

BUDHA DAL PUBLIC SCHOOL, PATIALA
Pre Board Examination (13 January 2025)

Class XII (Science)
Subject - Chemistry
(Set - B)

M.M. 70

Time: 3hrs.

General Instructions:

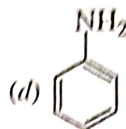
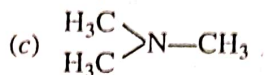
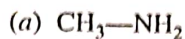
1. There are 33 questions in this question paper with internal choice.
2. Section A consists of 16 multiple-choice questions carrying 1 mark each.
3. Section B consists of 5 short answer questions carrying 2 marks each.
4. Section C consists of 7 short answer questions carrying 3 marks each.
5. Section 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.

SECTION-A

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. Lower molecular mass of alcohols are:
(a) miscible in limited amount of water.
(b) miscible in excess of water.
(c) miscible in water in all proportions.
(d) immiscible in water.
2. Major product obtained on reaction of 3-Phenyl propene with HBr in presence of organic peroxide will be
(a) 3-Phenyl-1-bromopropane
(b) 1-Phenyl-3-bromopropane
(c) 1-Phenyl-2-bromopropane
(d) 3-Phenyl-2-bromopropane
3. Transition elements show magnetic moment due to spin and orbital motion of electrons. Which of the following metallic ions have almost same spin only magnetic moment?
(i) Co^{2+}
(ii) Cr^{2+}
(iii) Mn^{2+}
(iv) Cr^{3+}
(a) (i) and (ii)
(b) (ii) and (iii)
(c) (i) and (iv)
(d) (iii) and (iv)
4. In the reaction, $\text{A} \longrightarrow \text{B}$, the rate of reaction increases two times on increasing the concentration of A four times, the order of reaction is
(a) 2
(b) 0
(c) $\frac{1}{2}$
(d) 3
5. Which of the following relationship is correct for Λ_m and Λ_m^0 for strong electrolytes?
(a) $\Lambda_m = \Lambda_m^0 + A\sqrt{C}$
(b) $\Lambda_m = \Lambda_m^0 \times \sqrt{C}$
(c) $\Lambda_m = \Lambda_m^0 - \sqrt{C}$
(d) $\Lambda_m = \Lambda_m^0 - A\sqrt{C}$
6. Identify the order of reaction, if $k = 3 \times 10^{-4} \text{ s}^{-1}$
(a) First order
(b) Pseudo first order
(c) Second order
(d) Third order

7. The most reactive amine towards dilute hydrochloric acid is _____



8. The most common and stable oxidation state of a Lanthanoid is:

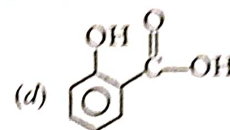
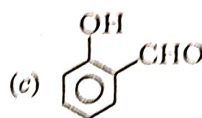
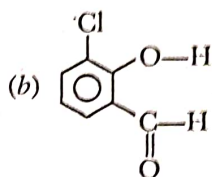
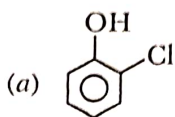
(a) + 2

(b) + 3

(c) + 4

(d) + 6

9. Reaction of phenol with CCl_4 and NaOH followed by hydrolysis is likely to give



10. A carbonyl compound react with HCN to form a cyanohydrin which on hydrolysis forms a racemic mixture of α -hydroxy acids. The carbonyl compound is

(a) acetone

(b) diethyl ketone

(c) acetaldehyde

(d) formaldehyde

11. An α -helix is a structural feature of:

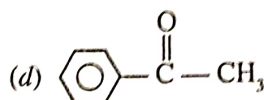
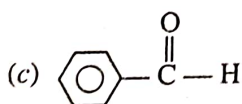
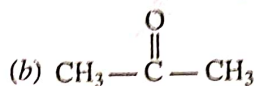
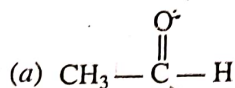
(a) Sucrose

(b) Starch

(c) Polypeptides

(d) Nucleotides

12. Which of the following compounds is most reactive towards nucleophilic addition reactions?



In these questions (Q. No. 13 to 16), two statements are given – one labelled as Assertion (A) and the other labelled Reason (R). Select the most appropriate answer from the options given below:

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

13. Assertion (A) : Treatment of anisole with HI at 373 K gives phenol and methyl iodide.

Reason (R) : Due to resonance $\text{O—C}_6\text{H}_5$ bond is stronger than O—CH_3 bond.

14. Assertion (A) : D (+)-Glucose is dextrorotatory in nature.

Reason (R) : 'D' represents its dextrorotatory nature.

15. Assertion (A) : The molecularity of the reaction $\text{H}_2 + \text{Br}_2 \longrightarrow 2\text{HBr}$ appears to be 2.
Reason (R) : Two molecules of the reactants are involved in the given elementary reaction.
16. Assertion (A) : Acylation of amines gives a monosubstituted product whereas alkylation of amines gives polysubstituted product.
Reason (R) : Acyl group sterically hinders the approach of further acyl groups.

SECTION-B

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. The rate constant for a first order reaction is 60 s^{-1} . How much time will it take to reduce the initial concentration of the reactant to $\frac{1}{10}$ th of its initial value?
18. Differentiate between globular and fibrous proteins.

OR

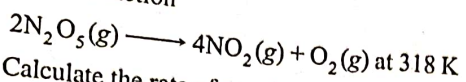
- (a) Name the linkage that hold together the amino acid molecules in a protein.
(b) Name the unit formed by attachment of nucleoside to phosphoric acid at 5' position of sugar moiety.
19. What will be the product formed when chlorobenzene reacts with magnesium in presence of dry ether? Give equation also.
20. State Henry's law. Calculate the solubility of CO_2 in water at 298 K under 760 mm Hg.
(K_H for CO_2 in water at 298 K is $1.25 \times 10^5 \text{ mm Hg}$)
21. Write the major product(s) in the following:
(a) $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_2-\text{CN} \xrightarrow[\text{(ii) } \text{H}_3\text{O}^+]{\text{(i) DIBAL-H}}$
(b) $\text{CH}_3-\text{CH}_2-\text{OH} \xrightarrow{\text{CrO}_3}$

SECTION-C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. Convert the following:
(a) Phenol to *o*-hydroxybenzaldehyde. (b) Methanal to ethanol.
(c) Phenol to phenyl ethanoate.
23. (a) Write the hybridisation type and Shape of the complex $[\text{Fe}(\text{CN})_6]^{3-}$.
(b) Calculate the spin only magnetic moment of $[\text{CoF}_6]^{3-}$ ion.
24. (a) (i) What should be the signs (positive/negative) for E_{Cell}° and ΔG° for a spontaneous redox reaction occurring under standard conditions?
(ii) State Faraday's first law of electrolysis.
(b) Calculate the emf of the following cell at 298 K:
 $\text{Fe(s)} | \text{Fe}^{2+}(0.01\text{M}) || \text{H}^+(1\text{M}) | \text{H}_2(\text{g}) (1 \text{ bar}), \text{Pt(s)}$
Given: $E_{\text{Cell}}^\circ = 0.44 \text{ V}$.

25. (a) For the reaction

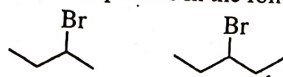


Calculate the rate of reaction if rate of disappearance of $\text{N}_2\text{O}_5(\text{g})$ is $1.4 \times 10^{-3} \text{ ms}^{-1}$.

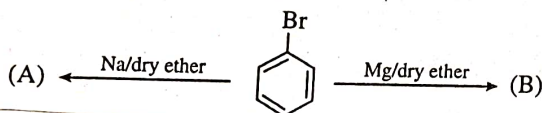
- (b) For a first order reaction derive the relationship $t_{99\%} = 2t_{90\%}$
26. Give reasons:
- (a) Grignard reagents should be prepared under anhydrous conditions?
 - (b) Alkyl halides, though polar, are immiscible with water?
 - (c) $\text{S}_{\text{N}}1$ reactions are accompanied by racemisation in optically active alkyl halides. Why?

OR

- (a) Write the structure of major alkene formed by β -elimination of 2, 2, 3-trimethyl-3-bromopentane with sodium ethoxide in ethanol.
- (b) Which one of the compounds in the following pairs is chiral?



- (c) Identify (A) and (B) in the following:



27. (a) Arrange the following compounds in increasing order of their reactivity in nucleophilic addition reactions: ethanal, propanal, propanone, butanone.
- (b) Which of the following compounds would undergo Cannizzaro reaction: Benzaldehyde, Cyclohexanone, 2-Methylpentanal.
- (c) Give a simple chemical test to distinguish between Pentan-2-one and Pentan-3-one

28. Give reasons for the following observations:

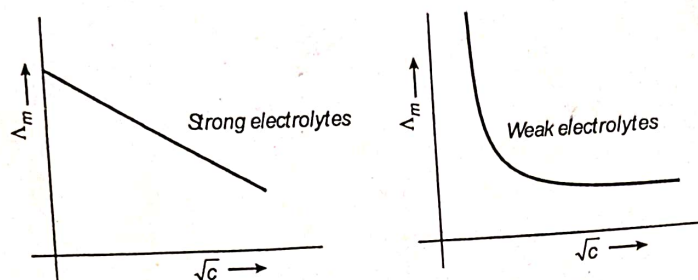
- (a) Penta-acetate of glucose does not react with hydroxylamine.
- (b) Amino acids behave like salts.
- (c) Water soluble vitamins must be taken regularly in diet.

SECTION-D

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

29. The conductivity or specific conductivity of an electrolytic solution varies with the concentration of the solutions of different electrolytes. For comparing the conductances of the solutions of different electrolytes, it is essential that the solutions should have equal volumes and they must contain definite amount of the electrolytes which give ions carrying the same total charge. The conducting power of an electrolytic solution can be expressed in terms of equivalent conductance and molar conductance. The equivalent conductance of a solution does not vary linearly with concentration and it is related

with specific conductance. The effect of equivalent conductance can be studied by plotting values against the square root of the concentration. Following two figures show the behaviour of strong and weak electrolytes with change of concentration.



Answer the following questions:

- (a) As seen from the graph the value of limiting molar conductivity cannot be obtained graphically. How can this value be obtained?

- (b) What is the effect of decreasing concentration on the molar conductivity of a weak electrolyte?

OR

Define specific conductance or conductivity.

- (c) Write the relationship between specific conductance and equivalent conductance?

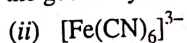
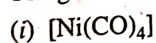
SECTION-D

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

29. Coordination compounds are widely present in the minerals, plant and animal worlds and are known to play many important functions in the area of analytical chemistry, metallurgy, biological systems and medicine. Alfred Werner's theory postulated the use of two types of linkages (primary and secondary), by a metal atom/ion in a coordination compound. He predicted the geometrical shapes of a large number of coordination entities using the property of isomerism. The Valence Bond Theory (VBT) explains the formation, magnetic behaviour and geometrical shapes of coordination compounds. It, however, fails to describe the optical properties of these compounds. The Crystal Field Theory (CFT) explains the effect of different crystal fields (provided by the ligands taken as point charges) on the degeneracy of *d*-orbital energies of the central metal atom/ion.

Answer the following questions:

- (a) Using Valence Bond Theory, predict the geometry and magnetic nature of



[Atomic number: Ni = 28, Fe = 26]

- (b) When a coordination compound $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ is mixed with AgNO_3 solution, 2 moles of AgCl are precipitated per mole of the compound. Write the structural formula of the complex and secondary valency for Nickel ion.

OR

- (b) Write IUPAC name of the ionisation isomer of $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Cl}$.

- (c) Give reasons low spin tetrahedral complexes are not formed.

SECTION-E

The following questions are long answer types and carry 5 marks each. All questions have an internal choice.

31. (a) Observed and calculated values for the standard electrode potentials of elements from Ti to Zn in the first reactivity series are depicted in figure (1):

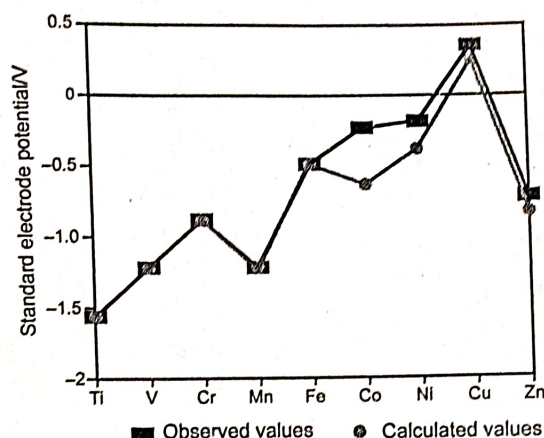


Figure 1 (Source: NCERT)

Explain the following observations:

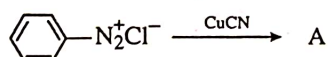
- The general trend towards less negative E° values across the series
 - The unique behaviour of Copper
 - More negative E° values of Mn and Zn
- (b) Give reasons for the following:
- Transition elements act as catalysts.
 - It is difficult to obtain oxidation state greater than two for Copper.

OR

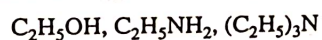
- (a) Account for the following:
- E° value for $\text{Mn}^{3+}/\text{Mn}^{2+}$ couple is much more positive than that for $\text{Cr}^{3+}/\text{Cr}^{2+}$.
 - Sc^{3+} is colourless whereas Ti^{3+} is coloured in an aqueous solution.
 - Actinoids show wide range of oxidation states.
- (b) Write the chemical equations for the preparation of KMnO_4 from MnO_2 .
32. (a) Why is boiling point of 1M NaCl solution more than that of 1M glucose solution?
- (b) A non-volatile solute 'X' (molar mass = 50g mol^{-1}) when dissolved in 78 g of benzene reduced its vapour pressure to 90%. Calculate the mass of X dissolved in the solution.
- (c) Calculate the boiling point elevation for a solution prepared by adding 10g of MgCl_2 to 200g of water assuming MgCl_2 is completely dissociated.
(K_b for water = $0.512\text{ K kg mol}^{-1}$, Molar mass $\text{MgCl}_2 = 95\text{g mol}^{-1}$)

OR

- (a) Define the following terms:
- (i) Azeotrope
 - (ii) Osmotic pressure
 - (iii) Colligative properties
- (b) Calculate the molarity of 9.8% (w/w) solution of H_2SO_4 if the density of the solution is 1.02 g mL^{-1} . (Molar mass of $\text{H}_2\text{SO}_4 = 98 \text{ g mol}^{-1}$)
33. (a) Give reason, why
- Aniline on nitration gives good amount of *m*-nitroaniline, though $-\text{NH}_2$ group is o/p directing in electrophilic substitution reactions.
- (b) Write the reaction involved in Carbylamine test.
- (c) Write the structures of A in the following reaction:



- (d) Why aniline does not undergo Friedel-Crafts reaction?
- (e) Arrange the following in increasing order of their boiling point:



OR

- (a) Write structures of different isomeric amines corresponding to the molecular formula, $\text{C}_4\text{H}_{11}\text{N}$
- (b) How will you convert benzene into aniline?
- (c) Arrange the following in order of their increasing basic strength : $\text{C}_2\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{NH}_2$, NH_3 , $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$
- (d) Give a chemical test to distinguish between Ethylamine and aniline.
- (e) Write short note on Gabriel phthalamide synthesis

III

B - 7

B - 1