

BUDHA DAL PUBLIC SCHOOL, PATIALA
Pre Board Examination (6 December 2025)

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

Time: 3hrs.

M.M.70

General Instructions:

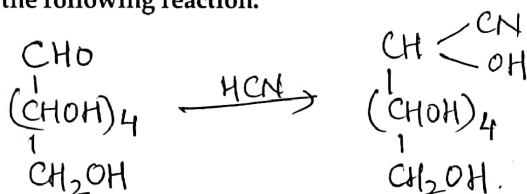
1. There are 33 questions in this question paper with internal choice.
2. Section A consists of 16 multiple-choice questions carrying 1 mark each.
3. Section B consists of 5 short answer questions carrying 2 marks each.
4. Section C consists of 7 short answer questions carrying 3 marks each.
5. Section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

Q1. A complex compound in which the oxidation number of a metal is zero, is

- a) $[\text{Ni}(\text{CO})_4]$ b) $[\text{Pt}(\text{NH}_3)_4]\text{Cl}_2$ c) $\text{K}_3[\text{Fe}(\text{CN})_6]$ d) $\text{K}_4[\text{Fe}(\text{CN})_6]$

Q2. Consider the following reaction:



The given reaction confirms

- a) Presence of primary alcoholic group
 - b) Five-OH groups attached to different carbon atoms.
 - c) All six carbon atoms are linked in a straight chain
 - d) The presence of a carbonyl group in glucose
- Q3. Phenol when first reacts with concentrated sulphuric acid and then with concentrated nitric acid, gives
- a) 2, 4, 6 - trinitrophenol b) o - nitrophenol c) p - nitrophenol d) nitrobenzene
- Q4. Which of the following complex species is not expected to exhibit optical isomerism?
- a) $[\text{Co}(\text{en})_3]^{3+}$ b) $[\text{Co}(\text{en})_2\text{Cl}_2]^+$ c) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$ d) $[\text{Co}(\text{en})_2(\text{NH}_3)_2\text{Cl}_2]^+$
- Q5. Which one of the following sets correctly represents the increase in the melting points of the isomeric dichlorobenzene?
- a) o-dichlorobenzene < m-dichlorobenzene < p - dichlorobenzene
 - b) o-dichlorobenzene < p-dichlorobenzene < m - dichlorobenzene
 - c) m-dichlorobenzene < p - dichlorobenzene < o - dichlorobenzene
 - d) m - dichlorobenzene < o-dichlorobenzene < p - dichlorobenzene
- Q6. Which of the following statement is not correct about the solutions of electrolyte?
- I) The conductivity of the solution depends upon the size of the ions.
 - II) Conductivity depends upon the viscosity of the solution
 - III) Conductivity does not depends upon the salvation of ions present in the solution
 - IV) The conductivity of the solution decreases with temperature.
- a) I, II, III b) I, III, IV c) III, IV d) II, IV

A-1



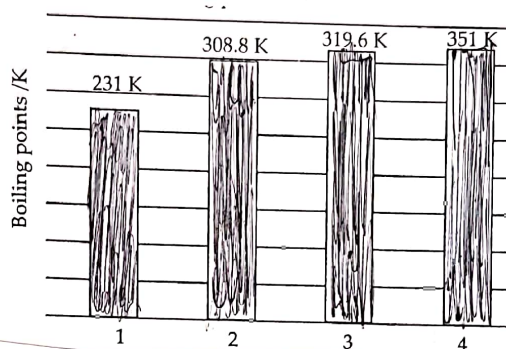
Which one of the following pairs is the essential constituent of our food?

- a) Nucleic acids and lipids
- b) Proteins and carbohydrates
- c) Proteins and nucleic acids
- d) Proteins and lipids

Q8. Which of the following statements is not correct about amines?

- a) all aliphatic amines are more basic than ammonia
- b) boiling point of 1° amine is lower than 2° and 3° amines
- c) aliphatic amines are soluble in water
- d) gabriel phthalimide synthesis cannot be used for the preparation of 2° and 3° amines.

Q9. Study the graph showing the boiling points of some hydrocarbons and identify the compounds



Which of the following shows correct relation between the compounds and their boiling points?

- a) 1=propane, 2=1-chloropropane, 3=iso propyl chloride, 4=1-chlorobutane
- b) 1=propane, 2= iso propyl chloride, 3=1-chloropropane, 4=1-chlorobutane
- c) 1= chloropropane , 2=propane, 3=iso propyl chloride, 4=1-chlorobutane
- d) 1= chloropropane , 2=propane, 3=1- chlorobutane, 4=iso propyl chloride

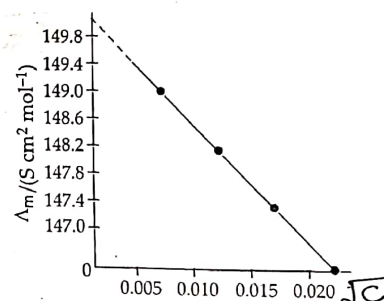
Q10. The base which is present in DNA but not in RNA is

- a) cytosine
- b) guanine
- c) adenine
- d) thymine

Q11. Consider the following graph,

Here, the limiting molar conductivity is near about

- a) 149 S cm² mol⁻¹
- b) 150 S cm² mol⁻¹
- c) 149.4 S cm² mol⁻¹
- d) 147 S cm² mol⁻¹



Q12. Reena when reacted aniline with sodium nitrite and hydrochloric acid at a certain temperature; a compound was formed. This compound further gives phenol on reaction with

- a) warm H₂O
- b) NaBH₄
- c) NaOH
- d) C₂H₅OH

In the following questions, two statements are given - one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to the questions from the codes (a), (b), (c) and (d) as given below:

- a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
- b) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is not the correct explanation of the Assertion (A).
- c) Assertion (A) is correct, but Reason (R) is incorrect statement.
- d) Assertion (A) is incorrect, but Reason (R) is correct statement.

Q13. Assertion (A) : Butan-1-ol has higher boiling point than ethoxyethane.

Reason (R) : Extensive hydrogen bonding leads to stronger association of molecules.

A-2

Assertion (A) : Cuprous ion (Cu^+) is colourless, whereas cupric ion (Cu^{2+}) is blue in the aqueous solution.

Reason (R) : Cuprous ion (Cu^+) has unpaired electrons, while cupric ion (Cu^{2+}) does not.

Q15. Assertion (A) : Separation of Zr and Hf is difficult.

Reason (R) : Because Zr and Hf lie in the same group of the periodic table.

Q16. Assertion (A) : In acylation reaction of amines, equilibrium shifts to be right hand side in the presence of pyridine.

Reason (R) : In the presence of strong base, HCl is removed and reaction shifts toward the right hand side.

Section - B

- Q17. a) A rusted piece of iron undergoes electrochemical reactions. Write the chemical reaction taking place at :
- the electrode that behaves as an anode
 - the electrode that behaves as a cathode
- b) Given that the standard reduction potential for $\text{Al}^{3+} / \text{Al} = -1.66 \text{ V}$ and $\frac{1}{2} \text{I}_2 / \text{I}^- = 0.54 \text{ V}$, what will be the standard potential of the cell made by using Al^{3+} and I^- ?

Q18. Write the hybridization, magnetic character, colour of $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$

Q19. Give reasons for the following:

- Grignard Reagent should be prepared under anhydrous condition.
- p-dichlorobenzene has higher melting point than that of ortho or meta-isomer.

Q20. Define the following terms :

- Denaturation of proteins
- Peptide bond

Q21. Account for the following :

- Vitamin B and vitamin C are essential for us.
- Amino acids show amphoteric behaviour.

OR

What happens when glucose is reacted with

- HI
- $(\text{CH}_3\text{CO})_2\text{O}$

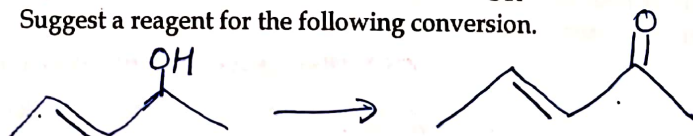
Section - C

Q22. Write the equations for the following reaction.

- Phenol is treated with zinc dust and then with conc. HNO_3 and H_2SO_4 .
- Ethanol is treated with PCC.
- Chloroethane is treated with aq. NaOH and then followed by KMnO_4 .

OR

- Suggest a reagent for the following conversion.



- Out of 2-chloroethanol and ethanol which is more acidic?

A-3

An organic compound contains 69.77% carbon, 11.63% hydrogen and rest oxygen. The molecular mass of the compound is 86. It does not reduce Tollen's reagent but forms an addition compound with sodium hydrogen sulphite and gives positive iodoform test.

On vigorous oxidation, it gives ethanoic acid and propanoic acid. Write the possible structure of the compound.

Q24. Answer the following questions:

- State Henry's law
- Mention two important applications of Henry's law
- Calculate the mass of compound (molar mass = 256 g mol^{-1}) to be dissolved in 75 g of benzene to lower its freezing point by 0.48 K ($K_f = 5.12 \text{ K kg mol}^{-1}$)

Q25. When AgNO_3 solution is added into the solution of a co-ordination compound $\text{PdCl}_2 \cdot 4\text{NH}_3$, it produces 2 moles of AgCl precipitate.

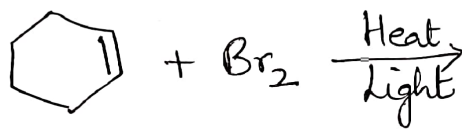
On the basis of the information above, designate the following:

- Coordination entity
- Counter ions
- The oxidation number of Pd

Q26. a) Identify the major product formed when hexanol is treated with SOCl_2 . Write the reaction involved.

b) Name the possible product when chlorobenzene undergoes nitration reaction.

c) Draw the structure of major monohalogen product in the following reaction.



Q27. Give reasons for the following observations.

- $(\text{CH}_3)_2\text{NH}$ is more basic than $(\text{CH}_3)_3\text{N}$ in an aqueous solution.
- $-\text{NH}_2$ group of aniline is acetylated before carrying out nitration.
- Higher aliphatic amines are not soluble in water.

Q28. 20% of 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.

Section - D

Q29. Read the passage given below and answer the following questions:

Order of a reaction is an experimentally determined quantity. It corresponds to the stoichiometric coefficients only for an elementary reaction (a reaction which occurs in just one step). A complex reaction occurs in a series of elementary reactions (multiple steps).

Some steps are very fast as they do not require much energy. These steps do not affect the overall rate of reaction. Hence, the rate of reaction is mainly determined by the slowest step of the reaction. Order of a reaction, in case of complex reaction, corresponds to the stoichiometric coefficients of the rate determining step.

The integrated rate equation can be fitted with kinetics data to determine the order of reaction. The integrated rate equation for zero, first and second order reactions are

For zero order, $[\text{A}] = -kt + [\text{A}]_0$

For first order, $\log[\text{A}] = -kt / 2.303 + \log[\text{A}]_0$

For second order, $1 / [\text{A}] = kt + 1 / [\text{A}]_0$

These equation can be used to calculate the half-life period of the different reactions, which gives the time during which the conc. of reactant is reduced to half of its initial concentration.

Answer the following questions:

- Distinguish between rate expression and rate constant of a reaction.
- For a zero order reaction will be the molecularity be equal to zero? Explain.

OR

Define the term pseudo first order reaction.

- Name two factors that affect the rate of a chemical reaction.

Read the following passage and answer the questions that follow:

Boiling point or freezing point of liquid solution would be affected by the dissolved solids in the liquid phase. A soluble solid in solution has the effect of rising its boiling point and depressing its freezing point.

The addition of non-volatile substances to a solvent decreases the vapour pressure and the added solute particles affect the formation of pure solvent crystals.

According to many researches the decrease in freezing point is directly correlated to the concentration of solutes dissolved in the solvent. This phenomenon is expressed as freezing point depression and it is useful for several applications such as to freeze concentration of liquid food and to find the molar mass of an unknown solute in the solution. Freeze concentration is a high-quality liquid food concentration method where water is removed by forming ice crystals. This is done by cooling the liquid food below the freezing point of the solution's identity.

The freezing point depression is referred as a colligative property and it is proportional to the molar concentration of the solution (m). The other three colligative properties are vapour pressure lowering, boiling point elevation and osmotic pressure. These are physical characteristics of solutions that depend only on the identity of the solvent and the concentration of the solute. The characters are not depending on the solute's identity.

Answer the following questions on the basis of above data.

- What is the value of van't Hoff factor for a molecule undergoes tetramerization?
- Give example of a solution in which solute molecules undergo association in solution.

OR

Which of the following will have highest van't Hoff factor?

Assume 100% dissociation.

$C_6H_{12}O_6$, NaCl, $CaCl_2$, $Ca_3(PO_4)_2$

- Which colligative property is preferred for the molar mass determination of macromolecules?

Section - E

31. a) Give simple chemical tests to distinguish between following pairs of compounds. (3+2)

- Propanal and propanone
- Pentan - 2 - one and Pentan - 3- one
- Phenol and Benzoic acid

b) Arrange the following compounds in increasing order of their property as indicated

- Acetaldehyde, Acetone, Di-tertbutylketone, Methyl tert-butyl ketone (reactivity towards HCN)
- Benzoic acid, 4 - Nitrobenzoic acid, 3, 4.- Dinitrobenzoic acid, 4 - Methoxy-benzoic acid (2+3)
(acid strength)

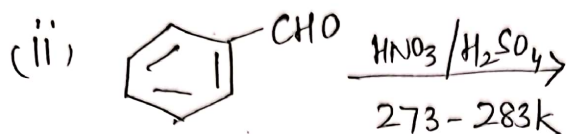
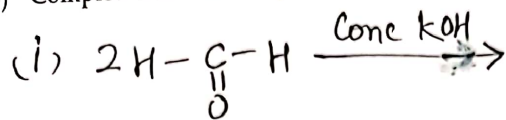
OR

a) Write chemical equations for given named reactions:

- Aldol condensation
- Wolf - Kishner reduction
- Hell-Volhard Zelinsky Reaction

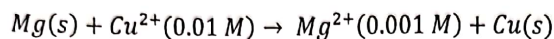
A-5

b) Complete the following reactions.



Q32. a) E_{cell}^0 for the given redox reaction is 2.71 V

(2+3)



Calculate E_{cell} for the reaction.

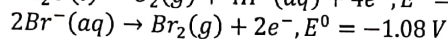
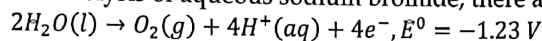
b) The resistance of 0.01 M NaCl solution at 25°C is 200Ω. The cell constant of the conductivity cell used is unity. What will be the molar conductivity of the solution?

OR

a) Write chemistry of recharging the lead storage battery. (Reaction at Anode, Cathode and Complete reaction)

b) How much electricity in terms of Faradays is required to produce 20 g of calcium from molten CaCl_2 ?

c) In the electrolysis of aqueous sodium bromide, there are two possible anodic reactions



Which reaction occurs at anode and why?

Q33. Answer the following:

(2+3)

a) Why orange colour of $\text{Cr}_2\text{O}_7^{2-}$ ion changes to yellow when treated with an alkali?

b) Write the formula of compound in which transition metal is in +7 oxidation state?

c) Why actinoids exhibit a greater range of oxidation states than lanthanoids?

d) Why transition elements show catalytic properties?

e) What are the similarities between the chemistry of lanthanoids and that of actinoids?

OR

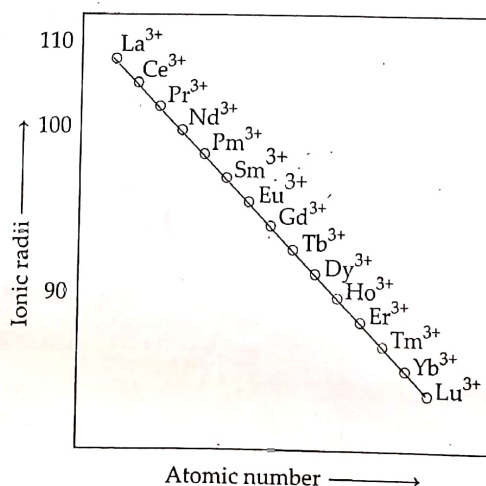
a) Describe the cause of the following variations with respect to transition elements.

(i) The higher oxidation states are usually exhibited by the members in the middle of a series of transition elements.

(ii) The third ionization enthalpy of manganese (Z=25) is exceptionally high.

(2+3)

b) On the basis of the figure given below, answer the following questions:



Write down the electronic configuration of gadolinium (Gd) and also calculate the magnetic moment of Ce^{3+} on the basis of 'spin only' formula.

A-6