

**(English Version)**

- Instructions :**
1. This question paper has five parts. All parts are compulsory.
 2. PART-A carries 20 marks. Each question carries 1 mark.
PART-B carries 06 marks. Each question carries 2 marks.
PART-C carries 15 marks. Each question carries 3 marks.
PART-D carries 20 marks. Each question carries 5 marks.
PART-E carries 09 marks. Each question carries 3 marks.
 3. For PART-A questions only first written answer will be considered for evaluation.
 4. Write balanced chemical equations and draw neat labelled diagrams and graphs wherever necessary.
 5. Direct answers to the numerical problems without detailed steps and specific unit for final answer will not carry any marks.
 6. Use log tables and simple calculator if necessary.
(Use of scientific calculator is not allowed)

PART – A

- I. Select the correct options from the given choices : **(15 × 1 = 15)**
- 1) Incorrect statement regarding vitamins,
 - a) Excess vitamin intake is harmful
 - b) Most of the vitamins contain amino groups
 - c) Vitamins can be produced by plants
 - d) Vitamin deficiency causes diseases



- 2) Camphor in nitrogen gas, is an example of _____.
- a) liquid solution b) solid solution
c) gaseous solution d) aqueous solution
- 3) Which of the following is not a subdivision of structural isomerism?
- a) Coordination isomerism b) Linkage isomerism
c) Ionisation isomerism d) Geometrical isomerism
- 4) Cumene hydroperoxide on hydrolysis with dilute acid gives _____.
- a) alcohol and phenol b) only phenol
c) phenol and acetone d) alcohol and acetone
- 5) An example for pseudo first-order reaction is,
- a) The decomposition of gaseous ammonia on a hot platinum surface
b) Photochemical reaction between hydrogen and chlorine
c) Inversion of cane sugar
d) Hydrogenation of ethene
- 6) The hybridisation of 'N' atom in trimethyl amine is,
- a) sp^3 b) sp^2
c) sp d) dsp^2
- 7) The IUPAC name of
$$\text{HC}_3 - \overset{\text{Br}}{\underset{|}{\text{CH}}} - \text{CH}_2 - \overset{\text{O}}{\parallel}{\text{C}} - \text{H}$$
- a) 3-bromobutyraldehyde b) 2-bromopropanaldehyde
c) 3-bromobutanal d) 2-bromobutanal
- 8) Select non-semiconductor from the following,
- a) silicon b) carbon-black
c) gallium arsenide d) doped silicon



9) Given below are two statements :

Statement I : Ammonolysis of alkyl halides has the disadvantage of yielding a mixture of primary, secondary, tertiary amines and quaternary ammonium salt.

Statement II : Tertiary amine is obtained as a major product by taking large excess of ammonia in ammonolysis of alkyl halides.

In the light of the above statements, choose the appropriate answer from the options given below :

- a) Statement I is incorrect but Statement II is correct
 - b) Both Statement I and Statement II are correct
 - c) Both Statement I and Statement II are incorrect
 - d) Statement I is correct but Statement II is incorrect
- 10) The structure of pentacarbonyliron(0) is,
- a) tetrahedral
 - b) trigonal bipyramidal
 - c) octahedral
 - d) square pyramidal
- 11) Two compounds 'A' and 'B' were being tested for their boiling points. It was observed that 'A' started boiling after 'B', when both were subjected to same conditions. If the compound 'B' is acetone, which of the following can be compound 'A'?
- a) Propanal
 - b) Propan-1-ol
 - c) Methoxyethane
 - d) n-Butane
- 12) Select the correct order of melting points of isomeric dichlorobenzenes.
- a) o-dichlorobenzene > m-dichlorobenzene > p-dichlorobenzene
 - b) p-dichlorobenzene > m-dichlorobenzene > o-dichlorobenzene
 - c) p-dichlorobenzene > o-dichlorobenzene > m-dichlorobenzene
 - d) m-dichlorobenzene > o-dichlorobenzene > p-dichlorobenzene



13) Match the following given in List - I with List - II :

List - I	List - II
i) V_2O_5	A) Oxidation of ethyne to ethanal
ii) $TiCl_4$ with $Al(CH_3)_3$	B) Polymerisation of alkynes
iii) $PdCl_2$	C) Oxidation of SO_2 in the manufacture of sulphuric acid
iv) Nickel complexes	D) Manufacture of polyethylene

Choose the correct option :

- a) i – C, ii – D, iii – A, iv – B
b) i – A, ii – B, iii – C, iv – D
c) i – A, ii – C, iii – B, iv – D
d) i – C, ii – A, iii – D, iv – B
- 14) Which of the following explains the increase in the reaction rate by a catalyst?
- a) Catalyst decreases the rate of backward reaction so that rate of forward reaction increases
b) Catalyst provides extra energy to reacting molecules, so that they produce effective collisions
c) Catalyst provides an alternative pathway by reducing the activation energy between the reactants and products
d) Catalyst increases the number of collisions between the reacting molecules
- 15) Sufficient amount of 2-methylpropan-2-ol heated with 20% phosphoric acid at 358 K gives main product 'X' with the elimination of water and tert-butyl alcohol undergoes dehydration when it is passed over heated copper at 573 K gives 'Y'
- Pick the correct statement regarding X and Y.
- a) The boiling points of 'X' and 'Y' are equal
b) The boiling point of 'X' is greater than the boiling point of 'Y'
c) The boiling point of 'X' is lesser than the boiling point of 'Y'
d) At room temperature both 'X' and 'Y' exists as a solids



II. Fill in the blanks by choosing the appropriate word from those given in brackets : (5 × 1 = 5)

[carbocation, pre-exponential, exponential, unpaired, carbohydrate, CCl₂F₂]

- 16) Arrhenius factor is also called _____ factor.
- 17) Paramagnetism arises from the presence of _____ electrons.
- 18) _____ is one of the most common freon in industrial use.
- 19) The electrophilic attack of H₃O⁺ on alkene forms _____.
- 20) The hormone glucocorticoids control the _____ metabolism.

PART – B

III. Answer **any three** of the following. Each question carries 2 marks : (3 × 2 = 6)

- 21) Explain Wurtz reaction with suitable chemical equation.
- 22) Molarity (M), molality (m) and mole fraction (χ) are some methods for expressing concentration of solutions.
Which of these are temperature dependent? Give reason.
- 23) What are non-essential amino acids? Name an optically inactive naturally occurring α -amino acid.
- 24) Write any two characteristic properties of interstitial compounds.
- 25) While separating a mixture of ortho and para nitrophenols by steam distillation, name the isomer which will be steam volatile. Give reason.



PART – C

- IV. Answer **any three** of the following. Each question carries **3** marks : **(3 × 3 = 9)**
- 26) State any three postulates of Werner's theory of coordination compounds.
- 27) Write the balanced chemical equations involved in the manufacture of potassium dichromate ($K_2Cr_2O_7$) from chromite ore ($FeCr_2O_4$).
- 28) $[Co(NH_3)_5Br]SO_4$ is an octahedral coordination compound. Write its IUPAC name and draw the diagram which indicates the splitting of d-orbitals in above complex with respect to CFT (Crystal Field Theory).
- 29) What is lanthanoid contraction? Write one comparison and one difference between lanthanoids and actinoids with respect to oxidation states shown by them.
- 30) Write the facial (fac) and meridional (mer) isomeric structures of $[Co(NH_3)_3(NO_2)_3]$. Mention the coordination number of a metal ion in an above complex.
- V. Answer **any two** of the following. Each question carries **3** marks : **(2 × 3 = 6)**
- 31) Derive an integrated rate equation for the rate constant of zero-order reaction.
- 32) Write a neat labelled diagram, cell representation and half-cell reaction of Standard Hydrogen Electrode (S.H.E.).
- 33) Define azeotropes. What type of azeotropes are formed by solutions with negative deviation from Raoult's law? Give an example for it.
- 34) Lead storage battery is commonly used as a secondary cell in automobiles. What is secondary cell? Write down the reactions occurs at anode and cathode during discharging of the lead storage battery.



PART – D

VI. Answer any four of the following. Each question carries 5 marks : (4 × 5 = 20)

- 35) a) Write the S_N2 mechanism for the conversion of chloromethane to methanol. Mention its order. (3)
- b) What is racemic mixture? Represent the butan-2-ol in racemic mixture form. (2)
- 36) a) Amylose and Amylopectin are two components of the starch. Write any two differences between them. (2)
- b) List any two nitrogenous bases commonly found in both RNA and DNA. (2)
- c) Name the enzyme that catalyses hydrolysis of maltose into glucose. (1)
- 37) a) Write the mechanism of addition of HCN (Hydrogen Cyanide) to carbonyl group in presence of base. (3)
- b) Explain Rosenmund reduction with chemical equation. (2)
- 38) a) Describe carbylamine reaction with suitable chemical equation. (2)
- b) Explain the conversion of aniline to benzene diazonium chloride with chemical equation. (2)
- c) Among aryl amines and ammonia which is more basic? (1)
- 39) a) Lucas reagent is an important reagent which helps to distinguish between three classes of alcohols.
Write the chemical composition of the Lucas reagent and explain how the above reagent helps to distinguish 1° and 3° -alcohols? (3)
- b) Illustrate preparation of ether by Williamson synthesis with a general chemical equation. (2)
- 40) An organic compound 'A' on treatment with ethanoic acid in the presence of hydrochloric acid gas as a catalyst produces an ester 'B'. 'A' on oxidation with CrO_3 in an anhydrous medium gives 'C'. 'C' is heated with concentrated KOH followed by acidification with dilute HCl generates 'A' and 'D'. Three moles of 'D' reacts with PCl_3 gives three moles of compound with molecular formula $HCOCl$ and 'E'. 'D' is reduced to 'A' by lithium aluminium hydride followed by hydrolysis. Write the molecular formulas of the compounds 'A', 'B', 'C', 'D' and 'E'.



PART – E

(PROBLEMS)

VII. Answer **any three** of the following. Each question carries **3** marks : $(3 \times 3 = 9)$

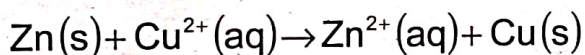
41) The initial concentration of N_2O_5 in the following first order reaction.

$N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$ was $1.24 \times 10^{-2} \text{ mol L}^{-1}$ at 318K. The concentration of N_2O_5 after 60 minutes was $0.20 \times 10^{-2} \text{ mol L}^{-1}$. Calculate the rate constant of the reaction at 318 K.

42) Calculate the osmotic pressure in Pascals exerted by a solution prepared by dissolving 1.0 g of polymer of molar mass 185000 in 450 mL of water at 37°C .

$$[R = 8.314 \times 10^3 \text{ PaLK}^{-1}\text{mol}^{-1}]$$

43) The standard electrode potential for Daniel cell is 1.1 V. Calculate the standard Gibbs energy for the reaction :



44) The vapour pressure of pure liquids 'A' and 'B' are 450 and 700 mm Hg respectively, at 350 K. Find out the composition of the liquid mixture if total vapour pressure is 600 mm Hg.

45) The rate constant of a first order reaction increases from $2 \times 10^{-2} \text{ s}^{-1}$ to $4 \times 10^{-2} \text{ s}^{-1}$ when the temperature changes from 300 K to 310 K. Calculate the energy of activation (E_a).

$$[\log 2 = 0.3010, \log 2.5 = 0.3979, \log 4 = 0.6021, R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}]$$

46) The conductivity of $0.001028 \text{ mol L}^{-1}$ acetic acid is $4.95 \times 10^{-5} \text{ S cm}^{-1}$. Calculate its dissociation constant if Λ_m° for acetic acid is $390.5 \text{ S cm}^2 \text{ mol}^{-1}$.