



ST.MARGARET SR.SEC. SCHOOL

MID TERM EXAMINATION 2024-25

CHEMISTRY – XII

SAMPLE PAPER

M.M: 70

Time: 3Hours

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 colourless in aqueous solution?
 (a) Fe^{3+} (b) Cr^{3+} (c) Sc^{3+} (d) Ni^{2+}
8. Magnetic moment of 2.83 BM is given by which of the following ion?
 (a) Ti^{3+} (b) Ni^{2+} (c) Cr^{3+} (d) Mn^{2+}
9. Which of the following element has highest melting point?
 (a) Cr (b) Ti (c) Zn (d) Fe
10. Facial and meridional isomerism will be shown by
 (a) $[Co(NH_3)3Cl_3]$ (b) $[Co(NH_3)_4Cl_2] Cl$
 (c) $[Co(en)_3] Cl_3$ (d) $[Co(NH_3)_5Cl] Cl_2$
11. Correct increasing order of wavelength of absorption in visible region for complex of Co^{3+} is
 (a) $[Co(H_2O)_6]^{3+}$, $[Co(en)_3]^{3+}$, $[Co(NH_3)_6]^{3+}$
 (b) $[Co(H_2O)_6]^{3+}$, $[Co(NH_3)_6]^{3+}$, $[Co(en)_3]^{3+}$
 (c) $[Co(NH_3)_6]^{3+}$, $[Co(en)_3]^{3+}$, $[Co(H_2O)_6]^{3+}$
 (d) $[Co(en)_3]^{3+}$, $[Co(NH_3)_6]^{3+}$, $[Co(H_2O)_6]^{3+}$
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. Zinc rod is dipped in 0.1 M solution of ZnSO_4 . The salt is 95% dissociated at this dilution at 298 K. Calculate the electrode potential. Given $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$, $\log 1000 = 3.0000$, $\log 95 = 1.9777$
19. Name the reagents used in the following reactions:
- | | |
|--|-----------------------------|
| (i) Oxidation of phenol to benzoquinone | ii) Butanone to Butanol |
| (ii) Friedel-Crafts acylation of anisole
alcohol to ketone. | (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) Tetraamminediaquacobalt(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. How would you account for the following?
- (i) The oxidising power of oxoanions are in the order $\text{VO}_2^+ < \text{Cr}_2\text{O}_7^{2-} < \text{MnO}_4^-$.

- (ii) The third ionization enthalpy of manganese ($Z = 25$) is exceptionally high.
(iii) Cr^{2+} is a stronger reducing agent than Fe^{2+} .

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 :

- a. Why osmotic pressure is a colligative property ?
b. What is azeotrope ?
c. 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. When a chromite ore (A) is fused with sodium carbonate in free excess of air and the product is dissolved in water, a yellow solution of compound (B) is obtained. After treatment of this yellow solution with sulphuric acid, compound (C) can be crystallised from the solution. When compound (C) is treated with KCl, orange crystals of compound (D) crystallise out. Identify A to D and also explain the reactions. 4

SECTION -E

31. (a) What type of a battery is lead storage battery ? Write the anode and cathode reactions and the overall cell reaction occurring in the operation of a lead storage battery.
(b) Calculate the potential for half-cell containing $0.10 \text{ M K}_2\text{Cr}_2\text{O}_7(\text{aq})$, $0.20 \text{ M Cr}^{3+}(\text{aq})$ and $1.0 \times 10^{-4} \text{ M H}^+(\text{aq})$

The half-cell reaction is



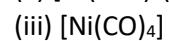
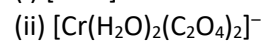
and the standard electrode potential is given as $E^\circ = 1.33 \text{ V}$. 5

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) Compare the following complexes with respect to their shape, magnetic behaviour and the hybrid orbitals involved:



(At. no.: Co = 27, Cr = 24, Ni = 28)

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