

Time : 1 Hour]

PART - A

[Total Marks : 50

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

1) Time taken to complete zero order reaction is... [March-2023]

- (A)  $\frac{[R]_0}{2k}$  (B)  $\frac{2k}{[R]_0}$  (C)  $\frac{[R]_0}{k}$  (D)  $\frac{k}{[R]_0}$

2) The unit of molal elevation constant is .....

- (A)  $K \text{ kg mol}^{-1}$  or  $K (\text{molality})^{-1}$   
 (B)  $\text{mol kg K}^{-1}$  or  $K^{-1} (\text{molality})$   
 (C)  $\text{kg mol}^{-1} K^{-1}$  or  $K^{-1} (\text{molality})^{-1}$   
 (D)  $K \text{ mol kg}^{-1}$  or  $K (\text{molality})$

3) How much water should be added at 25°C to 2% W/V, 1 liter NaOH solution so as to make its concentration to 0.5 N ?

- (A) 5 liter (B) 2.5 liter (C) 1 liter  
 (D) No need to add water

4) Out of the following solutions which shows negative deviation from Raoult's law ?

- (A) Chloroform and Acetone  
 (B) Carbon disulphide and Acetone  
 (C) Hexane and Heptanes  
 (D) Benzene and Toluene

5) The quantity of charge required to obtain one mole of aluminium from  $\text{Al}_2\text{O}_3$  is .....

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

6) Which of the following cell is different in terms of principle ?

- (A) Storage cell (B) Electrolytic cell  
 (C) Fuel cell (D) Leclanche cell

7) What is symbolic representation of given following reactions.

- $\text{Fe}_{(s)} + \text{Cd}_{(aq)}^{2+} \rightleftharpoons \text{Fe}_{(aq)}^{2+} + \text{Cd}_{(s)}$   
 (A)  $\ominus \text{Fe}_{(s)} | \text{Fe}^{2+}_{(1M)} || \text{Cd}_{(s)} | \text{Cd}^{2+}_{(1M)} \oplus$   
 (B)  $\ominus \text{Cd}_{(s)} | \text{Cd}^{2+}_{(1M)} || \text{Fe}^{2+}_{(1M)} | \text{Fe}_{(s)} \oplus$   
 (C)  $\ominus \text{Cd}_{(s)} | \text{Cd}^{2+}_{(1M)} || \text{Fe}_{(s)} | \text{Fe}^{2+}_{(1M)} \oplus$   
 (D)  $\ominus \text{Fe}_{(s)} | \text{Fe}^{2+}_{(1M)} || \text{Cd}^{2+}_{(1M)} | \text{Cd}_{(s)} \oplus$

8) When in reaction concentration of reactant is 8 times increases then rate of reactant is doubled than what is order of reaction ?

9) A first order reaction takes 60 minutes for 60% completion. What time will it take for 50% completion ?

- (A) 45 minutes (B) 60 minutes  
 (C) 40 minutes (D) 50 minutes

10) Which complex compound contains  $dsp^2$  hybridization ?

- (A)  $\text{KMnO}_4$  (B)  $\text{K}_2[\text{Ni}(\text{CN})_4]$   
 (C)  $\text{K}_3[\text{Ni}(\text{CN})_4]$  (D)  $\text{K}_2[\text{NiCl}_4]$

11) Which of the following spectrochemical series is true ?

- (A)  $\text{SCN}^- < \text{NH}_3 < \text{F}^- < \text{en} < \text{CO}$   
 (B)  $\text{SCN}^- < \text{F}^- < \text{en} < \text{NH}_3 < \text{CO}$   
 (C)  $\text{SCN}^- < \text{F}^- < \text{NH}_3 < \text{en} < \text{CO}$   
 (D)  $\text{SCN}^- < \text{F}^- < \text{en} < \text{CO} < \text{NH}_3$

12) The shape of manganate ion is ..... [March-2023]

- (A) pyramidal (B) square planar  
 (C) tetrahedral (D) square pyramidal

13) Which compound has magnetic moment equal to 4.90 BM ? [March-2023]

- (A)  $\text{FeSO}_4$  (B)  $\text{NiSO}_4$   
 (C)  $\text{MnSO}_4$  (D)  $\text{Cr}_2(\text{SO}_4)_3$

14) Which oxidation state is common for lanthanoid elements ? [March-2023]

- (A) +4 (B) +3 (C) +2 (D) +5

15) Number of possible isomers for  $[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]^-$  are ..... [March-2023]

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

16) Which is correct formula of Wilkinson catalyst ? [March-2023]

- (A)  $[(\text{Ph}_3\text{P})_3 \text{RhCl}]$  (B)  $[(\text{Me}_3\text{P})_3 \text{RhCl}]$   
 (C)  $[(\text{Ph}_3\text{As})_3 \text{RhCl}]$  (D)  $[(\text{Me}_3\text{As})_3 \text{RhCl}]$

17) How many monochloro structural isomers expected to be formed on free radical monochlorination of iso-pentane ? [March-2023]

- (A) 2 (B) 4 (C) 3 (D) 5



- 18)  $R' - X \xrightarrow{Na/ether} 2, 3\text{-dimethylbutane}$  [March-2023]  
Identify R'.  
(A)  $(CH_3CH_2)_3C -$  (B)  $(C_2H_5)_2CH -$   
(C)  $(CH_3)_3C -$  (D)  $(CH_3)_2CH -$
- 19) Which compound has highest reactivity towards  $S_N2$  reaction? [March-2023]  
(A) 1-Bromobutane  
(B) 1-Bromo-2-methylbutane  
(C) 1-Bromo-2, 2-dimethylpropane  
(D) 1-Bromo-3-methylbutane
- 20) By which reaction Freon 12 is prepared from  $CCl_4$ ? [March-2023]  
(A) Wurtz reaction (B) Fittig reaction  
(C) Swarts reaction (D) Finkelstein reaction
- 21) Which compound will give yellow precipitate on reaction with sodium hypoiodite? [March-2023]  
(A) isobutyl alcohol (B) tert-Butyl alcohol  
(C) *n*-Butyl alcohol (D) sec-Butyl alcohol
- 22) Salicylaldehyde on heating with zinc dust give ..... organic product. [March-2023]  
(A) Benzoic acid (B) Benzaldehyde  
(C) Benzyl alcohol (D) Benzene
- 23) Which compound has highest value of  $pK_a$ ? [March-2023]  
(A) *p*-cresol (B) phenol  
(C) *o*-nitrophenol (D) *m*-nitrophenol
- 24) Which reagent is useful in the conversion of ethanenitrile to ethanal? [March-2023]  
(A) Anhydrous  $CrO_3$  (B) PCC  
(C) DIBAL-H (D)  $LiAlH_4$
- 25) How many  $\pi$ -electrons are present in phthalimide? [March-2023]  
(A) 6 (B) 12 (C) 5 (D) 10
- 26) Which salt is insoluble in water? [March-2023]  
(A)  $C_6H_5N_2^+Br^-$  (B)  $C_6H_5N_2^+BF_4^-$   
(C)  $C_6H_5N_2^+Cl^-$  (D)  $C_6H_5N_2^+HSO_4^-$
- 27) Which compound will not give ethanamine on reduction? [March-2023]  
(A) Ethanoyl chloride (B) Ethanamide  
(C) Ethanenitrile (D) Nitroethane
- 28) Which gas is evolved during the reaction of methyl amine with  $HNO_2$ ? [March-2023]  
(A)  $H_2$  (B)  $NH_3$  (C)  $N_2$  (D)  $NO_2$
- 29) Which reagent is used to distinguish aniline and benzylamine? [March-2023]  
(A)  $CHCl_3 + KOH$  (B)  $C_6H_5SO_2Cl$   
(C)  $CH_3COCl$ /pyridine (D)  $Br_2/H_2O$
- 30) Thyroxine produced in the thyroid gland is an iodinated derivative of ..... amino acid. [March-2023]  
(A) tyrosine (B) cysteine  
(C) glutamine (D) histidine
- 31) Which one acts as non-reducing sugar? [March-2023]  
(A) glucose (B) lactose (C) sucrose (D) maltose
- 32) Which polysaccharide is highly branched? [March-2023]  
(A) amylose (B) glycogen  
(C) cellulose (D) amylopectin
- 33) Which vitamin must be supplied regularly in diet? [March-2023]  
(A) Vitamin-D (B) Vitamin-K  
(C) Vitamin-E (D) Vitamin-C
- 34) Reduction of which of the following compounds will form product propan-2-ol?  
(A) Acetone (B) Propene  
(C) Acetaldehyde (D) Acetic acid
- 35) Complete the reaction :  
$$CH_3 - \underset{\text{CH}_3}{\text{CH}} - CH_2 - O - CH_2 - CH_3 + HI \xrightarrow{\Delta}$$
  
(A)  $CH_3 - \underset{\text{CH}_3}{\text{CH}} - CH_2OH + CH_3CH_3$   
(B)  $CH_3 - \underset{\text{CH}_3}{\text{CH}} - CH_3 + CH_3CH_2OH$   
(C)  $CH_3 - \underset{\text{CH}_3}{\text{CH}} - CH_2OH + CH_3CH_2I$   
(D)  $CH_3 - \underset{\text{CH}_3}{\text{CH}} - CH_2 - I + CH_3CH_2OH$



- 36) The correct order of increasing acidic strength is....
- (A) Phenol < Ethanol < Chloroacetic acid < Acetic acid  
 (B) Ethanol < Phenol < Chloroacetic acid < Acetic acid  
 (C) Ethanol < Phenol < Acetic acid < Chloroacetic acid  
 (D) Chloroacetic acid < Acetic acid < Phenol < Ethanol
- 37) Which of the following can form iodoform ?  
 (A)  $\text{CH}_3\text{COOH}$  (B)  $\text{HCHO}$   
 (C)  $\text{CH}_3\text{COCH}_2\text{CH}_3$  (D)  $\text{CH}_3\text{OH}$
- 38) Which of the following substance is useful as perfumery industry ?  
 (A) Acetaldehyde (B) Formaldehyde  
 (C) Benzaldehyde (D) Acetone
- 39) Which of the following is a disproportionation redox reaction (process) ?  
 (A)  $2\text{CH}_3\text{CHO} \xrightarrow{\text{dil. NaOH}}$   
 (B)  $2\text{HCHO} \xrightarrow{50\% \text{NaOH(aq)}}$   
 (C)  $2\text{CH}_3\text{COCH}_3 \xrightarrow{\text{Mg-Hg}} \text{H}_2\text{O}$   
 (D)  $2\text{CH}_3\text{COOH} \xrightarrow{\text{P}_2\text{O}_5/\Delta}$
- 40)  $\text{CH}_3 - \text{CH}_2 - \text{NH}_2 + \text{CHCl}_3 + 3\text{KOH} \xrightarrow{\Delta} \text{X} + 3\text{KCl} + 3\text{H}_2\text{O}$   
 What is X ?  
 (A) Ethyl isocyanide (B) Ethyl cyanide  
 (C) Propane nitrile (D) Ethanamide
- 41) Which out of following is correct order of compounds in their basic strength ?  
 (A)  $(\text{C}_2\text{H}_5)_2\text{NH} > \text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3 > \text{C}_6\text{H}_5\text{NH}_2$   
 (B)  $\text{C}_6\text{H}_5\text{NH}_2 > \text{NH}_3 > \text{C}_2\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_2\text{NH}$   
 (C)  $\text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3 > (\text{C}_2\text{H}_5)_2\text{NH} > \text{C}_6\text{H}_5\text{NH}_2$   
 (D)  $\text{NH}_3 > \text{C}_2\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_2\text{NH} > \text{C}_6\text{H}_5\text{NH}_2$
- 42) Elevation in boiling point of the aqueous solution of 0.01 M urea is ..... [March-2023]  
 (A) approximately three times  
 (B) equal  
 (C) approximately twice  
 (D) approximately half
- 43) If the solubility product of CuS is  $9 \times 10^{-16}$  then what will be maximum molarity of CuS in aqueous solution ? [March-2023]  
 (A)  $3 \times 10^{-8}$  M (B)  $5 \times 10^{-7}$  M  
 (C)  $6 \times 10^{-12}$  M (D)  $2 \times 10^{-10}$  M

- 44) Which mixture shows negative deviation from Raoult's law ? [March-2023]

- (A) Hexane and Heptane  
 (B) Carbon disulphide and Acetone  
 (C) Phenol and Aniline  
 (D) Ethanol and Acetone

- 45) Which species is obtained at anode on electrolysis of aqueous solution containing higher concentration of  $\text{H}_2\text{SO}_4$  ? [March-2023]

- (A)  $\text{S}_2\text{O}_8^{2-}$  (B)  $\text{SO}_3^{2-}$  (C)  $\text{SO}_2$  (D)  $\text{S}_2\text{O}_3^{2-}$

- 46) Which substance is used as cathode in mercury cell ? [March-2023]

- (A)  $\text{HgO} + \text{KOH}$  (B)  $\text{ZnO} + \text{Pt}$   
 (C)  $\text{HgO} + \text{C}$  (D)  $\text{ZnO} + \text{NaOH}$

- 47) If  $E^\circ \text{Fe}^{3+}/\text{Fe} = x\text{V}$  and  $E^\circ \text{Fe}^{2+}/\text{Fe} = y\text{V}$  then what will be the value of  $E^\circ \text{Fe}^{3+}/\text{Fe}^{2+}$  ? [March-2023]

- (A)  $2x + y$  (B)  $3x + 2y$  (C)  $x - y$  (D)  $3x - 2y$

- 48) In which of the following condition reduction potential of hydrogen half cell will be negative ? [March-2023]

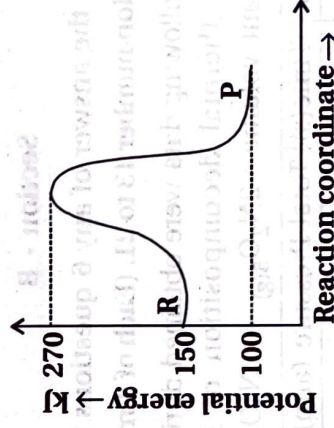
- (A)  $\text{PH}_2 = 1 \text{ atm}$  and  $[\text{H}^+] = 1\text{M}$   
 (B)  $\text{PH}_2 = 2 \text{ atm}$  and  $[\text{H}^+] = 1\text{M}$   
 (C)  $\text{PH}_2 = 2 \text{ atm}$  and  $[\text{H}^+] = 2\text{M}$   
 (D)  $\text{PH}_2 = 1 \text{ atm}$  and  $[\text{H}^+] = 2\text{M}$

- 49) What will be the unit of rate constant for following reaction ? [March-2023]



- (A)  $\text{mol}^{-1} \text{L S}^{-1}$  (B)  $\text{S}^{-1}$   
 (C)  $\text{mol L}^{-1} \text{S}^{-1}$  (D)  $\text{mol}^{-2} \text{L}^2 \text{S}^{-1}$

- 50) For  $\text{R} \rightarrow \text{P}$  reaction, following graph is given.



- What will be enthalpy change for the given reaction ? [March-2023]

- (A)  $-50 \text{ kJ}$  (B)  $50 \text{ kJ}$  (C)  $120 \text{ kJ}$  (D)  $170 \text{ kJ}$



## Section - A

- ◆ Write the answer of any 8 questions from given question number 1 to 12. (Each of 2 marks) [16]
- How catalyst increases the rate of reaction ? Explain it by graph. [March-2023]
  - Write the isomers of the compound having formula  $C_4H_9Br$ .
  - Explain the nature of bonding in metal carbonyls. [March-2023]
  - Write down chemical equations to prepare following substance from 1-Chloropropane.
    - Propene
    - Propan-1-ol
 [March-2023]
  - Write down chemical equations to prepare orange and yellow dye from diazonium salt. [March-2023]
  - Write down structural difference between DNA and RNA (Any two points) [March-2023]
  - What is the effect of denaturation on the structure of proteins ? [March-2023]
  - Explain co-ordination isomerism.
  - Give chemical reaction from Butan-2-ol from acetaldehyde conversion.
  - Explain : Decarboxylation
  - Calculate  $\Delta G$  and  $E_{cell}$  for the following cell at 298 K temperature.
 
$$Al_{(s)} | Al^{3+} (0.01 M) || Fe^{2+} (0.02 M) | Fe_{(s)}$$

$$[E^{\ominus}_{Al^{3+}/Al} = -1.66 V \text{ and } E^{\ominus}_{Fe^{2+}/Fe} = -0.44 V]$$
  - Hund's rule to derive the electronic configuration of  $Ce^{3+}$  ion, and calculate its magnetic moment on the basis of 'spin-only' formula.

## Section - B

- ◆ Write the answer of any 6 questions from given question number 13 to 21. (Each of 3 marks) [18]
- 13) The following data were obtained during the first order thermal decomposition of  $N_2O_5(g)$  at constant volume :  $2N_2O_5(g) \rightarrow 2N_2O_4(g) + O_2(g)$

S.No.	Time(s)	Total Pressure (atm)
1.	0	0.5
2.	100	0.512

Calculate the rate constant. [March-2023]

- Give reason :
  - Transition elements exhibit higher enthalpies of atomisation.
  - In aqueous solution  $Cr^{2+}$  is stronger reducing agent than  $Fe^{2+}$ .
  - The second ionisation enthalpy of  $Cu$  is higher than  $Zn$ .
 [March-2023]
- Explain dehydration reaction of alcohol to form alkene. [March-2023]
- Henry's law constant for  $CO_2$  in water is  $1.67 \times 10^8$  Pa at 298 K. Calculate the quantity of  $CO_2$  in 500 mL of soda water when packed under 2.5 atm  $CO_2$  pressure at 298 K.
- Derive Nernst equation for calculating  $E_{cell}$  of when there is change in concentration of  $Zn^{2+}$  and  $Cu^{2+}$ .
- Explain the formation of arylhalide by Sandmeyer process from amine compounds.
- Write a note on reaction occurred in hydrocarbon part of carboxylic acid or Write a note on Hell-Volhard-Zelinsky reaction.
- Give the conversions (in three step) : Aniline to 2,4,6-tribromofluorobenzene
- Arrange the following :
  - In decreasing order of the  $pK_b$  values :  $C_2H_5NH_2$ ,  $C_6H_5NHCH_3$ ,  $(C_2H_5)_2NH$  and  $C_6H_5NH_2$
  - In decreasing order of basic strength in gas phase :
  - In increasing order of solubility in water :  $C_2H_5NH_2$ ,  $(C_2H_5)_2NH$ ,  $C_2H_5NH_2$

## Section - C

- ◆ Write the answer of any 4 questions from given question number 22 to 27. (Each of 4 marks) [16]
- 22) Vapour pressure of Chloroform ( $CHCl_3$ ) and dichloromethane ( $CH_2Cl_2$ ) at 298 K are 200 mm Hg and 415 mm Hg respectively. [March-2023]
- Calculate the vapour pressure of the solution prepare by mixing 50 g of  $CHCl_3$  and 30 g of  $CH_2Cl_2$  at 298 K.



