



ST.MARGARET SR.SEC. SCHOOL

MID TERM EXAMINATION 2023-24

CHEMISTRY – XII

Time: 3Hours

SAMPLE PAPER

M.M: 70

General Instructions:

Read the following instructions carefully.

- There are **33** questions in this question paper with internal choice.
- SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 5 very short answer questions carrying 2 marks each.
- SECTION C consists of 7 short answer questions carrying 3 marks each.
- SECTION D consists of 2 case- based questions carrying 4 marks each.
- SECTION E consists of 3 long answer questions carrying 5 marks each.

SECTION -A

- Low concentration of oxygen in the blood and tissues of people living at high altitude is due to _____.
(a) low temperature
(b) low atmospheric pressure
(c) high atmospheric pressure
(d) both low temperature and high atmospheric pressure
- When egg is placed in distilled water it swells because _____.
(a) it gains water due to osmosis.
(b) it loses water due to reverse osmosis.
(c) it gains water due to reverse osmosis.
(d) it loses water due to osmosis.
- A solution containing 10 g per dm^3 of urea (molar mass 60 g mol^{-1}) is isotonic with 5% solution of non-volatile solute, Molar mass of solute is
(a) 300 g mol^{-1}
(b) 350 g mol^{-1}
(c) 200 g mol^{-1}
(d) 250 g mol^{-1}
- Henry's law constant of oxygen is $1.4 \times 10^{-3} \text{ mol L}^{-1} \text{ atm}^{-1}$ at 298 K. How much oxygen will be dissolved in 1L at 298 K when its partial pressure is 0.5 atm?
(a) 1.4 g
(b) 3.2 g
(c) 22.4 mg
(d) 2.24 mg
- What is the correct order of reactivity of Dehydrohalogenation of alkyl halides?
(a) $1^\circ > 2^\circ > 3^\circ$
(b) $1^\circ < 2^\circ > 3^\circ$
(c) $3^\circ > 2^\circ > 1^\circ$
(d) $3^\circ > 1^\circ > 2^\circ$

6. IUPAC name of the compound $C_6H_5-CH(OH)-CH_3$ is
 (a) 1-phenylethanol (b) 2-Hydroxy-2-phenylethanol (c) 2-methylphenol (d) Benzylmethyl alcohol
7. Which of the following is most stable in aqueous solution?
 (a) Fe^{3+} (b) Cr^{3+} (c) Sc^{3+} (d) Ni^{2+}
8. $KMnO_4$ is not acidified by HCl instead of H_2SO_4 because
 (a) H_2SO_4 is stronger acid than HCl (b) HCl is oxidised to Cl_2 by $KMnO_4$ (c) H_2SO_4 is dibasic acid (d) rate is faster in presence of H_2SO_4
9. Which of the following element has highest enthalpy of atomisation?
 (a) Cr (b) Ti (c) Zn (d) Fe
10. Highest oxidation state of manganese in fluoride is +4 but highest oxidation state in oxides is +7 because _____ (a) fluorine is more electronegative than oxygen. (b) fluorine does not possess d-orbitals. (c) fluorine stabilises lower oxidation state. (d) in covalent compounds fluorine can form single bond only while oxygen forms double bond.
11. Which of the following ions show lowest spin only magnetic moment value?
 (a) Sc^{3+} (b) Cr^{2+} (c) Fe^{2+} (d) V^{3+}
12. Which of the following alkyl halides will undergo S_N1 reaction most readily?
 (a) $(CH_3)_3C-F$ (b) $(CH_3)_3C-Cl$ (c) $(CH_3)_3C-Br$ (d) $(CH_3)_3C-I$

In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (a) Assertion and reason both are correct and reason is correct explanation of assertion.
 (b) Assertion and reason both are wrong statements.
 (c) Assertion is correct but reason is wrong statement.
 (d) Assertion is wrong but reason is correct statement.
 (e) Assertion and reason both are correct statements but reason is not correct explanation of assertion.
13. Assertion: Presence of a nitro group at ortho or para position decreases the reactivity of haloarenes towards nucleophilic substitution.
 Reason: Nitro group, being an electron withdrawing group decreases the electron density over the benzene ring.
14. Assertion: Λ_m for weak electrolytes shows a sharp increase when the electrolytic solution is diluted. Reason: For weak electrolytes degree of dissociation increases with dilution of solution.
15. Assertion: For measuring resistance of an ionic solution an AC source is used. Reason: Concentration of ionic solution will change if DC source is used.

16. Assertion: Bond angle in alcohols is slightly less than the tetrahedral angle. Reason: There is a repulsion between the two lone pairs on oxygen.

SECTION -B

17. The molar conductivity of 1.5 M solution of an electrolyte is found to be $138.9 \text{ S cm}^2 \text{ mol}^{-1}$. Calculate the conductivity solution.
18. (a) Calculate $\Delta_r G^\circ$ for the reaction: $\text{Mg(s)} + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{Cu(s)}$
Given: $E^\circ_{\text{cell}} = + 2.71 \text{ V}$, $1 \text{ F} = 96500 \text{ C mol}^{-1}$
19. Name the reagents used in the following reactions:
(i) Oxidation of phenol to benzoquinone
(ii) Friedel–Crafts acylation of anisole
alcohol to ketone.
- ii) Butanone to Butanol
(iv) Oxidation of secondary
20. Indicate the types of isomerism exhibited by the following complexes and draw the structures for these isomers:
(i) $\text{K}[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]$
(ii) $[\text{CO}(\text{en})_3]\text{Cl}_3$
21. Find the freezing point of a solution containing 0.520 g of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) dissolved in 80.2 g of water. [Given: K_f for water = $1.86 \text{ K kg mol}^{-1}$]

SECTION-C

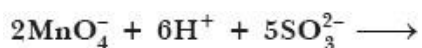
22. How the following conversions can be carried out:
(i) Phenol to aspirin
(ii) 2-Chlorobutane to But-2-ene
23. I) Out of Cu^{2+} and Cu^+ which is more stable and why ?
II) Electrode potential of Cu^{2+}/Cu is exceptionally positive. Why?
24. Calculate the amount of sodium chloride which must be added to one kilogram of water so that the freezing point of water is depressed by 3 K. [Given: $K_f = 1.86 \text{ K kg mol}^{-1}$, Atomic mass: Na = 23.0, Cl = 35.5]
25. (a) Write the mechanism of the dehydration of ethanol.
(b) Write the equation involved in the Kolbe's reaction.
- 26.** Write the formulas for the following coordination compounds:
(i) Tetraammine diaquacobalt(III) chloride
(ii) Potassium tetracyanonickelate(II)
(iii) Tris(ethane-1,2-diamine) chromium(III) chloride
27. Write the major products when phenol is treated with
i) Bromine water
($\text{HNO}_3 + \text{H}_2\text{SO}_4$)
ii) Acidified sodium dichromate
iii) conc

- 28 (a) How would you account for the following:

Transition metal show catalytic activities.

Transition metals form alloys.

Complete the following equation:



SECTION-D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. passage carefully and answer the questions that follow.

29. The properties of solutions which depend on the number of solute particles and are independent of their chemical identity are called colligative properties. These are lowering of vapour pressure, elevation of boiling point, depression of freezing point and osmotic pressure. Colligative properties have been used to determine the molar mass of solutes. Solutes which dissociate in solution exhibit molar mass lower than the actual molar mass and those which associate show higher molar mass than their actual values. Quantitatively, the extent to which a solute is dissociated or associated expressed by van't Hoff factor i . This factor has been defined as ratio of normal molar mass to experimentally determined molar mass or as the ratio of observed colligative property to the calculated colligative property.

Answer the following questions :

- Why osmotic pressure is a colligative property ?
- What is azeotrope ?
- A 5% solution by mass of sucrose ($M=342 \text{ g mol}^{-1}$) in water has a freezing point of 269.15K.

Calculate the freezing point of 5% glucose ($M=180 \text{ g mol}^{-1}$) in water if the freezing point of pure water is 273.15K.

30. The f-block consists of the two series, lanthanoids (the fourteen elements following lanthanum) and actinoids (the fourteen elements following actinium). Because lanthanum closely resembles the lanthanoids, it is usually included in any discussion of the lanthanoids for which the general symbol Ln is often used. Similarly, a discussion of the actinoids includes actinium besides the fourteen elements constituting the series. The lanthanoids resemble one another more closely than do the members of ordinary transition elements in any series. They have only one stable oxidation state and their chemistry provides an excellent opportunity to examine the effect of small changes in size and nuclear charge along a series of otherwise similar elements. The chemistry of the actinoids is, on the other hand, much more complicated.

Answer the following questions :

- Why Zr and Hf have almost identical atomic radii ?
- Why Eu^{2+} is strong reducing agent ?
- Why actinoids chemistry is complicated as compare to Lanthanoids? Give two reasons.

O

R

Write two differences between Lanthanoids and actinoids.

SECTION -E

31. (a) Define the following terms:

(i) Limiting molar conductivity (ii) Fuel cell

(b) Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100Ω . If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520Ω , calculate the conductivity and molar conductivity of 0.02 mol L^{-1} KCl solution. conductivity of 0.1 mol L^{-1} KCl solution is $1.29 \times 10^{-2} \Omega^{-1} \text{ cm}^{-1}$.

32.

a) Give the equations of the reaction for the preparation of phenol from aniline.

b) Predict the major product of acid catalysed dehydration of **2**-methylbutan-2-ol.

c) Write the mechanism of the reaction of HI with methoxymethane.

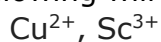
d) Write equations of the following reactions: (i) Nitration of anisole. (ii) Friedel-Craft's acetylation of anisole.

33. A) How would you account

for the following: (i) Cr^{2+} is strong reducing agent.

(ii) Zn is a non-transition element.

B) Predict which of the following will be coloured in aqueous solution? Give reason.



C) Write the ionic equations for oxidising reaction of KMnO_4 with:

(i) H_2S

(ii) KI solution

