



COMMON PRE-BOARD EXAMINATION

CHEMISTRY-Code No. 043

Class-XII-(2025-26)

SET: 3



Time allowed: 3 Hrs.

Maximum Marks: 70

General Instructions:

Read the following instructions very carefully and follow them:

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

Question 1 to 16 are multiple choice questions. Only one of the choices is correct.

Select and write the correct choice as well as the answer to these questions

1. The complex having minimum Δ_o value 1
(a) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (b) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ (c) $[\text{Cr}(\text{CN})_6]^{3-}$ (d) $[\text{CoCl}_6]^{3-}$
2. A polysaccharide "X" on boiling with dilH_2SO_4 , at 393 K under 2-3 atm pressure yields Y "Y" on 1
treatment with bromine water gives gluconic acid. X contains β -glycosidic linkages only.
Compound X is
(a) Starch (b) cellulose (c) Amylose (d) amylopectin
3. One litre solution of MgCl_2 is electrolysed completely by passing a current of 1A for 100 sec. The 1
original concentration of MgCl_2 solution was (Atomic mass of Mg = 24)
(a) $5.18 \times 10^{-3} \text{ M}$ (b) $5.18 \times 10^{-2} \text{ M}$ (c) $0.518 \times 10^{-3} \text{ M}$ (d) $1.0 \times 10^{-2} \text{ M}$
4. Which of the following is a diamagnetic ion: (Atomic numbers of Sc, V, Mn and Cu are 21, 23, 25 1
and 29 respectively)
(a) V^{2+} (b) Sc^{3+} (c) Cu^{2+} (d) Mn^{3+}

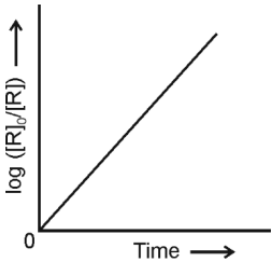
5. The relative lowering of vapour pressure of an aqueous solution containing a non-volatile solute is 0.0125. The mole fraction of the non-volatile solute is : 1
 (a) 0.80 (b) 0.725 (c) 0.15 (d) 0.0125
6. A hydrocarbon on free radical halogenation gives four isomeric monochlorides. The hydrocarbon is 1
 (a) 2-Methylbutane (b) 2,3-Dimethylbutane
 (c) 2,2-Dimethylbutane (d) 2-Methylpentane
7. Which isomer of $C_5H_{11}Cl$ will have highest boiling point? 1
 (a) n-pentyl chloride (b) Isopentylchloride (c) Neopentylchloride (d) Sec-pentyl chloride
8. The heating of phenyl methyl ether with HI produces an aromatic compound A which on treatment with conc. HNO_3 gives B. The A and B respectively are, 1
 (a) Methanol and ethanoic acid (b) Picric acid and phenol
 (c) Iodobenzene and 1-iodo-4-nitrobenzene (d) Phenol and picric acid
9. Identify the reagents for the conversion of benzene to benzaldehyde. 1
 (a) $CrO_3, (CH_3CO)_2O$ (b) CrO_2Cl_2, H_2O (c) $CO, HCl \& CuCl$ (d) Cl_2, uv light
10. Choose the acid with highest value of K_a : 1
 (a) FCH_2COOH (b) O_2NCH_2COOH (c) $HCOOH$ (d) $ClCH_2COOH$
11. Which of the following compounds on treatment with benzene sulphonyl chloride forms an alkali-soluble precipitate ? 1
 (a) CH_3CONH_2 (b) $(CH_3)_3N$ (c) $(CH_3)_2NH$ (d) $CH_3CH_2NH_2$
12. The reaction of diborane with but-1-ene, followed by oxidation with alkaline hydrogen peroxide gives 1
 (a) isobutyl alcohol (b) tert-butyl alcohol (c) sec-butyl alcohol (d) n-butyl alcohol
13. Assertion(A) : When NaCl is added to water, a depression in freezing point is observed. 1
 Reason(R) : The vapour pressure of solution is increased which causes depression in freezing point.
 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, and R is not the correct explanation of A.
 C. A is true but R is false.
 D. A is false but R is true
14. Assertion(A): The resistance of ionic solutions increases with increase in temperature. 1
 Reason(B): Increase in temperature increases the mobility of ions.
 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, and R is not the correct explanation of A.
- C. A is true but R is false.
- D. A is false but R is true

15. Assertion (A) : Diazonium salts of aromatic amines are more stable than those of aliphatic amines. 1
Reason (R) : Diazonium salts of aromatic amines show resonance.
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, and R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true
16. Assertion (A) : Proteins are polymers of alpha-amino acids connected by peptide bonds. 1
Reason (R) : A tetrapeptide contains 4 amino acids linked by 4 peptide bonds
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, and R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true

Section-B

Question No. 17 to 21 are very short answer questions carrying 2 marks each.

17. 1 molal aqueous solution of an electrolyte A_2B_3 is 60% ionized. Calculate the boiling point of the solution. (Given : K_b for $H_2O = 0.52 \text{ K kg mol}^{-1}$) 2
18. Observe the following graph and answer the following questions 2
- 
- (i) What is the order of the reaction?
(ii) What is the slope of the graph ?
19. Explain why $[Co(NH_3)_6]^{3+}$ is an inner orbital complex whereas $[Ni(NH_3)_6]^{2+}$ is an outer orbital complex . 2
20. (i) Write the reaction for catalytic reduction of nitrobenzene followed by reaction of product so formed with bromine water. 2
(ii) Write the IUPAC name of $CH_2=CHCH(CH_3)NH(CH_3)$

21. **Attempt either option A or B**

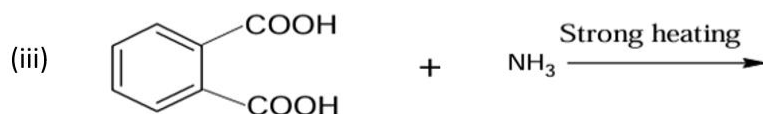
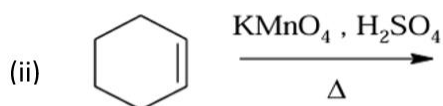
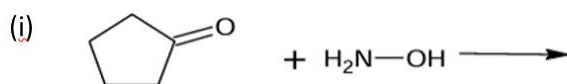
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- A. Describe the mechanism of dehydration of ethanol at 443 K.
- B. Write the structure of the major product(s) in the following reactions:
- Mononitration of 3-methylphenol.
 - tert-butyl chloride is treated with sodium ethoxide
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Section-C

Question No. 22 to 28 are short answer questions, carrying 3 marks each.

22. Write the cell reaction and calculate the emf of following cell at 298 K: 3
 $\text{Mg}_{(s)}|\text{Mg}^{2+}(0.001\text{ M})||\text{Cu}^{2+}(0.0001\text{ M})|\text{Cu}_{(s)}$ **Given $E^0_{\text{cell}} = 2.71\text{ V}$**
23. Give reasons 3
- Transition elements act as catalysts
 - It is difficult to obtain oxidation state greater than two for Copper.
 - Greater range of oxidation states of actinoids as compared to lanthanoids.
24. Give the structure of the major product in the following reactions; 3
- Cyclohexanol reacts with a mixture of red phosphorus and iodine
 - Phenyl magnesium chloride reacts with ethanol
 - Bromoethane reacts with KNO_2
25. Carry out the following conversions. (Attempt any 3) 3
- Chloroethane to Phenetole
 - Butan-2-one to 3-Methylpentan-3-ol
 - Phenol to benzene
 - Prop-2-enol to prop-2-enal
26. Complete the following ; 3



27. Vapour pressure of pure water at 298 K is 24.8 mm Hg. Calculate the lowering in vapour pressure 3
of an aqueous solution which freezes at -0.3°C . (K_f of water = $1.86\text{ K kg mol}^{-1}$)

28. (i) When orange solution containing $\text{Cr}_2\text{O}_7^{2-}$ ion is treated with an alkali, a yellow solution is formed and when H^+ ions are added to yellow solution, an orange solution is obtained. Explain why does this happen? Also write reaction involved. 3
- (ii) Complete the following chemical equations:
 $\text{MnO}_4^- (\text{aq}) + \text{S}_2\text{O}_3^{2-} (\text{aq}) + \text{H}_2\text{O} (\text{l}) \rightarrow$

Section D

Question No. 29 & 30 are case-based/data -based questions carrying 4 marks each.

29. Electrolysis is the process in which electrical energy is used to drive a non-spontaneous chemical reaction. Faraday's laws are widely applied in electroplating, electro refining of metals, and the determination of ion concentration in solutions. Factors such as electrode material, current, and electrolyte concentration influence the efficiency of electrolysis. Thus, Faraday's laws provide both a theoretical and practical framework for understanding and controlling electrochemical processes. 1+ 1+ 2
- (i) If the molar conductivities at infinite dilution for NaI, CH_3COONa and $(\text{CH}_3\text{COO})_2\text{Mg}$ are 12.69, 9.10 and 18.78 $\text{S cm}^2 \text{mol}^{-1}$ respectively at 25°C , then calculate the molar conductivity of MgI_2 at infinite dilution.

OR

What are the products formed when aqueous KCl is electrolysed?

- (ii) What is the quantity of electricity in Coulombs required to oxidise 72g of water.
- (iii) The cell constant of a conductivity cell is 0.146 cm^{-1} . What is the molar conductivity of 0.01 M solution of an electrolyte at 298 K, if the resistance of the cell is 1000 ohm?
30. Coordination chemistry is the study of compounds that have a central atom (often metallic) surrounded by molecules or anions, known as ligands. The ligands are attached to the central atom by dative bonds, also known as coordinate bonds, in which both electrons in the bond are supplied by the same atom on the ligand. The bonding in these compounds can be explained through Valence Bond Theory (VBT) and Crystal Field Theory (CFT), highlighting how electronic configurations determine magnetic and spectral properties. These complexes show various forms of isomerism, including structural and stereoisomerism. Coordination compounds such as chlorophyll, haemoglobin, vitamin B_{12} , and metal complexes used in catalysis, medicines, and analytical chemistry showing how these compounds bridge the gap between inorganic chemistry and real-life applications. 1+ 1+ 2

- (i) Draw the meridional isomer of $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$.

OR

Write the formula of Diamminechloridonitrito-N-platinum(II).

- (ii) Write the name and structure of a hexadentate ligand.
- (iii)(a) Arrange the following complexes in the increasing order of conductivity of their solution;
 $[\text{Cr}(\text{NH}_3)_3\text{Cl}_3]$, $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$, $[\text{Cr}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$
- (b) Using Crystal Field theory, write the electronic configuration of octahedral complexes of Fe^{3+} in the presence of a strong field ligand. [Atomic number : $\text{Fe} = 26$]

Section-E

Question No. 31 to 33 are long answer type questions carrying 5 marks each.

31. (i) What products would be formed when DNA is hydrolysed ? 5
(ii) Differentiate between native protein and denatured protein.
(iii) Mention two important functions of nucleic acid.
(iv) How can you differentiate between Fibrous protein and Globular protein?
(v) Give one example each for essential and non-essential amino acid.

OR

- (i) Sucrose is a non-reducing sugar. Why?
(ii) What are the hydrolysis products of lactose?
(iii) Name the polysaccharide which is known as animal starch? Why is it called animal starch?
(iv) What happens when glucose reacts with bromine water? What is the inference?
(Give equation)
32. (i) Draw structure of the 2,4-dinitrophenylhydrazone of benzaldehyde. 5
(ii) A compound (A) with molecular formula C_4H_5N on reduction with DIBAL-H followed by hydrolysis, gives a compound (B). Compound (B) gives positive Tollens' test but does not give iodoform test. Compound (B) can also be obtained when ethanal is treated with dilute NaOH followed by heating. Identify (A) and (B). Write the reactions of (A) with DIBAL-H followed by hydrolysis.
(iii) Ethanamine reacts with benzoyl chloride to form a product 'X'. Give the structure and IUPAC name of 'X'. Can 'X' undergo Hoffmann bromamide degradation reaction? If yes, then give the structure of the product. If no, then give reason.

OR

- (i) Give a simple test to distinguish between benzaldehyde and ethanol.
(ii) Write the main product formed when propanal reacts with the following reagents: (Give equations)
(a) 2 moles of CH_3OH in presence of dry HCl
(b) H_2N-NH_2 followed by heating with KOH in ethylene glycol
(iii) Explain the following reactions and write the chemical equations involved;
(a) Gabriel Phthalimide synthesis.
(b) Carbylamine reaction
33. (i) What happens to the rate constant k and activation energy E_a as the temperature of a chemical reaction is increased? Justify 5
(ii) For the reaction $A \rightarrow B$, the rate of reaction becomes three times when the concentration of A is increased nine times. What is the order of the reaction?
(iii) The rate of the chemical reaction doubles for an increase of 10 K in absolute temperature from 298 K. Calculate activation energy (E_a). [$2 \cdot 303 R = 19 \cdot 15 JK^{-1} mol^{-1}$, $\log 2 = 0 \cdot 3$]

OR

- (i) Why is molecularity applicable only for elementary reactions whereas order is applicable for both elementary as well as complex reactions?

- (ii) The reaction between H_2 (g) and I_2 (g) was carried out in a sealed isothermal container. The rate law for the reaction was found to be : $\text{Rate} = k[\text{H}_2] [\text{I}_2]$. If 1 mole of H_2 (g) was added to the reaction chamber and the temperature was kept constant, then predict the change in rate of the reaction and the rate constant.
- (iii) If the half-life period of a first order reaction is 1386 s, calculate the rate constant of the reaction .
- (iv) For the reaction $\text{A} + \text{B} \rightarrow \text{Products}$, the following initial rates were obtained at various initial concentrations of reactants:

<i>Sl. No.</i>	<i>[A]/mol L⁻¹</i>	<i>[B]/mol L⁻¹</i>	<i>Initial rate / mol L⁻¹ s⁻¹</i>
1	0.1	0.1	0.05
2	0.2	0.1	0.10
3	0.1	0.2	0.05

Determine the order of the reaction with respect to A and B and write the rate law expression.