	Amines	1(2)	1(3)	–	
	Total Questions	**3(6)**	**8(24)**	**1(5)**	**12(35)**

*It is a choice based question.
#Out of the two questions only one question is choice based.

CHEMISTRY

Time allowed : 2 hours *Maximum marks : 35*

General Instructions :

Read the following instructions carefully.

1. *There are 12 questions in this question paper with internal choice.*
2. *SECTION A - Q. No. 1 to 3 are very short answer questions carrying 2 marks each.*
3. *SECTION B - Q. No. 4 to 11 are short answer questions carrying 3 marks each.*
4. *SECTION C - Q. No. 12 is case based question carrying 5 marks.*
5. *All questions are compulsory.*
6. *Use of log tables and calculators is not allowed.*

SECTION - A

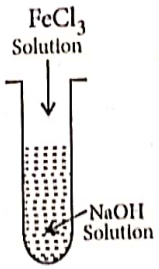
1. How are the following conversions carried out? (*any two*) :
   (i) Ethyl cyanide to ethanoic acid.
   (ii) Butan-1-ol to butanoic acid.
   (iii) Benzoic acid to *m*-bromobenzoic acid.

2. Two half-reactions of an electrochemical cell are given below :
   $MnO^-_{4(aq)} + 8H^+_{(aq)} + 5e^- \rightarrow Mn^{2+}_{(aq)} + 4H_2O_{(l)}$, $E^\circ = +1.51V$
   $Sn^{2+}_{(aq)} \rightarrow Sn^{4+}_{(aq)} + 2e^-$, $E^\circ = +0.15\ V$
   Construct the redox equation from the standard potential of the cell and predict if the reaction is reactant favoured or product favoured.

3. Arrange the following compounds as directed :
   (i) In increasing order of solubility in water : $(CH_3)_2NH$, CH_3NH_2, $C_6H_5NH_2$
   (ii) In increasing order of boiling point : $(C_2H_5)_2NH$, $(C_2H_5)_3N$, $C_2H_5NH_2$

SECTION - B

4. (i) A colloidal sol is prepared by the given method in figure. What is the charge on hydrated ferric oxide colloidal particles formed in the test tube? How is the sol represented?



   (ii) Give reasons for the following observations :
   (a) Leather gets hardened after tanning.
   (b) Lyophilic sol is more stable than lyophobic sol.

OR

Explain what is observed when :

(i) A beam of light is passed through a colloidal solution.

(ii) KCl solution is added to hydrated ferric oxide sol.

(iii) Electric current is passed through a sol.

5. Write the name, the structure and the magnetic behaviour of each one of the following complexes :

(i) $[Pt(NH_3)_2Cl(NO_2)]$

(ii) $[Co(NH_3)_4Cl_2]Cl$

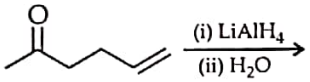
(iii) $Ni(CO)_4$

(At. nos. Co = 27, Ni = 28, Pt = 78)

6. (i) $CH_3CHO + HCHO \xrightarrow[\text{Heat}]{\text{dil. NaOH}} A \xrightarrow[H_3O^+]{HCN} B$

Write the structure of compound *B*.

(ii) What is the product of the following reaction?



7. (a) Electrolysis of aqueous $CuCl_2$ solution liberates Cl_2 at anode not O_2. Why?

(b) Suggest a method for the determination of limiting molar conductivity of weak electrolytes.

OR

When a certain conductance cell was filled with 0.1 M KCl, it has a resistance of 85 ohms at 25°C. When the same cell was filled with an aqueous solution of 0.052 M unknown electrolyte, the resistance was 96 ohms. Calculate the molar conductance of the electrolyte at this concentration.

[Specific conductance of 0.1 M KCl = 1.29×10^{-2} ohm^{-1} cm^{-1}]

8. An organic compound with molecular formula $C_5H_{10}O$ does not reduce Tollens' reagent but forms an addition compound with sodium hydrogen sulphite and gives a positive iodoform test. On vigorous oxidation, it gives ethanoic acid and propanoic acid. Identify the compound and write all chemical equations for the reactions.

OR

Arrange the following compounds in an increasing order of their property as indicated :

(i) Benzoic acid, 3,4-dinitrobenzoic acid, 4-methoxybenzoic acid (acid strength)

(ii) $CH_3CH_2CH(Br)COOH$, $CH_3CH(Br)CH_2COOH$, $(CH_3)_2CHCOOH$(acid strength)

9. Explain the following :

(i) Copper (I) ion is not stable in an aqueous solution.

(ii) With same (d^4) configuration Cr (II) is reducing whereas Mn (III) is oxidising.

(iii) Transition metals in general act as good catalysts.

10. (a) Write the chemical reaction of methyl amine with benzoyl chloride and write the IUPAC name of the product obtained.

(b) Arrange the following in the increasing order of their pK_b values : $C_6H_5NH_2$, NH_3, $C_2H_5NH_2$, $(C_2H_5)_2NH$

11. (i) Co^{2+} is easily oxidised to Co^{3+} in presence of a strong ligand. Why?
(ii) Write the coordination number and oxidation state of platinum in the complex $[Pt(en)_2Cl_2]$.

OR

(i) Write the IUPAC name of $[Cr(NH_3)_6][Co(CN)_6]$.
(ii) Give the formula of each of the following coordination entities :
(a) Co^{3+} ion is bound to one Cl^-, one NH_3 molecule and two bidentate ethylene diamine (*en*) molecules.
(b) Ni^{2+} ion is bound to two water molecules and two oxalate ions.
Write the name and magnetic behaviour of each of the above coordination entities.

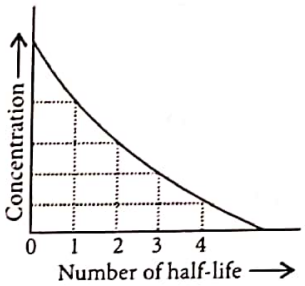
SECTION - C

12. Read the passage given below and answer the following questions :
The half-life of a reaction is the time required for the concentration of reactant to decrease by half, *i.e.*,

$$[A]_t = \frac{1}{2}[A]$$

For first order reaction,

$$t_{1/2} = \frac{0.693}{k}$$



this means $t_{1/2}$ is independent of initial concentration. Figure shows that typical variation of concentration of reactant exhibiting first order kinetics. It may be noted that though the major portion of the first order kinetics may be over in a finite time, but the reaction will never cease as the concentration of reactant will be zero only at infinite time.

(a) A first order reaction has a rate constant $k = 3.01 \times 10^{-3}\ s^{-1}$. How long will it take to decompose half of the reactant?
(b) The rate constant for a first order reaction is $7.0 \times 10^{-4}\ s^{-1}$. If initial concentration of reactant is 0.080 M, what is the half life of reaction?
(c) Draw the plot of $t_{1/2}$ *vs* initial concentration $[A]_0$ for a first order reaction.
(d) Is the half life period of a first oder reactions dependent on temperature?

OR

The rate of a first order reaction is 0.04 mol $L^{-1}s^{-1}$ after 10 minutes and 0.03 mol $L^{-1}s^{-1}$ after 20 minutes of initiation. What is the half-life of reaction?