(iii) Assertion: Nucleophilic substitution of iodoethane is easier than chloroethane.
Reason: Bond energy of C-I bond is more than that of C-Cl bond.

(iv) Assertion: S_N1 reaction takes place in single step.
Reason: Order of S_N1 reaction for alkyl halides is $3^0 > 2^0 > 1^0$halides.

3. The magnetic moment of a transition metal of 3d-series is 6.92 B.M. Its electronic configuration would be:
   (a) $3d^5 4s^1$ (b) $3d^5 4s^2$ (c) $3d^6 4s^0$ (d) $3d^5 4s^0$
4. Electronic configuration of a transition element X in +3 oxidation state is $[Ar]3d^5$. What is its atomic number?
   (a) 25 (b) 26 (c) 27 (d) 24
5. The IUPAC name of the following compound $[Cr(NH_3)_5(CO_3)]Cl$ is
   (a) pentaamminecarbonatochromium(II) chloride
   (b) pentaamminocarbonatochromium(I) chloride
   (c) pentaamminecarbanatochromium (III) chloride
   (d) pentaamminecarbonatochromium(IV) chloride

   (OR)

   When 1 mol $CrCl_3 \cdot 6H_2O$ is treated with excess of $AgNO_3$, 2 mol of AgCl are obtained. The formula of the complex is:
   (a) $[CrCl_3(H_2O)_3] \cdot 3H_2O$ (b) $[CrCl_2(H_2O)_4]Cl \cdot 2H_2O$
   (c) $[CrCl(H_2O)_5]Cl_2 \cdot H_2O$ (d) $[Cr(H_2O)_6]Cl_3$
6. The cell constant of a conductivity cell
   (a) Changes with change of electrolyte
   (b) Changes with change of concentration of electrolyte
   (c) Changes with temperature of electrolyte
   (d) Remains constant for a cell
7. The type of solid which are good conductor of electricity and malleable are
   (a) metallic solids (b) molecular solids
   (c) ionic solids (d) amorphous solids
8. Sodium chloride can be prepared by heating sodium in the atmosphere of chlorine, which is yellow in colour. The cause of yellow colour is
   (a) presence of Na^+ ions in the crystal lattice (b) presence of e- in the crystal lattice
   (c) presence of Cl^- ions in the crystal lattice (d) presence of face centred cubic lattice

   (OR)

   In a crystalline solid, atoms A are arranged in ccp array and atoms B occupy all the octahedral voids and half of the tetrahedral voids. What is the formula of the compound?
   (a) A_2B (b) AB_2 (c) AB (d) AB_3
9. When is glucose is reacted with bromine water the major product is
   (a) tartaric acid (b) meso oxalic acid (c) gluconic acid (d) saccharic acid

   (OR)

   Which of the following statements is correct?
   (a) All amino acids are optically active.
   (b) All amino acids except lysine are optically active.
   (c) All amino acids except glycine are optically active.
   (d) All amino acids except glutamic acid are optically active
10. When a solution of formaldehyde and KOH is heated, it will give
    (a) Acetylene and methane (b) Methanol and methane
    (c) Methanol and acetylene (d) Methanol and potassium formate

11. Which response gives the correct coordination number and oxidation number of the transition metal atom in $[Co(NH_3)_2(H_2O)_2Cl_2]^+$?

(a) C.N = 6; O.N = +3 (b) C.N = 4; O.N = +2

(c) C.N = 6; O.N = +1 (d) C.N = 4; O.N = +1

In the following questions (Q. no. 12-16) a statement of assertion followed by a statement of reason by given. Choose the correct answer out of the following choices.

(a) Assertion and Reason both are correct explanation for Assertion.

(b) Assertion and reason both are correct statement but reason is not correct explanation for Assertion.

(c) Assertion is correct statement but Reason is incorrect statement.

(d) Assertion is incorrect statement but reason is correct statement.

12. Assertion: Glucose and fructose are reducing sugars.
Reason: Glucose and fructose contain a free aldehydic and ketonic group adjacent to a >CHOH group respectively.
13. Assertion: Aniline is less basic than ethyl amine.
Reason: Aniline react with acid to form salts.
14. Assertion: Addition of HCN to carbonyl compounds gives cyanohydrins.
Reason: The reaction of HCN with aldehydes and ketones is catalysed by dry HCl gas.
15. Assertion: All halogens show only -1 oxidation state.
Reason: Fluorine is most electronegative element.
16. Assertion: Hydrolysis of an ester follows first order kinetics.
Reason: Concentration of water remains nearly constant during the course of reaction.

(OR)

Assertion: For a first order reaction $t_{1/2}$ is independent of [R]

Reason: For a first order reaction $t_{1/2}$ = 0693/k.

SECTION B

17. An element with molar mass 2.7 x 10^{-2} kg mol-1 forms a cubic unit cell with edge length 405 pm. If its density is 2.7 x 10^3 kg m^{-3}, what is the nature of the cubic unit cell?
18. Define conductivity and molar conductivity for the solution of an electrolyte. Give their units.
19. A reaction is first order in A and second order in B.

(i) Write the differential rate equation.

(ii) How is the rate affected on increasing the concentration of B three times?

(iii) How is the rate affected when the concentrations of both A and B is doubled?

(OR)

The reaction between A and B is first order with respect to A and zero order with respect to B. Fill in the blanks in the following table:

Experiment	[A] mol L^{-1}	[B] mol L^{-1}	Initial rate mol L^{-1} min^{-1}
I	0.1	0.1	2.0×10^{-2}
II	-	0.2	4.0×10^{-2}
III	0.4	0.4	-
IV	-	0.2	2.0×10^{-2}

20. Explain giving reasons:

(i)The enthalpies of atomisation of the transition metals are high.

(ii)Transition metals and their many compounds act as good catalyst

21. Why transition metal ions are coloured? Predict which of the following will be coloured in aqueous solution? Ti^{3+}, V^{3+}, Cu^+, Sc^{3+}, Mn^{2+}, Fe^{3+}.

22. How can you prepare Cl_2 from HCl and HCl from CI_2? Write reactions only.

(OR)

Complete and balance the following reactions:

(i) $XeF_4 + H_2O \rightarrow$

(ii) $Cu + HNO_3(dil) \rightarrow$

23. (i) Write structure of 4-tert-Butyl-3-iodoheptane.

(ii) Write IUPAC name of $(CH_3)_3CCH_2CH(Br)C_6H_5$

24. Write the equations involved in the following reactions (any two):

(i) Reimer-Tiemann reaction

(ii) Kolbe's reaction

(iii)Williamson's synthesis

25. Define the following terms:

(a) Peptide linkage

(b) Denaturation

(OR)

Differentiate

(a) Nucleoside and Nucleotides

(b) Globular and Fibrous proteins

SECTION C

26. Calculate the standard cell potentials of galvanic cell in which the following reactions take place:

$2Cr_{(s)} + 3Cd^{2+}_{(aq)} \rightarrow 2Cr^{3+}_{(aq)} + 3Cd$

Calculate the Δ_rG^o and equilibrium constant of the reaction.

Given: $E^o_{Cr3+/Cr} = - 0.74$ V ; $E^o_{Cd2+/Cd} = - 0.40$ V; Antilog 0.5014= 3173

(OR)

Write the Nernst equation and emf of the following cell at 298 K

$Mg_{(s)}|Mg^{2+}(0.001M) \,||\, Cu^{2+}(0.0001\ M)|Cu_{(s)}$

Given: $E^oMg^{2+}/Mg = - 2.36$ V ; $E^oCu^{2+}/Cu = 0.34$ V

27. Show that for a first order reaction the time required for 99% completion of a reaction is twice the time required to complete 90% of the reaction.

(OR)

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 its $1/16^{th}$ value? Given log 4 = 0.6020.

28. Account for the following:

(a) Explain the fact that in aryl alkyl ethers

(i) the alkoxy group activates the benzene ring towards electrophilic substitution and

(ii) it directs the incoming substituents to ortho and para positions in the benzene ring.

(b) Explain why ortho nitrophenol is more acidic than ortho methoxyphenol.

(OR)

Complete:

a. $C_6H_5CHO + H_2NCONHNH_2 \rightarrow$

b. $(CH_3)_3C\text{-}O\text{-}C_2H_5 + HBr \rightarrow$

c. $C_6H_5ONa + C_2H_5Cl \rightarrow$

29. Account for the following:

(i) pK_b of aniline is more than that of methylamine

(ii) Ethylamine is soluble in water whereas aniline is not.

(iii)Methylamine in water reacts with ferric chloride to precipitate hydrated ferric oxide.

30. Answer for the following:

(a) $[NiCl_4]^{2-}$ is paramagnetic while $[Ni(CO)_4]$ is diamagnetic though both are tetrahedral Why?

(b) What is meant by ambidentate ligands? Give example.

(c) What are homoleptic and heterolytic complexes? Give examples.

SECTION D

31. (a) Define the following terms:

(i) Ebullioscopic constant

(ii) Isotonic solutions

(b) The vapour pressures of pure liquids A and B are 450 mm and 700 mm of Hg respectively at 350 K. Calculate the composition of the liquid mixture if total vapour pressure is 600 mm of Hg. Also find the composition in the vapour phase.

(OR)

(a) Why does vapour pressure of liquid decreases when a non-volatile solute is added to it?

(b) Two liquids A and B on mixing produce a warm solution. Which type of deviation from Raoult's law does it show?

(c) Boiling point of water at 750 mm Hg is 99.63°C. How much sucrose is to be added to 500 g of water such that it boils at 100°C.

32. Answer for the following:

(a) What is the covalence of nitrogen in N_2O_5?

(b) Why is bond angle in PH_4^+ ion higher than in PH_3?

(c) Write the order of thermal stability of the hydrides of Group 16 elements.

(d) Give the reason for bleaching action of Cl_2.

(e) Why is ICI more reactive than l_2?

(OR)

a) Draw structures of the following:

i) XeO_3

ii) $H_2S_20_7$

b) Give reasons:

(i) $R_3P{=}O$ exist but $R_3N{=}O$ does not.

(ii) Helium is used in diving apparatus.

(iii) H_2O is liquid while H_2S is gas.

33. Answer for the following:

(a) Arrange the following compounds in increasing order of their boiling points:

CH_3CHO, CH_3CH_2OH, CH_3OCH_3, $CH_3CH_2CH_3$

(b) Out of CH_3COOH or CH_2FCOOH which would you expect to be a stronger acid and why?

(c) What is meant by oxime? Explain with one reaction.

(d) How will you convert ethanol to But-2-enal

(e) Give explanation: There are two $-NH_2$ groups in semi carbazide. However, only one is involved in the formation of semi carbazones.

(OR)

(a) Give chemical test to distinguish between the following:

(i) Acetophenone and Benzophenone (ii) Phenol and Benzoic acid

(b) An organic compound (A) (molecular formula $C_8H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-1-ene. Write equations for the reactions involved.