



Class: ISC XII

Subject: Chemistry (862)
Paper 1 (Theory)

Mock Test

Maximum Marks: 70

Time Allowed: Three hours

*Candidates are allowed additional 15 minutes for only reading the paper.
They must NOT start writing during this time.*

This paper is divided into four sections – A, B, C and D.

Answer all questions.

Section A consists of one question having sub-parts of one mark each.

Section B consists of ten questions of two marks each.

Section C consists of seven questions of three marks each, and

Section D consists of three questions of five marks each.

*Internal choices have been provided in one question each in Section B,
Section C and Section D.*

*All working, including rough work, should be done on the same sheet as, and adjacent to the rest
of the answer.*

The intended marks for questions or parts of questions are given in brackets [].

Balanced equations must be given wherever possible and diagrams where they are helpful.

When solving numerical problems, all essential working must be shown.

In working out problems, use the following data:

$$\begin{aligned} \text{Gas constant } R &= 1.987 \text{ cal deg}^{-1} \text{ mol}^{-1} = 8.314 \text{ JK}^{-1} \text{ mol}^{-1} \\ &= 0.0821 \text{ dm}^3 \text{ atm K}^{-1} \text{ mol}^{-1} \end{aligned}$$

$$1 \text{ l atm} = 1 \text{ dm}^3 \text{ atm} = 101.3 \text{ J. } 1 \text{ Faraday} = 96500 \text{ coulombs.}$$

$$\text{Avogadro's number} = 6.023 \times 10^{23}.$$

Question 1

- (a) Fill in the blanks by choosing the appropriate word/words from those given in the brackets: [4×1]

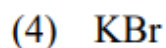
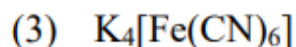
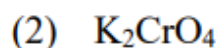
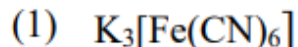
(iodoform, volume, mass, haloform, gram equivalent, chloroform, carbylamine, sp^3d^2 , high, coke, d^2sp^3 , low, gram mole, carbon monoxide)

- (i) Equivalent conductivity is the conducting power of all the ions furnished by one _____ of an electrolyte present in a definite _____ of the solution.
- (ii) Bleaching powder, on treatment with ethanol or acetone gives _____. This is an example of _____ reaction.
- (iii) Outer orbital complexes involve _____ hybridization and are _____ spin complexes.
- (iv) Zinc oxide is reduced by _____ at 1673K to form zinc and _____.

- (b) Select the correct alternative from the choices given: [4×1]

- (i) The packing efficiency of simple cubic structure, body centered cubic structure and face centered cubic structure respectively is:
- (1) 52.4%, 74%, 68%
- (2) 74%, 68%, 52.4%
- (3) 52.4%, 68%, 74%
- (4) 68%, 74%, 52.4%
- (ii) When acetone is treated with Grignard's reagent, followed by hydrolysis, the product formed is:
- (1) Secondary alcohol
- (2) Tertiary alcohol
- (3) Primary alcohol
- (4) Aldehyde

(iii) Which of the following electrolytes is least effective in causing flocculation of positively charged ferric hydroxide sol?



(iv) On heating an aliphatic primary amine with chloroform and alcoholic potassium hydroxide, the organic compound formed is an:

(1) Alkyl isocyanide

(2) Alkanol

(3) Alkanal

(4) Alkyl cyanide

(c)

Match the following:

[4×1]

(i) Phenol

(a) Hexane + heptane

(ii) EDTA

(b) Globular protein

(iii) Ideal solution

(c) Azo dye

(iv) Insulin

(d) Hexadentate ligand

(d)

[2×1]

- (i) **Assertion** : If a solution contains both H^+ and Na^+ ions, the H^+ ions are reduced first at cathode.

Reason : Cations with higher E° value are reduced first at cathode.

- (a) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion.
- (b) Both Assertion and Reason are true, but Reason is not the correct explanation for Assertion.
- (c) Assertion is true but Reason is false.
- (d) Assertion is false but Reason is true.
- (ii) **Assertion** : Addition of bromine water to 1-butene gives two optical isomers.

Reason : The product formed contains two asymmetric carbon atoms.

- (a) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion.
- (b) Both Assertion and Reason are true, but Reason is not the correct explanation for Assertion.
- (c) Assertion is true but Reason is false.
- (d) Assertion is false but Reason is true.

SECTION B – 20 MARKS

Question 2

[2]

Calculate the mass of ascorbic acid (molecular mass = 176 g/mol) that should be dissolved in 155g of acetic acid to cause a depression of freezing point by 1.15K. Assume that ascorbic acid does not dissociate or associate in the solution.

(K_f for acetic acid = 3.9 K kg/mol)

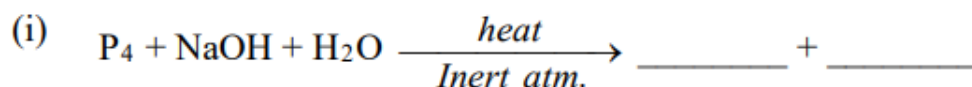
Question 3**[2]**

Give a reason for the following:

- (i) Cu^{+2} salts are paramagnetic while Cu^+ salts are diamagnetic.
- (ii) Mn^{+2} compounds are more stable than Fe^{+2} compounds.

Question 4**[2]**

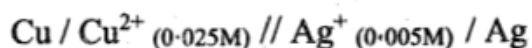
Complete and balance the following chemical equations:

**Question 5****[2]**

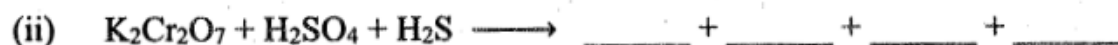
- (i) Write the chemical equation for the reaction of glucose with bromine water.
- (ii) Write the zwitter ion structure of glycine.

Question 6**[2]**

Calculate the emf of the following cell at 298K.

Given $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$, $E^\circ_{\text{Ag}^+/\text{Ag}} = 0.80\text{V}$,1 Faraday = 96500 C mol^{-1} **Question 7****[2]**

Complete and balance the following chemical equations:



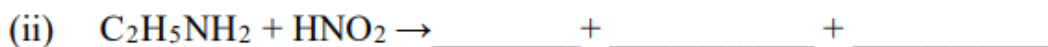
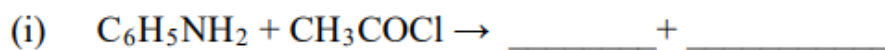
Question 8**[2]**

(a) State reasons for the following:

- (i) Ethylamine is soluble in water whereas aniline is insoluble in water.
- (ii) Aliphatic amines are stronger bases than aromatic amines.

OR

(b) Complete and balance the following equations:

**Question 9****[2]**

The osmotic pressure of blood at 37°C is 8.21 atm. How much glucose in grams should be used per litre of aqueous solution for an intravenous injection so that it is isotonic with blood? (Molecular wt of glucose = 180g/mol)

Question 10**[2]**

An aromatic carboxylic acid [A] which readily sublimes on heating, produces compound [B] on treatment with PCl_5 . Compound [B], when reduced in the presence of Pd catalyst over $BaSO_4$ poisoned by sulphur in xylene solution gives compound [C]. When compound [C] is condensed in the presence of alcoholic KCN, it gives compound [D].

(Molecular formula of compound [D] is $C_{14}H_{12}O_2$)

Identify the compounds [A], [B], [C] and [D].

Question 11**[2]**

State a reason for each of the following:

- (i) $La(OH)_3$ is more basic than $Lu(OH)_3$.
- (ii) Transition elements and their compounds act as catalyst.

SECTION C – 21 MARKS

Question 12

[3]

20% of a first order reaction is completed in five minutes. How much time will the 60% reaction take to complete? Calculate the half-life period ($t_{1/2}$) for the above reaction.

Question 13

[3]

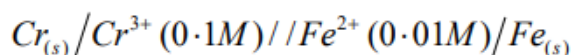
Write the balanced chemical equations for the following name reactions:

- (i) Sandmeyer's reaction
- (ii) Wurtz reaction
- (iii) Finkelstein reaction

Question 14

[3]

- (a) Calculate the emf and ΔG for the given cell at 25°C:



$$\text{Given: } E_{Cr^{3+}/Cr}^{\circ} = -0.74V, \quad E_{Fe^{2+}/Fe}^{\circ} = -0.44V$$

$$(1F = 96500 \text{ C, } R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1})$$

OR

- (b) Calculate the degree of dissociation (α) of acetic acid, if its molar conductivity (Λ_m) is 39.05 S cm² mol⁻¹.

$$(\text{Given } \lambda_{(H^+)}^{\circ} = 349.6 \text{ S cm}^2 \text{ mol}^{-1} \text{ and } \lambda_{(CH_3COO^-)}^{\circ} = 40.95 \text{ S cm}^2 \text{ mol}^{-1})$$

Question 15

[3]

A ketone A (C₄H₈O) which undergoes Iodoform reaction gives compound B on reduction. B on heating with conc. H₂SO₄ at 443 K gives a compound C which forms ozonide D. D on hydrolysis with Zn dust gives only E. Identify the compounds A to E. Write the Iodoform reaction with compound A.

Question 16**[3]**

Explain the following:

- (i) Transition metals and their compounds generally exhibit a paramagnetic behaviour.
- (ii) There is an increase in density of elements from titanium ($Z=22$) to copper ($Z = 29$) in the 3d series of transition elements.
- (iii) $K_2Cr_2O_7$ acts as a powerful oxidising agent in acidic medium.

Question 17**[3]**

How will you convert the following:

- (i) Chlorobenzene to biphenyl.
- (ii) Propene to 1- bromopropane.
- (iii) Chlorobenzene to aniline.

Question 18**[3]**

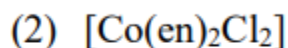
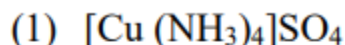
- (i) Give an example each of reducing sugar and a non-reducing sugar.
- (ii) What is denaturation of proteins?
- (iii) Give an example each of fat soluble vitamin and water soluble vitamin.

SECTION D – 15 MARKS**Question 19****[5]**

- (i) Write the chemical equations to illustrate the following name reactions:
 - (a) Cannizzaro's reaction
 - (b) HVZ reaction
 - (c) Aldol condensation
- (ii) How will the following be converted? (Give chemical equation)
 - (a) Acetaldehyde to acetone
 - (b) Formaldehyde to urotropine

Question 20**[5]**

(i) Write the IUPAC names of the following complexes:



(ii) With reference to the coordination complex ion $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ answer the following:

(at. no. of Fe = 26)

(1) Give the IUPAC name of the complex ion.

(2) What is the oxidation number of the central metal atom?

(3) How many unpaired electrons are there in the complex ion?

(4) State the type of hybridisation of the complex ion.

Question 21**[5]**

(i) The specific conductance of 2.5×10^{-4} M formic acid is $5.25 \times 10^{-5} \text{ ohm}^{-1}\text{cm}^{-1}$. Calculate its molar conductivity and degree of dissociation.

Given $\lambda^\circ_{(\text{H}^+)} = 349.5 \text{ ohm}^{-1}\text{cm}^2\text{mol}^{-1}$ and

$$\lambda^\circ_{(\text{HCOO}^-)} = 50.5 \text{ ohm}^{-1}\text{cm}^2\text{mol}^{-1}$$

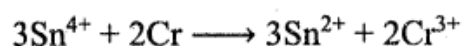
(ii) Calculate the time taken to deposit 1.27g of copper at cathode when a current of 2 amp. is passed through the solution of CuSO_4 .

(Atomic weight of Cu = 63.5 gmol^{-1})

OR

(i) The resistance of a conductivity cell with 0.1M KCl solution is 200 ohm. When the same cell is filled with 0.02M NaCl solution, the resistance is 1100 ohm. If the conductivity of 0.1M KCl solution is $0.0129 \text{ ohm}^{-1}\text{cm}^{-1}$, calculate the cell constant and molar conductivity of 0.02M NaCl solution.

(ii) The emf (E°_{cell}) of the following reaction is 0.89V:



Calculate the value of ΔG° for the reaction. Predict whether the above reaction will be spontaneous or not.