

# Sample Paper 11

Class XII 2023-24

## Chemistry

Time: 3 Hours

Max. Marks: 70

### General Instructions:

1. There are 33 questions in this question paper with internal choice.
  2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
  3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
  4. SECTION C consists of 7 short answer questions carrying 3 marks each.
  5. SECTION D consists of 2 case-based questions carrying 4 marks each.
  6. SECTION E consists of 3 long answer questions carrying 5 marks each.
  7. All questions are compulsory.
  8. Use of log tables and calculators is not allowed.
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## SECTION-A

**Directions (Q. Nos. 1-16) :** The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. Which of the following colligative property can provide molar mass of proteins (or polymers or colloids) with greatest precision?  
(a) Osmotic pressure  
(b) Elevation of boiling point  
(c) depression of freezing point  
(d) Relative lowering of vapour pressure
2. Correct formula of potassium ferrocyanide is  
(a)  $K_3[Fe(CN)_6]$   
(b)  $K_4[Fe(CN)_6]$   
(c)  $K_2[Fe(CN)_6]$   
(d)  $K[Fe(CN)_6]H_2O$
3. Williamson synthesis is used to prepare  
(a) Acetone  
(b) Diethyl ether  
(c) P.V.C.  
(d) Bakelite
4. Which of the following statement is incorrect?  
(a) Silver glance mainly contains silver sulphide.  
(b) Gold is found in native state.  
(c) Zinc is blende mainly contains zinc chloride.  
(d) Copper pyrites also contain  $Fe_2S_3$

5. A 5% solution of cane sugar (Mol. Wt = 342) is isotonic with 1% solution of substance X. The molecular weight of X is –
- (a) 68.4 (b) 34.2  
(c) 171.2 (d) 136.2
6. Which of the following possesses highest melting point?
- (a) Chlorobenzene (b) *m*-dichlorobenzene  
(c) *o*-dichlorobenzene (d) *p*-dichlorobenzene
7. Which of the following statements about primary amines is 'False'?
- (a) Alkyl amines are stronger bases than aryl amines.  
(b) Alkyl amines react with nitrous acid to produce alcohols  
(c) Aryl amines react with nitrous acid to produce phenols  
(d) Alkyl amines are stronger bases than ammonia.
8. In DNA, thymine is held by two hydrogen bonds with the base
- (a) Adenine (b) Cytosine  
(c) Thymine (d) Guanine
9. The standard electrode potentials of four elements A, B, C and D are –3.05, –1.66, –0.40 and +0.80. The highest chemical reactivity will be exhibited by:
- (a) A (b) B  
(c) C (d) D
10. The cell used in Apollo mission was
- (a) Leclanche cell (b) Daniell cell  
(c) Voltaic cell (d) Bacon cell
11. A catalyst can affect reversible reaction by
- (a) changing equilibrium constant  
(b) slowing forward reaction  
(c) attaining equilibrium in both directions  
(d) none of the above
12. Which of the following the strongest acid is
- (a)  $\text{CH}_3\text{COOH}$  (b)  $\text{CH}_2\text{ClCH}_2\text{COOH}$   
(c)  $\text{CH}_2\text{ClCOOH}$  (d)  $\text{CH}_3\text{CH}_2\text{COOH}$

**Directions (Q. Nos. 13-16) :** Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer :

- 13. Assertion :** Alkyl isocyanides in acidified water give alkyl form-amides.  
**Reason :** In isocyanides, carbon first acts as a nucleophile and then as an electrophile.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.  
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.  
(c) Assertion is correct but Reason is incorrect.  
(d) Both the Assertion and Reason are incorrect.
- 14. Assertion :** DNA has a double helix structure.  
**Reason :** The two strands in a DNA molecule are exactly similar.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.  
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.  
(c) Assertion is correct but Reason is incorrect.  
(d) Both the Assertion and Reason are incorrect.
- 15. Assertion :** Ethylenediaminetetraacetate ion forms an octahedral complex with the metal ion.  
**Reason :** It has six donor atoms which coordinate simulatneously to the metal ion.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.  
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.  
(c) Assertion is correct but Reason is incorrect.  
(d) Both the Assertion and Reason are incorrect.
- 16. Assertion :** Amines are basic in nature.  
**Reason :** Presence of lone pair of electrons on nitrogen atom.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.  
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.  
(c) Assertion is correct but Reason is incorrect.  
(d) Both the Assertion and Reason are incorrect.

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## SECTION-B

**Directions (Q. Nos. 17-21) :** This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. State and explain Faraday's second law of electrolysis.
18. Why do the transition elements exhibit higher enthalpies of atomisation ?
19. Give the similarities between  $>C=O$  and  $>C=C<$  bond.
20. Define molecularity of a reaction. Illustrate with an example.

**or**

Give the mechanism for the decomposition reaction of  $H_2O_2$  in alkaline medium catalysed by

21. Alcohols are comparatively more soluble in water than hydrocarbons of comparable molecular masses. Explain this fact.

## SECTION-C

**Directions (Q. Nos. 22-28) :** This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. What are Faraday's laws of electrolysis? Explain.
23. Give the name and chemical composition of important ores of Aluminium and Copper.
24. The atomic sizes of Fe, Co, Ni are nearly same. Explain with reason.
25. How are IUPAC and common names given to phenols?
26. How will you convert the following :
  - (a) Ethyl alcohol from ethyl amine.
  - (b) Ethyl amine from ethyl alcohol.
27. Define the terms :
  - (i) Biomolecules.
  - (ii) Reducing Sugars.

**or**

What is essentially the difference between  $\alpha$ -glucose? What is meant by pyranose structure of glucose?

28. How will you convert ethanal to the following compounds?
  - (i) Butane-1, 3-diol
  - (ii) But-2-enal
  - (iii) But-2-enoic acid

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## SECTION-D

**Directions (Q. Nos. 29-30) :** The following questions are case-based questions. Each question has an internal choice and carries 4 marks each. Read the passage carefully and answer the questions that follow.

- 29.** The study of the conductivity of electrolyte solutions is important for the development of electrochemical devices, for the characterisation of the dissociation equilibrium of weak electrolytes and for the fundamental understanding of charge transport by ions. The conductivity of electrolyte is measured for electrolyte solution with concentrations in the range of  $10^{-3}$  to  $10^{-1} \text{ mol L}^{-1}$  as solution in this range of concentrations can be easily prepared. The molar conductivity ( $A_m$ ) of strong electrolyte solutions can be nicely fit by Kohlrausch equation.

$$A_m = \Delta_m^\circ - K\sqrt{C} \quad \dots(1)$$

Where,  $\Delta_m^\circ$  is the molar conductivity at infinite dilution and  $C$  is the concentration of the solution.  $K$  is an empirical proportionality constant to be obtained from the experiment. The molar conductivity of weak electrolytes, on the other hand, is dependent on the degree of dissociation of the electrolyte. At the limit of very dilute solution, the Ostwald dilution law is expected to be followed,

$$\frac{1}{\Delta_m^\circ} = \frac{1}{\Delta_m^\circ} + \frac{\Delta_m^\circ}{(\Delta_m^\circ)^2} \frac{C_A}{K_d} \quad \dots(2)$$

Where,  $C_A$  is the analytical concentration of the electrolyte and  $K_d$  is dissociation constant. The molar conductivity at infinite dilution can be decomposed into the contributions of each ion.

$$\Delta_m^\circ = V_+ \lambda_+^\circ + V_- \lambda_-^\circ \quad \dots(3)$$

Where,  $\lambda_+$  and  $\lambda_-$  are the ionic conductivities of positive and negative ions, respectively and  $V_+$  and  $V_-$  are their stoichiometric coefficients in the salt molecular formula.

Answer the following questions :

- Give reason why conductivity of  $\text{CH}_3\text{COOH}$  decreases on dilution.
- The value of  $\Delta_m^\circ$  of  $\text{Al}_2(\text{SO}_4)_3$  is  $858 \text{ S cm}^2 \text{ mol}^{-1}$ , while  $\lambda^\circ \text{SO}_4^{2-}$  is  $160 \text{ S cm}^2 \text{ mol}^{-1}$  calculate the limiting ionic conductivity of  $\text{Al}^{3+}$ .
- Calculate  $\Delta_m^\circ$  for acetic acid.

Given that :

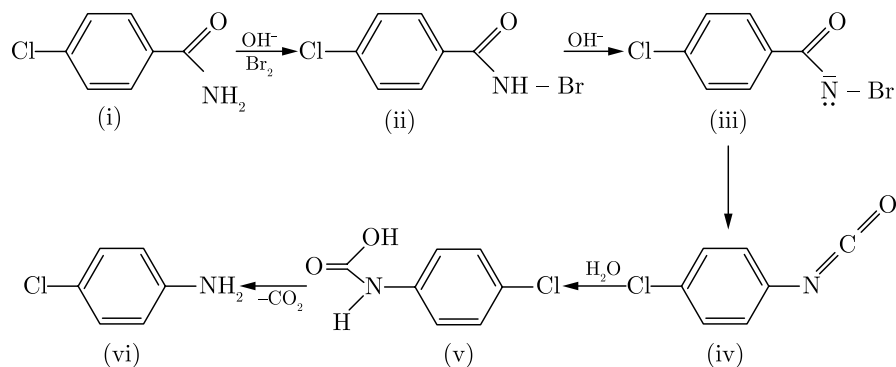
$$\begin{aligned} \Delta_m^\circ(\text{HCl}) &= 426 \text{ S cm}^2 \text{ mol}^{-1} \\ \Delta_m^\circ(\text{NaCl}) &= 126 \text{ S cm}^2 \text{ mol}^{-1} \\ \Delta_m^\circ(\text{CH}_3\text{COONa}) &= 91 \text{ S cm}^2 \text{ mol}^{-1} \end{aligned}$$

**or**

- Calculate the degree of dissociation of acetic acid at 298 K, given that :

$$\begin{aligned} \Delta_m(\text{CH}_3\text{COOH}) &= 11.7 \text{ S cm}^2 \text{ mol}^{-1} \\ \Delta_m(\text{CH}_3\text{COO}^-) &= 49.9 \text{ S cm}^2 \text{ mol}^{-1} \\ \Delta_m^\circ(\text{H}^+) &= 349.1 \text{ S cm}^2 \text{ mol}^{-1} \end{aligned}$$

30.  $R\text{CONH}_2$  is converted into  $R\text{NH}_2$  by means of Hoffmann bromamide degradation. During the reaction amide is treated with  $\text{Br}_2$  and alkali to get amine. This reaction is used to descend the series in which carbon atom is removed as carbonate ion ( $\text{CO}_3^{2-}$ ). Hoffmann bromide degradation reaction can be written as :



Answer the following questions :

- (a) Why cannot primary aromatic amines be prepared by Gabriel phthalimide synthesis?
- (b) Write the chemical equation involved in the following reaction : Hofmann bromamide degradation reaction
- (c) Write the structures of  $A$ ,  $B$  and  $C$  in the following :
- (i)  $\text{C}_6\text{H}_5-\text{CONH}_2 \xrightarrow{\text{Br}_2/\text{aq. KOH}} A \xrightarrow[0-5^\circ\text{C}]{\text{NaNO}_2+\text{HCl}} B \xrightarrow{\text{KI}} C$
- or**
- (d) An aromatic compound ' $A$ ' on treatment with aqueous ammonia and heating forms compound ' $B$ ' which on heating with  $\text{Br}_2$  and  $\text{KOH}$  forms a compound ' $C$ ' of molecular formula  $\text{C}_6\text{H}_7\text{N}$ . Write the structures and IUPAC names of compounds  $A$ ,  $B$  and  $C$ .

## SECTION-E

**Directions (Q. Nos. 31-33) :** The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

31. Write various methods of preparation of alcohol.
32. (a) What do you mean by the term 'Depression of freezing point'?
- (b) State Raoult's Law of depression of freezing point. How is it useful in determining the molecular weight of non-volatile and non-electrolyte solute?
- or**
- (a) What do you mean by relative lowering of vapour pressure?
- (b) The relative lowering of vapour pressure of 1% solution of Aniline in Ether was 0.007. Calculate the molecular weight of Aniline.
33. What are haloalkanes and haloarenes ? Give their classification.

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