

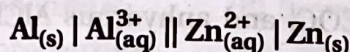
Time : 1 Hour]

PART - A

[Total Marks : 50

❖ Select the following questions with proper alternative and answer it :

- 1) Which Nernst equation is correct for the following cell ?



(A) $E_{\text{cell}} = E_{\text{cell}}^0 - \frac{0.059}{3} \log \frac{[\text{Al}^{3+}]^3}{[\text{Zn}^{2+}]^2}$

(B) $E_{\text{cell}} = E_{\text{cell}}^0 - \frac{0.059}{6} \log \frac{[\text{Zn}^{2+}]^3}{[\text{Al}^{3+}]^2}$

(C) $E_{\text{cell}} = E_{\text{cell}}^0 - \frac{0.059}{6} \log \frac{[\text{Al}^{3+}]^2}{[\text{Zn}^{2+}]^3}$

(D) $E_{\text{cell}} = E_{\text{cell}}^0 - \frac{0.059}{2} \log \frac{[\text{Al}^{3+}]^2}{[\text{Zn}^{2+}]^3}$

- 2) If value of rate constant $K = 2.3 \times 10^{-5} \text{ L mol}^{-1} \text{ s}^{-1}$ then identify the reaction order :

- (A) First order (B) Third order
(C) Second order (D) Zero order

- 3) What is the slop of plot between $\ln K \rightarrow \frac{1}{T}$ according to Arrhenius equation ?

- (A) $\frac{-E_a}{R}$ (B) $\frac{K}{2.303}$ (C) $-\frac{2.303E_a}{R}$ (D) $\ln A$

- 4) A reaction is first order in A and second order in B. How many times the rate constant affected on increasing the concentration of B three times.

- (A) 6 times increases (B) 9 times increases
(C) 9 times decreases (D) 6 times decreases

- 5) Which statement is true with respect to catalyst ?

- (A) It increases value of activation energy.
(B) It increases equilibrium constant.
(C) Does not alter Gibbs energy.
(D) It increases potential energy barrier.

- 6) Which of the relation is correct for zero order reaction ?

(A) $t_{1/2} \propto \frac{1}{[R]_0}$

(B) $t_{1/2} \propto \frac{1}{[R]_0^2}$

(C) $t_{1/2} \propto [R]_0^2$

(D) $t_{1/2} \propto [R]_0$

- 7) What is the magnetic moment of a divalent ion in aqueous solution if its atomic number is 28 ?

- (A) 1.73 BM (B) 2.84 BM (C) 3.87 BM (D) 4.90 BM

- 8) Which transition element does not exhibit variable oxidation states ?

- (A) Copper (B) Nickel
(C) Chromium (D) Scandium

- 9) What is the formula of Manganate ion ?

- (A) MnO_4^{2-} (B) MnO_4^- (C) MnO_2 (D) Mn^{2+}

- 10) When acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution is added to Sn^{2+} salt then Sn^{2+} changes to

- (A) Sn (B) Sn^{3+} (C) Sn^{4+} (D) Sn^+

- 11) Primary and Secondary valency of Co in the complex compound $[\text{Co}(\text{en})_3]\text{Cl}_3$ is respectively.....

- (A) 3, 3 (B) 3, 6 (C) 2, 3 (D) 4, 6

- 12) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Cl}$ are which type of isomers ?

- (A) Solvate isomer (B) Linkage isomer
(C) Ionisation isomer (D) Coordination isomer

- 13) How many number of unpaired electrons are there in complex ion $[\text{Ni}(\text{CN})_4]^{2-}$?

- (A) 2 (B) 3 (C) 4 (D) 0

- 14) Which of the following is an ambidentate ligand ?

- (A) SCN^- (B) $\text{C}_2\text{O}_4^{2-}$
(C) H_2O (D) $[\text{EDTA}]^{4-}$

- 15) Amongst the following, the most stable complex is

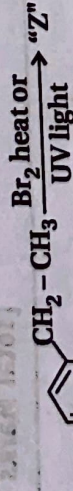
- (A) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ (B) $[\text{Fe}(\text{NH}_3)_6]^{3+}$
(C) $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$ (D) $[\text{FeCl}_6]^{3-}$

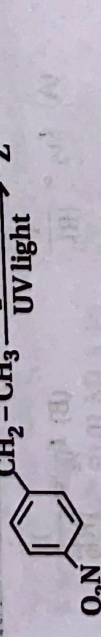
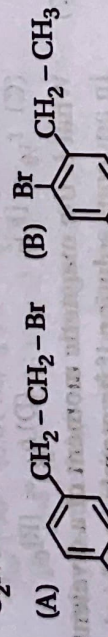
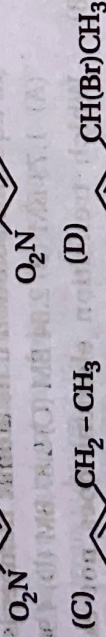
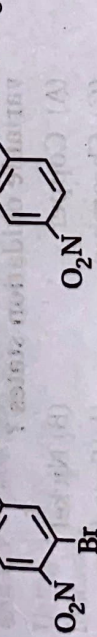
- 16) Predict the order of reactivity of the following compounds in $\text{S}_{\text{N}}1$ reaction.

- (i) $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{CH}_3$
(ii) $(\text{CH}_3)_2\text{CHCH}_2\text{Br}$ (iii) $(\text{CH}_3)_3\text{CBr}$

- (A) (i) < (ii) < (iii) (B) (ii) < (i) < (iii)
(C) (iii) < (ii) < (i) (D) (iii) < (i) < (ii)

- 17) Which reagent is not used in Swartz reaction ?
 (A) AgF (B) SbF₃ (C) HF (D) CoF₂
- 18) Which is the major product "Z" in the following reaction ?

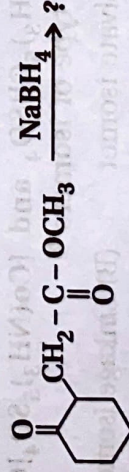


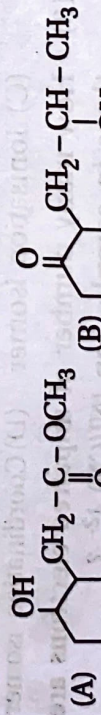
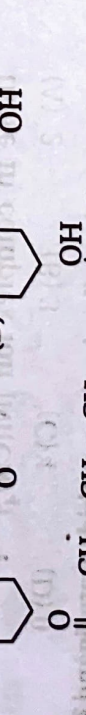
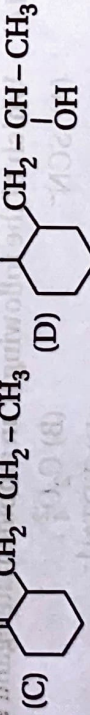
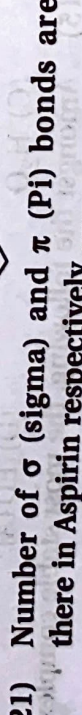
- (A)  (B) 
- (C)  (D) 

- 19) Name the following compounds according to IUPAC system.



- (A) 2, 5-Dimethylhexane-4,6-diol
 (B) 2-Methyl-4-hydroxy, 5-(methyl alcohol)hexane
 (C) 2, 5-Dimethylhexane-1, 3-diol
 (D) 5-Methyl-3-hydroxy(methyl alcohol) hexane
- 20) Write the structure of the product of the following reaction.



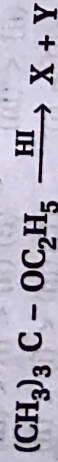
- (A)  (B) 
- (C)  (D) 

- 21) Number of σ (sigma) and π (Pi) bonds are there in Aspirin respectively

- 22) Which is the final product of Reimer-Tiemann reaction ?

- (A) Salicylic acid (B) Aspirin
 (C) Salicylaldehyde (D) Phenol

- 23) Predict the products 'X' and 'Y' of the following reaction respectively.

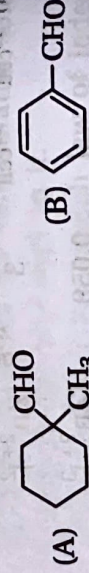
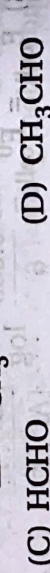


- (A) C₄H₁₀ + C₂H₆
 (B) (CH₃)₃C - I + C₂H₅OH
 (C) (CH₃)₃C - OH + C₂H₅I
 (D) (CH₃)₃C - I + CH₃OH

- 24) Which reagent is used in preparation of benzene to benzaldehyde by Gatterman - Koch reaction ?

- (A) CO, HCl and anhydrous AlCl₃
 (B) SnCl₂ and HCl
 (C) CH₃COCl and anhydrous AlCl₃
 (D) CrO₂Cl₂ and CS₂

- 25) Cannizzaro reaction is not given by....

- (A)  (B) 
- (C) HCHO (D) CH₃CHO

- 26) Which product is obtained when cyclopentanone reacts with hydroxyl amine in acidic medium ?

- (A) Cyclopentanone hydrazone
 (B) Cyclopentanol
 (C) Cyclopentanoneoxime
 (D) Cyclopentanamide

- 27) Which of the following compound gives Iodoform reaction ?

- (A) Pent-3-one (B) Acetone
 (C) Propanal (D) Benzophenone

- 28) Which of the following compound has highest K_a Value ?

- (A) CCl₃COOH (B) BrCH₂COOH
 (C) NO₂CH₂COOH (D) CH₃COOH

- 29) Which product is obtained on heating sodium acetate with sodalime ?

- (A) Ethane (B) Propane
 (C) Butane (D) Methane

- 30) Which of the following compound gives carbyl amine test ?

- (A) Ethanamide (B) Methylamine
 (C) Isopropylamine (D) Trimethylamine

- 31) Which reagent is used to distinguish between secondary and tertiary amines ?

- (A) Hinsberg's reagent (B) Tollens reagent
 (C) Nessler reagent (D) Schiff's reagent

- 32) Which order for solubility in water of the following compounds is correct ?

- (A) $(C_2H_5)_2NH < C_6H_5NH_2 < C_2H_5NH_2$
 (B) $C_2H_5NH_2 < (C_2H_5)_2NH < C_6H_5NH_2$
 (C) $C_6H_5NH_2 < C_2H_5NH_2 < (C_2H_5)_2NH$
 (D) $C_6H_5NH_2 < (C_2H_5)_2NH < C_2H_5NH_2$

33) Give IUPAC name of the product due to acetylation of aniline.

- (A) Acetanilide (B) N-Phenylethanamide
 (C) Acetyl benzene (D) N-methylbenzamide

34) Which product is not obtain by Sandmeyer reaction ?

- (A) Iodobenzene (B) Bromobenzene
 (C) Chlorobenzene (D) Cynobenzene

35) Which amide gives propanamine by Hoffmann bromamide reaction ?

- (A) Propanamide (B) Ethanamide
 (C) Butanamide (D) Pentanamide

36) What is the hydrolysis product of Lactose ?

- (A) Galactose and Glucose
 (B) Glucose and Fructose
 (C) Glucose and Glucose
 (D) Galactose and Fructose

37) Which of the following acid is Vitamin ?

- (A) Adipic acid (B) Picric acid
 (C) Ascorbic acid (D) Aspartic acid

38) Hydrogen bond is present in which two pair of bases in double helix structure of DNA ?

- (A) Adenine and Cytosine
 (B) Adenine and Thymine
 (C) Guanine and Thymine
 (D) Cytosine and Thymine

39) Which amino acid is not optically active ?

- (A) Glycine (B) Alanine (C) Leucine (D) Valine

40) Which one is an example of solid solution ?

- (A) Camphor in nitrogen gas
 (B) Glucose dissolved in water
 (C) Copper dissolved in gold
 (D) Ethanol dissolved in water

41) If 22 gm of benzene (C_6H_6) dissolved in 122 gm of carbon tetrachloride (CCl_4) calculate the mass percentage of benzene.

- (A) 15.28% (B) 18.03% (C) 84.72% (D) 28.20%

42) We have three aqueous solutions of NaCl labelled as 'A', 'B' and 'C' with concentrations 0.1 M, 0.01 M and 0.001 M respectively. The value of Von't Hoff factor for these solution will be in the order

- (A) $i_A < i_B < i_C$ (B) $i_A > i_B > i_C$
 (C) $i_A = i_B = i_C$ (D) $i_A < i_B > i_C$

43) For 1 molal aqueous solution of glucose which one is correct ?

- (A) $\Delta T_b > K_b$ (B) $\Delta T_b < K_b$
 (C) $\Delta T_b \neq K_b$ (D) $\Delta T_b = K_b$

44) Which one is an example of ideal solution of the following ?

- (A) Ethanol and Acetone
 (B) Benzene and Toluene
 (C) Chloroform and Acetone
 (D) Water and Ethanol

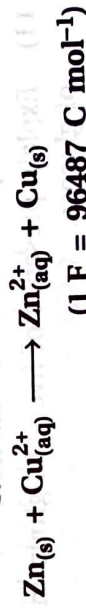
45) An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because....

- (A) It gains water due to osmosis.
 (B) It loses water due to reverse osmosis.
 (C) It gains water due to reverse osmosis.
 (D) It loses water due to osmosis.

46) An electrochemical cell can be behave like an electrolytic cell when

- (A) $E_{\text{cell}} = 0$ (B) $E_{\text{cell}} > E_{\text{ext}}$
 (C) $E_{\text{ext}} > E_{\text{cell}}$ (D) $E_{\text{cell}} = E_{\text{ext}}$

47) The standard electrode potential for Daniell cell is 1.1 V. What will be the value of standard Gibbs energy for the reaction :



- (A) -212.27 kJ mol⁻¹ (B) 212.27 kJ mol⁻¹
 (C) -106.14 kJ mol⁻¹ (D) 106.14 kJ mol⁻¹

48) The quantity of charge required to obtain 2 mole of aluminium from Al_2O_3 .

- (A) 1 F (B) 6 F (C) 3 F (D) 2 F

49) In Mercury cell which of the following acts as a cathode ?

- (A) Paste of HgO and Carbon
 (B) Zinc and mercury amalgam
 (C) Paste of ZnO and Carbon
 (D) Paste of NH_4Cl and $ZnCl_2$

50) Δ_m° for NaCl, HCl and NaAc are 126.4, 425.9 and 91.0 S cm² mol⁻¹ respectively. Calculate Δ° for HAc.

- (A) 643.3 S cm² mol⁻¹ (B) 208.5 S cm² mol⁻¹
 (C) 461.3 S cm² mol⁻¹ (D) 390.5 S cm² mol⁻¹

Section - A

- ◆ Write the answer of any 8 questions from given question number 1 to 12. (Each of 2 marks) [16]
- Write reaction equation occurs at anode and cathode in Dry cell.
 - 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 318 K. 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 318K.
 - Explain lanthanoid contraction.
 - What are interstitial compounds. Write its any two characteristics.
 - Write main postulates of Werner's theory of coordination compounds.
 - Write the IUPAC names of the following coordination compounds :
(i) $K_3[Cr(C_2O_4)_3]$ (ii) $[CoCl_2(en)_2]Cl$
 - Explain Finkelstein reaction.
 - Write two step conversion from benzene to diphenyl.
 - Explain production of phenol from cumene.
 - Explain reactivity of aldehyde and ketones in nucleophilic addition reaction.
 - Explain presence of five -OH group in structure of glucose.
 - Differentiate between globular protein and fibrous protein.

Section - B

- ◆ Write the answer of any 6 questions from given question number 13 to 21. (Each of 3 marks) [18]
- Derive equation of Raoult's law for vapour pressure of liquid-liquid solution and give its conclusion.
 - Write the Nernst equation and calculate emf of the following cell at 298 K.
 $Pt(s) | H_2(g) | H^+ (0.030 \text{ M}) || Br^- (0.010 \text{ M}) | Br_2(l) | Pt(s)$
 $E^\circ_{Br_2/Br^-} = 1.09 \text{ volt}$
 - The rate constants of a reaction at 500K and 700K are 0.02 s^{-1} and 0.07 s^{-1} respectively. Calculate the values of E_a and A . [$R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$]
 - Describe the preparation of potassium dichromate from iron chromite ore. What is the

effect of increasing pH on a solution of potassium dichromate.

- Primary alkylhalide C_4H_9Br (a) reacted with alcoholic KOH to give compound (b). Compound (b) is reacted with HBr to give (c) which is an isomer of (a). When (a) is reacted with sodium metal it gives compound (d), C_8H_{18} which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (a) and write the equations for all the reactions.
- Write only chemical equation of method of preparation of 1°, 2° and 3° alcohol from Grignard reagent.
- What is cross aldol condensation ? Write structural formula and name of four possible aldol condensation products from propanal and ethanal.
- Explain Gabriel phthalimide synthesis.
- Explain reaction of nitrous acid with primary aliphatic amine and primary aromatic amine.

Section - C

- ◆ Write the answer of any 4 questions from given question number 22 to 27. (Each of 4 marks) [16]
- 4g of benzoic acid (C_6H_5COOH) dissolved in 50g of benzene shows a depression in freezing point equal to 1.62 K. Molal depression constant for benzene is $4.9 \text{ K kg mol}^{-1}$. What is the percentage association of acid if it forms dimer in solution? (Molar mass of benzoic acid is $= 122 \text{ g mol}^{-1}$)
 - What is corrosion. Explain chemistry of corrosion of iron and give its prevention.
 - Derive the formula for rate constant (K) and half life period ($t_{1/2}$) for first order reaction.
 - $[CoF_6]^{3-}$ is paramagnetic while $[Ni(CN)_4]^{2-}$ is diamagnetic, explain on the basis of valance bond theory.
 - Give equations of the following reactions :
(i) When tertiary butyl alcohol heated at $573K$ in presence of copper (Cu)
(ii) Bromine in CS_2 with phenol
(iii) Dilute HNO_3 with phenol
(iv) Oxidation of phenol with chromic acid
 - Write short note on : (i) Fehling Test
(ii) Hell-Volhard-Zelinsky reaction