DAY — 08 SEAT NUMBER | 0 | 0 | 9 | 7 | 9 | 2 |

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 J/K/mol

(ii) Atomic mass Na = 23

(iii) K_f for water = 1.86 K kg mol^{-1}

(iv) 1F = 96500C

(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 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) $[CoCl_2(NH_3)_4]Cl$ (b) $[CoCl(NH_3)_5]Cl_2$

(c) $[CoCl_3(NH_3)_3]$ (d) $[Co(NH_3)_6]Cl_3$

(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

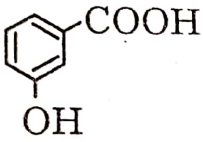
(c) Nanofilms (d) Nanorods

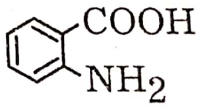
(vii) Which formula co-relates degree of dissociation and concentration of electrolyte?

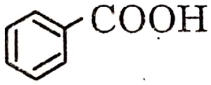
(a) $c = \sqrt{\frac{Ka}{\alpha}}$ (b) $\alpha = \sqrt{\frac{Ka}{c}}$

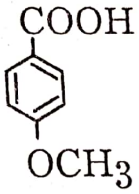
(c) $c = \sqrt{K_a \alpha}$ (d) $c = \sqrt{\frac{\alpha}{K_a}}$

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

(a) 

(b) 

(c) 

(d) 

(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-dimethylethanamine.

(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→Product, is 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 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 :

(i) Atomicity

(ii) Oxidation state

(iii) Magnetic property

(iv) Nature of hydrides.

Q. 7. What is the action of :

(i) Liquid bromine in acetic acid on anisole.

(ii) Soda-lime on sodium acetate?

Q. 8. Calculate the work done in kJ in a reaction, if volume of the reactant decreases from 8 dm^3 to 4 dm^3 against 43 bar pressure.
[1 dm^3. 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 $C_4H_{10}O$ which does not undergo oxidation under normal condition.

Q. 13. Identify 'A' and 'B' in the following reaction and rewrite the complete reaction :

$$CH_3 \cdot CH = CH_2 \xrightarrow[\text{Peroxide}]{\text{HBr}} A \xrightarrow[\text{-KBr}]{\text{alcoholic KCN}} B$$

Q. 14. Write the reaction for the preparation of :

(i) acetaldehyde by Rosenmund reaction.

(ii) benzaldehyde by Gatterman-Koch formylation.

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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 2×10^{-4} 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 pentacholoride on ethyl methyl ether?

Q. 20. (a) Write the formula to calculate EAN.

(b) Explain formation of $[CO(NH_3)_6]^{3+}$ 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) $NO(g) + Cl_2(g) \rightarrow NOCl_2(g)$

(ii) $NOCl_2(g) + NO(g) \rightarrow 2NOCl(g)$

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.

P.T.O

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

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