

DAY — **08**

SEAT NUMBER

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2025 II 20

1100

J-302

(E)

CHEMISTRY (55)

Time : 3 Hrs.

(8 Pages)

Max. Marks : 70

*General Instructions :**The question paper is divided into **four** sections.*

- (1) **Section A :** Q. No. 1 contains **Ten** multiple choice type of questions carrying **One** mark each. Only the first attempt will be considered for evaluation.
Q. No. 2 contains **Eight** very short answer type of questions carrying **One** mark each.
- (2) **Section B :** Q. No. 3 to Q. No. 14 are **Twelve** short answer type -I questions carrying Two marks each.
(Attempt **any Eight**)
- (3) **Section C :** Q. No. 15 to Q. No. 26 are **Twelve** short answer type -II questions carrying **Three** marks each. (Attempt **any Eight**)
- (4) **Section D :** Q. No. 27 to Q. No. 31 are **Five** long answer type of questions carrying **Four** marks each.
(Attempt **any Three**)
- (5) Use of log table is allowed. Use of calculator is not allowed.
- (6) Figures to the right indicate full marks.

(7) *Given data :*

- (i) $R = 8.314 \text{ J/K/mol}$
- (ii) Atomic mass $\text{Na} = 23$
- (iii) K_f for water $= 1.86 \text{ K kg mol}^{-1}$
- (iv) $1^\circ\text{F} = 96500^\circ\text{C}$
- (v) $N_A = 6.022 \times 10^{23}$

SECTION - A

Q. 1. Select and write the correct answer for the following multiple choice type of questions :

[10]

- (i) Schottky defect is NOT observed in _____.
 - (a) NaCl
 - (b) KCl
 - (c) AgBr
 - (d) NiO
- (ii) The freezing point of 0.1m aqueous solution of urea, if K_f for water is $1.86 \text{ K kg mol}^{-1}$ is _____.
 - (a) 1.86°C
 - (b) -1.86°C
 - (c) 0.186°C
 - (d) -0.186°C
- (iii) Ozone layer is depleted by _____.
 - (a) NO
 - (b) NO_2
 - (c) NO_3
 - (d) N_2O_5
- (iv) When excess of AgNO_3 is added to a complex, one mole of AgCl is precipitated. The formula of complex is _____.
 - (a) $[\text{CoCl}_2(\text{NH}_3)_4]\text{Cl}$
 - (b) $[\text{CoCl}(\text{NH}_3)_5]\text{Cl}_2$
 - (c) $[\text{CoCl}_3(\text{NH}_3)_3]$
 - (d) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$
- (v) The value of Δn_g for the oxidation of 4 mole of sulphur dioxide to sulphur trioxide is _____.
 - (a) -2
 - (b) 2
 - (c) -4
 - (d) 4

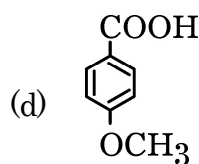
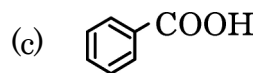
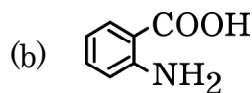
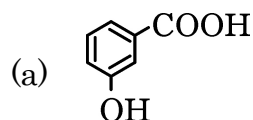
(vi) One dimensional nanostructure amongst the following is ____.

- (a) Nanoparticles (b) Nanotubes
(c) Nanofilms (d) Nanorods

(vii) Which formula co-relates degree of dissociation and concentration of electrolyte?

- (a) $c = \sqrt{\frac{K_a}{\alpha}}$ (b) $\alpha = \sqrt{\frac{K_a}{c}}$
(c) $c = \sqrt{K_a \alpha}$ (d) $c = \sqrt{\frac{\alpha}{K_a}}$

(viii) The highest acidic compound among the following is ____.



(ix) The formula used to calculate molar conductivity of an electrolyte is ____.

- (a) $\Lambda = \frac{1000c}{k}$ (b) $c = \frac{1000\Lambda}{k}$
(c) $\Lambda = \frac{1000k}{c}$ (d) $k = \frac{1000}{\Lambda c}$

(x) Which of the following is a secondary amine?

- (a) Cyclohexylamine
(b) Isopropylamine
(c) Diphenylamine
(d) N, N-Dimethylaniline

Q. 2. Answer the following questions :

[8]

- (i) Write the structural formula of N, N-dimethylethan-amine.
- (ii) Write the reagents used for the reduction of carbonyl group in Clemmensen's reduction.
- (iii) Write the IUPAC name of isoprene.
- (iv) The rate law equation for $A \rightarrow \text{Product}$, is $\text{rate} = k[A]^x$
What is the effect of increase in concentration of 'A' on rate of reaction, if $x < 0$?
- (v) What is the molality of an aqueous solution of KBr having freezing point -3.72°C (K_f for water is $1.86 \text{ K kg mol}^{-1}$)?
- (vi) Write the balanced chemical equation, when excess of ammonia is treated with chlorine.
- (vii) Write the number of donor atoms present in EDTA, during formation of complex.
- (viii) Write the names of the metal elements in brass alloy.

SECTION - B

Attempt any EIGHT of the following questions :

[16]

- Q. 3.** Derive the relation between half life and rate constant for a first order reaction.
- Q. 4.** (a) State Henry's law.
(b) Define : Osmotic pressure
- Q. 5.** Write the differences between lanthanoids and actinoids.

- Q. 6.** Write anomalous behaviour of oxygen with respect to :
- Atomicity
 - Oxidation state
 - Magnetic property
 - Nature of hydrides.
- Q. 7.** What is the action of :
- Liquid bromine in acetic acid on anisole.
 - Soda-lime on sodium acetate?
- Q. 8.** Calculate the work done in kJ in a reaction, if volume of the reactant decreases from 8 dm³ to 4 dm³ against 43 bar pressure.
[1 dm³. bar = 100J]
- Q. 9.** Explain ionization isomers with suitable example in complexes.
- Q. 10.** Write preparation of glucose from sucrose.
- Q. 11.** How many coulombs of electricity is required to produce 1g of sodium metal by reduction of sodium ion?
- Q. 12.** Write the structural formula and IUPAC name of the alcohol having molecular formula C₄H₁₀O which does not undergo oxidation under normal condition.
- Q. 13.** Identify 'A' and 'B' in the following reaction and rewrite the complete reaction :
- $$\text{CH}_3 - \text{CH} = \text{CH}_2 \xrightarrow[\text{Peroxide}]{\text{HBr}} \text{A} \xrightarrow[\text{-KBr}]{\text{alcoholic KCN}} \text{B}$$
- Q. 14.** Write the reaction for the preparation of :
- acetaldehyde by Rosenmund reaction.
 - benzaldehyde by Gatterman-Koch formylation.

SECTION - C

Attempt any EIGHT of the following questions :

[24]

- Q. 15. Write the general electronic configuration of 3d series. Draw the structures of sulphuric acid and thiosulphuric acid.
- Q. 16. Define conjugate acid-base pair. The hydroxyl ion concentration in aqueous solution of NaOH is $2 \times 10^{-4} \text{ mol dm}^{-3}$. Calculate pH of the solution.
- Q. 17. What is atom economy? Explain any two applications of nanomaterials.
- Q. 18. What is peptide bond? How is it formed? Write the name and formula of the reagent used to convert alkylhalide to nitroalkane.
- Q. 19. (a) Write the reactions for the action of following reagents on phenol :
(i) Nitrating mixture
(ii) Zinc dust
(b) What is the action of phosphorous pentachloride on ethyl methyl ether?
- Q. 20. (a) Write the formula to calculate EAN.
(b) Explain formation of $[\text{Co}(\text{NH}_3)_6]^{3+}$ complex ion with respect to :
(i) Type of hybridisation
(ii) Magnetic property
- Q. 21. (a) Calculate spin only magnetic moment of M^{2+} ion.
[atomic number of M = 26]
(b) Write condensed electronic configuration of Gadolinium
[Z = 64].

- Q. 22.** (a) Write the reducing agents used to convert Fe_2O_3 to 'Fe' in the reduction zone of blast furnace.
- (b) Write chemical equations involved in :
 (i) Carbylamine reaction for ethylamine.
 (ii) Hoffmann Bromamide degradation for acetamide.
- Q. 23.** (a) Explain Cannizzaro's reaction with the help of benzaldehyde.
- (b) Write the reaction for the conversion of cyclohexene to adipic acid.
- Q. 24.** Define zero order reaction.
 A reaction takes place in two steps :
 (i) $\text{NO(g)} + \text{Cl}_2\text{(g)} \rightarrow \text{NOCl}_2\text{(g)}$
 (ii) $\text{NOCl}_2\text{(g)} + \text{NO(g)} \rightarrow 2\text{NOCl(g)}$
 Write the overall reaction and identify the reaction intermediate.
- Q. 25.** ΔH for formation of ethane gas is -84.4 kJ at 300 K . Calculate ΔU for the reaction.
- Q. 26.** Mention the types of polymers formed on the basis of intermolecular forces. Write any two uses of low density polyethylene.

SECTION - D

Attempt any THREE of the following questions :

[12]

- Q. 27.** (a) An element with molar mass 27 g/mol forms a cubic unit cell with edge length 405 pm . If density of the crystal is 2.7 g cm^{-3} , identify the type of unit cell.
- (b) Derive the equation of Raoult's law for binary solution containing non-volatile solute.

- Q. 28.** (a) State whether entropy change is positive or negative in the following examples :
- (i) Melting of ice
 - (ii) Vaporisation of a liquid
- (b) Explain 'common ion effect' with example.
- Q. 29.** Draw a neat and labelled diagram of a lead accumulator cell. Write the overall reactions taking place at cathode and anode during discharging of the cell.
- Q. 30.** (a) Define a unit cell.
- Which colour is shown by NaCl crystal due to formation of F-centre?
- (b) Why does fluorine show anomalous behaviour in '17 group' elements?
- Q. 31.** (a) Write salient features of SN^2 mechanism.
- (b) What is the action of following reagents on bromomethane :
- (i) bromobenzene
 - (ii) mercurous fluoride

