

# 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)	–	5(13)
2.	Chemical Kinetics	1(2)	1(3)	–	
3.	Surface Chemistry	–	1(3)	–	
4.	<i>d</i> - and <i>f</i> -Block Elements	–	1(3)*	–	3(9)
5.	Coordination Compounds	–	2(6)#	–	
6.	Aldehydes, Ketones and Carboxylic Acids	1(2)	–	1(5)	4(13)
7.	Amines	–	2(6)*	–	
	<b>Total Questions</b>	<b>3(6)</b>	<b>8(24)</b>	<b>1(5)</b>	<b>12(35)</b>

\*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. Arrange the following in the increasing order of their reactivity in nucleophilic addition reactions (*any two*).
  - (a) Ethanal, Propanal, Propanone, Butanone
  - (b) Formaldehyde, Acetaldehyde, Benzaldehyde, Propanaldehyde
  - (c) Acetone, Benzophenone, Acetophenone, Formaldehyde
2. The standard reduction potential  $E^\circ$  for half reactions are
$$\text{Zn} \rightarrow \text{Zn}^{2+} + 2e^- ; E^\circ = +0.76 \text{ V}$$
$$\text{Fe} \rightarrow \text{Fe}^{2+} + 2e^- ; E^\circ = +0.41 \text{ V}$$
What is the EMF of the following cell reaction:
$$\text{Fe}^{2+} + \text{Zn} \rightarrow \text{Zn}^{2+} + \text{Fe}?$$
3. Define half-life of a reaction. Write the expression of half-life for
  - (a) zero order reaction and
  - (b) first order reaction.

## SECTION - B

4. Write the hybridisation and magnetic character of the following complexes :
  - (a)  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$
  - (b)  $[\text{Ni}(\text{CN})_4]^{2-}$[Atomic number : Fe = 26, Ni = 28]

OR

For the complex  $[\text{NiCl}_4]^{2-}$ , write

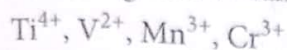
- (a) the IUPAC name
  - (b) the hybridization type
  - (c) the shape of the complex.
- (Atomic no. of Ni = 28)

5. Account the following :

- Why transition metals form large number of complex compounds?
- The lowest oxide of transition metal is basic whereas the highest oxide is amphoteric or acidic.
- Why  $E^\circ$  value for the  $Mn^{3+}/Mn^{2+}$  couple is highly positive (+1.57 V) as compared to  $Cr^{3+}/Cr^{2+}$ ?

OR

Following are the transition metal ions of 3d series :



(Atomic numbers : Ti = 22, V = 23, Mn = 25, Cr = 24)

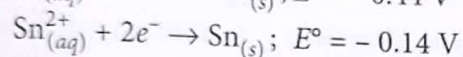
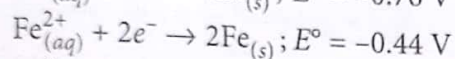
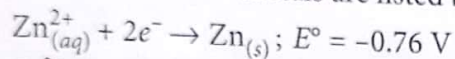
Answer the following :

- Which ion is most stable in aqueous solution and why?
  - Which ion is strong oxidising agent and why?
  - Which ion is colourless and why?
6. Account for the following :

(a) Why does Zn give  $H_2$  gas with  $H_2SO_4$  but not with  $HNO_3$ ?

(b) Why is fluorine the best oxidising agent?

(c)  $E^\circ$  values of three metals are listed below :



If iron is coated with zinc it does not get rusted even after cracks appear as compared to when iron coated with tin. Give reason.

7. (a) For the reaction  $N_2 + 3H_2 \rightarrow 2NH_3$ , how are the rate of reaction expressions inter-related  $\frac{d[H_2]}{dt}$  and  $\frac{d[NH_3]}{dt}$ ?

(b) Rate constant of two reactions are given below. Identify their order of reaction.

(i)  $k = 5.3 \times 10^{-2} \text{ L}^{-1} \text{ mol s}^{-1}$

(ii)  $k = 3.8 \times 10^{-4} \text{ s}^{-1}$

8. Account for following :

(a) What is the role of adsorption in froth floatation process used especially for concentration of sulphide ores?

(b) Define multimolecular colloids with examples.

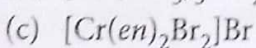
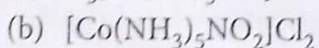
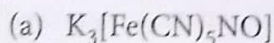
(c) What are the two processes involved in Bredig's arc method?

9. An aromatic compound 'A' on treatment with aqueous ammonia and heating forms compound 'B' which on heating with  $Br_2$  and KOH forms a compound 'C' of molecular formula  $C_6H_7N$ . Write the structures and IUPAC names of compounds A, B and C.

OR

Write the reactions of (a) aromatic and (b) aliphatic primary amines with nitrous acid.

10. Give the IUPAC Names of following complexes :



11. Arrange the following as indicated :

- $\text{CH}_3\text{NH}_2$ ,  $(\text{CH}_3)_2\text{NH}$ ,  $(\text{CH}_3)_3\text{N}$ ,  $\text{NH}_3$  (Decreasing order of basicity in aqueous state)
- Aniline, *p*-nitroaniline, *p*-toluidine (Increasing order of basicity)
- $\text{C}_6\text{H}_5\text{NH}_2$ ,  $\text{C}_6\text{H}_5\text{NHCH}_3$ ,  $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$  (Increasing order of basicity)

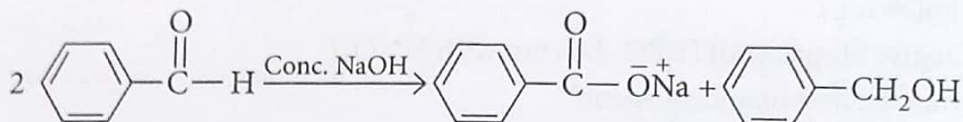
OR

- Given a method by which the activation effect of aniline can be reduced.
- The lone pair of  $\text{CH}_3\text{NH}_2$  is more available for donation than  $\text{C}_6\text{H}_5\text{NH}_2$ . Why?
- Aniline on nitration gives a significant amount of *m*-nitroaniline. Give reason.

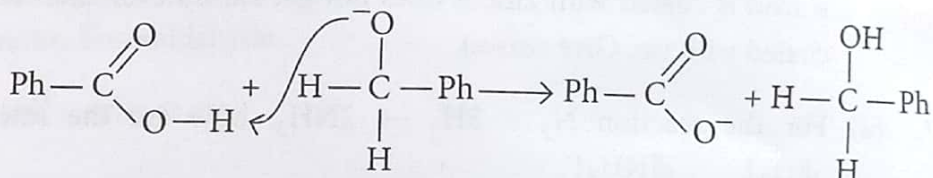
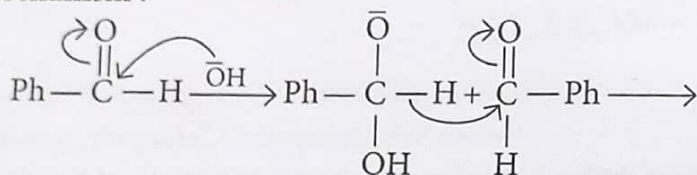
### SECTION C

12. Read the passage given below and answer the questions that follow.

When an aldehyde with no  $\alpha$ -hydrogen reacts with concentrated aqueous NaOH, half the aldehyde is converted to carboxylic acid salt and other half is converted to an alcohol. In other words, half of the reactant is oxidized and other half is reduced. This reaction is known as Cannizzaro reaction.



Mechanism :



- What does a mixture of benzaldehyde and formaldehyde produce on heating with aqueous NaOH?
- Out of benzaldehyde and acetaldehyde one gives Cannizzaro reaction and the other undergoes aldol condensation. Identify and give their respective reactions.
- For the Cannizzaro reaction,
 
$$2\text{PhCHO} \xrightarrow{\text{OH}^-} \text{PhCH}_2\text{OH} + \text{PhCO}_2^-$$
 Which is the slowest step?
- Does Cannizzaro reaction results in the formation of C — C bond?

OR

What are the Cannizzaro product of trichloroacetaldehyde?