

Time : 1 Hour]

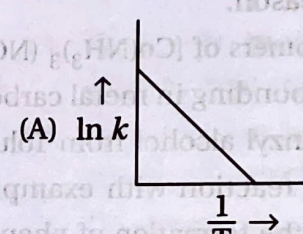
PART - A

[Total Marks : 50

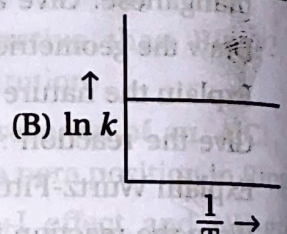
- ❖ Select the following questions with proper alternative and answer it :
- Which of the following is an example of a solid solution in which the solute is a gas ? [March-2020]
    - Amalgam of mercury with sodium
    - Camphor in nitrogen gas
    - Solution of hydrogen in palladium
    - Oxygen dissolved in water
  - We have three aqueous solutions of NaCl labelled 'A', 'B' and 'C' with concentrations 0.1 M, 0.01 M and 0.01 M respectively. The value of Van't Hoff factor for these solutions will be in the order ..... [March-2020]
    - $i_C = i_B = i_A$
    - $i_C > i_B > i_A$
    - $i_A = i_C = i_B$
    - $i_B > i_A > i_C$
  - An electrochemical cell can behave like an electrolytic cell when ..... [March-2020]
    - $E_{\text{cell}} < E_{\text{ext}}$
    - $E_{\text{cell}} > E_{\text{ext}}$
    - $E_{\text{cell}} = E_{\text{ext}}$
    - $E_{\text{cell}} = 0$
  - Which is increasing order of the reducing power of the following metals on the basis of standard electrode potential ? [March-2020]
 

$\text{Ag}^+ / \text{Ag} = 0.80 \text{ V}$        $\text{Mg}^{2+} / \text{Mg} = -2.37 \text{ V}$   
 $\text{Hg}^{2+} / \text{Hg} = 0.79 \text{ V}$        $\text{Cr}^{3+} / \text{Cr} = -0.74 \text{ V}$

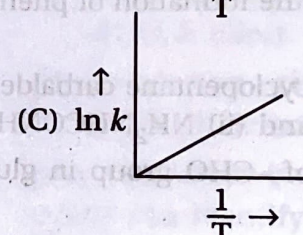
    - $\text{Hg} < \text{Ag} < \text{Mg} < \text{Cr}$
    - $\text{Cr} < \text{Mg} < \text{Ag} < \text{Hg}$
    - $\text{Mg} < \text{Cr} < \text{Hg} < \text{Ag}$
    - $\text{Ag} < \text{Hg} < \text{Cr} < \text{Mg}$
  - $\Delta_m^\circ(\text{HAc})$  is equal to ..... [March-2020]
    - $\Delta_m^\circ(\text{AcH}) + \Delta_m^\circ(\text{KAc}) + \Delta_m^\circ(\text{NaAc})$
    - $\Delta_m^\circ(\text{HCl}) + \Delta_m^\circ(\text{NaAc}) - \Delta_m^\circ(\text{NaCl})$
    - $\Delta_m^\circ(\text{KCl}) + \Delta_m^\circ(\text{KAc}) - \Delta_m^\circ(\text{HCl})$
    - $\Delta_m^\circ(\text{KCl}) + \Delta_m^\circ(\text{NaAc}) - \Delta_m^\circ(\text{NaCl})$
  - While charging the lead storage battery : [March-2020]
    - $\text{PbSO}_4$  on cathode is changed to Pb.
    - $\text{PbSO}_4$  on anode is changed to Pb.
    - $\text{PbSO}_4$  on cathode is changed to  $\text{PbO}$ .
    - $\text{PbSO}_4$  on anode is changed to  $\text{PbO}_2$ .
  - The decomposition of  $\text{NH}_3$  on platinum surface is zero order reaction. What is the rate of production of  $\text{N}_2$  if  $K = 2.5 \times 10^{-4} \text{ mol L}^{-1} \text{ S}^{-1}$  ? [March-2020]
    - $2.5 \times 10^{-4} \text{ mol L}^{-1} \text{ S}^{-1}$
    - $8.3 \times 10^{-5} \text{ mol L}^{-1} \text{ S}^{-1}$
    - $7.5 \times 10^{-4} \text{ mol L}^{-1} \text{ S}^{-1}$
    - $5 \times 10^{-4} \text{ mol L}^{-1} \text{ S}^{-1}$
  - Which of the following graph for  $\ln k \rightarrow \frac{1}{T}$  is correct ? [March-2020]
 



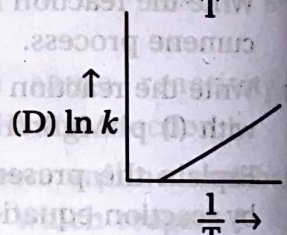
(A)  $\ln k$



(B)  $\ln k$



(C)  $\ln k$

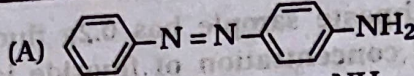
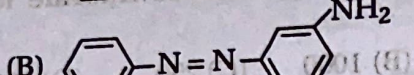
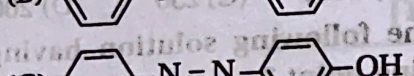
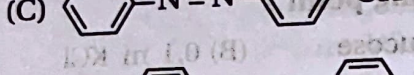
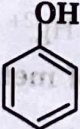
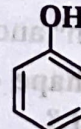
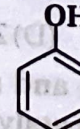
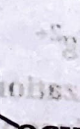
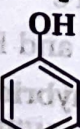


(D)  $\ln k$
  - The role of catalyst is to change ..... [March-2020]
    - Gibbs energy of reaction
    - Enthalpy of reaction
    - Equilibrium constant of the reaction
    - Activation energy of the reaction
  - The mixture that forms maximum boiling azeotrope is :
    - Heptane + Octane
    - Water + Nitric acid
    - Ethanol + Water
    - Acetone + Carbon disulphide
  - Calculate Van't Hoff factor ( $i$ ) for an aqueous solution of  $\text{K}_3[\text{Fe}(\text{CN})_6]$  having a degree of dissociation ( $\alpha$ ) equal to 0.778.
    - 4.334
    - 3.334
    - 0.222
    - 2.334



- 12) A 500g toothpaste sample has 0.2g fluoride. What is the concentration of fluoride ion in ppm ?  
 (A) 400 (B) 1000 (C) 250 (D) 200
- 13) Which of the following solution having the highest boiling point ?  
 (A) 0.1 m glucose (B) 0.1 m KCl  
 (C) 0.1 m Na<sub>2</sub>SO<sub>4</sub> (D) 0.1 m AlCl<sub>3</sub>
- 14) Which of the following is correct Nernst equation for the given electrochemical cell ?  
 $\text{Al}_{(s)} \mid \text{Al}^{3+}_{(aq)} (0.1 \text{ M}) \parallel \text{Cl}^{-}_{(aq)} (0.1 \text{ M}) \mid \text{Cl}_{2(g)} (1 \text{ bar}) \mid \text{Pt}$   
 (A)  $E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{6} \log \frac{1}{[\text{Al}^{3+}]^2 [\text{Cl}^{-}]^6}$   
 (B)  $E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{3} \log \frac{[\text{Cl}^{-}]^3}{[\text{Al}^{3+}]}$   
 (C)  $E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{3} \log \frac{[\text{Al}^{3+}]}{[\text{Cl}^{-}]^3}$   
 (D)  $E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{6} \log [\text{Al}^{3+}]^2 [\text{Cl}^{-}]^6$
- 15) To reduce 1 mol MnO<sub>4</sub><sup>-</sup> into Mn<sup>2+</sup>, how much coulomb electricity is required ?  
 (A) 96500 C (B) 1.93 × 10<sup>5</sup> C  
 (C) 4.83 × 10<sup>5</sup> C (D) 9.65 × 10<sup>6</sup> C
- 16) The  $t_{1/2} = 20$  s of a first order reaction is 20 s. How much time will it take to reduce the concentration of the reactant to its  $\frac{1}{16}$ <sup>th</sup> value ?  
 (A) 86 (B) 81 (C) 75 (D) 90
- 17) When initial concentration of the reactant is doubled, the half-life period of a zero order reaction.....  
 (A) remains unchanged. (B) is halved.  
 (C) is tripled. (D) is doubled.
- 18) Which is paramagnetic from the following ?  
 Fe<sup>2+</sup>, Zn<sup>0</sup>, Hg<sup>2+</sup>, Ti<sup>+4</sup>  
 (A) only Fe<sup>2+</sup> (B) Zn<sup>0</sup> and Ti<sup>+4</sup>  
 (C) Fe<sup>2+</sup> and Hg<sup>2+</sup> (D) Zn<sup>0</sup> and Hg<sup>2+</sup>
- 19) What is hybridization and shape of metal ion present in Wilkinson catalyst ?  
 (A) sp<sup>3</sup>d, trigonal pyramid  
 (B) sp<sup>3</sup>, tetrahedral  
 (C) dsp<sup>2</sup>, square planar  
 (D) d<sup>2</sup>sp<sup>3</sup>, octahedral
- 20) The magnetic moment if a divalent ion in aqueous solution if its atomic number is 25 :  
 [March-2020]  
 (A) 2.84 BM (B) 5.92 BM (C) 4.90 BM (D) 3.87 BM
- 21) Which of the following is amphoteric oxide ?  
 Mn<sub>2</sub>O<sub>7</sub>, CrO<sub>3</sub>, Cr<sub>2</sub>O<sub>3</sub>, CrO, V<sub>2</sub>O<sub>5</sub>, V<sub>2</sub>O<sub>4</sub>  
 [March-2020]  
 (A) V<sub>2</sub>O<sub>5</sub>, Cr<sub>2</sub>O<sub>3</sub> (B) CrO<sub>3</sub>, V<sub>2</sub>O<sub>4</sub>  
 (C) Mn<sub>2</sub>O<sub>7</sub>, CrO (D) Cr<sub>2</sub>O<sub>3</sub>, Mn<sub>2</sub>O<sub>7</sub>
- 22) Which of the following element having one electron in 5d orbital in its electronic configuration ?  
 [March-2020]  
 (A) Pm (B) Tb (C) Nd (D) Gd
- 23) Which of the following is the most stable complex ?  
 [March-2020]  
 (A) [Fe(H<sub>2</sub>O)<sub>6</sub>]<sup>3+</sup> (B) [Fe(NH<sub>3</sub>)<sub>6</sub>]<sup>3+</sup>  
 (C) [Fe(C<sub>2</sub>O<sub>4</sub>)<sub>3</sub>]<sup>3-</sup> (D) [FeCl<sub>6</sub>]<sup>3-</sup>
- 24) Molecular formula of tetra-ammine-aqua-chloridocobalt(III) chloride is .....  
 [March-2020]  
 (A) [Co(NH<sub>3</sub>)<sub>4</sub>(H<sub>2</sub>O)Cl]Cl<sub>3</sub>  
 (B) [Co(NH<sub>3</sub>)<sub>4</sub>(H<sub>2</sub>O)Cl]Cl<sub>2</sub>  
 (C) [Co(NH<sub>3</sub>)<sub>4</sub>(H<sub>2</sub>O)]Cl<sub>3</sub>  
 (D) [Co(NH<sub>3</sub>)<sub>4</sub>(H<sub>2</sub>O)Cl]<sub>3</sub>Cl<sub>2</sub>
- 25) Which of the following compound has highest reactivity towards S<sub>N</sub>1 reaction ? [March-2020]  
 (A) C<sub>6</sub>H<sub>5</sub>C(CH<sub>3</sub>)(C<sub>6</sub>H<sub>5</sub>)Br (B) C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>Br  
 (C) C<sub>6</sub>H<sub>5</sub>CH(C<sub>6</sub>H<sub>5</sub>)Br (D) C<sub>6</sub>H<sub>5</sub>CH(CH<sub>3</sub>)Br
- 26) Which of the following has the highest dipole moment ? [March-2020]  
 (A) CH<sub>2</sub>Cl<sub>2</sub> (B) CHCl<sub>3</sub> (C) CCl<sub>4</sub> (D) CH<sub>3</sub>Cl
- 27) The position of -Br in the compound in CH<sub>3</sub>CH = CHC(Br)(CH<sub>3</sub>)<sub>2</sub> can be classified as...  
 [March-2020]  
 (A) Benzyl (B) Aryl (C) Vinyl (D) Allyl
- 28) The IUPAC name of the major organic product of the reaction :  
 [March-2020]  
 $\text{CH}_3\text{CH}_2\text{CH} = \text{CH}_2 + \text{HBr} \xrightarrow{\text{Peroxide}}$   
 (A) 1,2-Dibromobutane (B) 2,2-Dibromobutane  
 (C) 1-Bromobutane (D) 2-Bromobutane



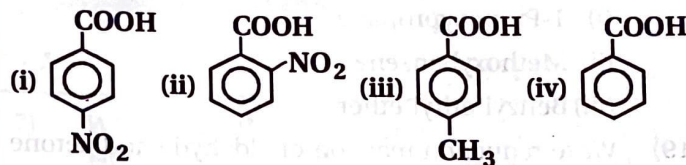
- 29) Possible isomers of monohydric phenol having molecular formula  $C_7H_8O$  are ..... [March-2020]  
 (A) 3 (B) 4 (C) 1 (D) 2
- 30) The reagent (X) in the given reaction is phenol  
 $\xrightarrow[273\text{ K}]{\text{"X"}} \text{Parabromophenol}$  [March-2020]  
 (A)  $Br_2/CH_3COOH$  (B)  $Br_2/FeBr_3$   
 (C) Bromine water (D)  $Br_2/CS_2$
- 31) Which of the following compound has highest boiling point? [March-2020]  
 (A) Butan-2-ol (B) Butan-1-ol  
 (C) Pentan-1-ol (D) Propan-1-ol
- 32) Conjugate base of which of the following acid is weak? [March-2020]  
 (A)  $CH_3CH_2CH(Br)COOH$   
 (B)  $CH_3CH_2CH(F)COOH$   
 (C)  $CH_3CH_2CH(I)COOH$   
 (D)  $CH_3CH_2CH(Cl)COOH$
- 33) Sodium salt of which acid is used as food preservative? [March-2020]  
 (A) Phthalic acid (B) Adipic acid  
 (C) Formic acid (D) Benzoic acid
- 34) Which of the following compound does not give reaction with Hinsberg's reagent? [March-2020]  
 (A) Triethyl amine  
 (B) Tertiary butyl amine  
 (C) N-methyl aniline  
 (D) 1-methyl cyclohexylamine
- 35) ..... compound gives Hofmann bromamide reaction. [March-2020]  
 (A) Ethyl cyanide (B) Ethenoic acid  
 (C) Ethenamide (D) Ethenamine
- 36) The reaction  $ArN_2^+Cl^- \xrightarrow{Cu/HCl} ArCl + N_2 + CuCl$  is named as ..... [March-2020]  
 (A) Sandmeyer reaction (B) Gatterman reaction  
 (C) Claisen reaction (D) Carbylamine reaction
- 37) Which of following is structural formula of orange dye? [March-2020]
- (A) 
- (B) 
- (C) 
- (D) 
- 38) ..... vitamin cannot be stored in a body. [March-2020]  
 (A) D (B) C (C) A (D) K
- 39) Which of the following base is not present in DNA? [March-2020]  
 (A) Uracil (B) Adenine  
 (C) Guanine (D) Thymine
- 40) Which of the following pair of protein is globular protein? [March-2020]  
 P-keratin, Q-Insulin, R-myosin, S-albumin  
 (A) P, R (B) Q, R (C) R, S (D) Q, S
- 41) Thyroxine is iodinated derivative of which amino acid? [March-2020]  
 (A) Tyrosine (B) Cysteine  
 (C) Glutamine (D) Tryptophan
- 42) Co-ordinate number, oxidation number, number of electrons in  $d$ -orbital and number of unpaired electron of central metal Co in  $[Co(NH_3)_4CO_3]ClO_4$ ?  
 (A) 6, 3, 6, 0 (B) 7, 2, 7, 1  
 (C) 6, 2, 7, 3 (D) 7, 1, 6, 4
- 43) Which of the following complex possesses linkage isomerism?  
 (A)  $[Co(NH_3)_5(NO_2)]^{2+}$  (B)  $[Co(H_2O)_5CO]^{3+}$   
 (C)  $[Fe(en)_2Cl_2]^+$  (D) None of them
- 44) Mark the correct order of decreasing acidic strength of the following compounds :  
 (I)   
 (II)   
 (III)   
 (IV)   
 (V) 
- (A)  $V > IV > II > I > III$  (B)  $II > IV > I > III > V$   
 (C)  $IV > V > III > II > I$  (D)  $V > IV > III > II > I$



- 45) Phenol on heating with alcoholic KOH and Chloroform represent which reaction?  
 (A) Reimer-Tiemann (B) Kolbe-Schmitt  
 (C) Gattermann (D) Cannizzaro
- 46) Which is Hell-Volhard-Zelinsky reaction?  
 (A)  $RCH_2COOH \xrightarrow[H_2O]{(i) X_2 / \text{Red phosphorus}}$   

$$\begin{array}{c} RCH - COOH \text{ (X = Cl, Br)} \\ | \\ X \end{array}$$
  
 (B)  $RCOOH \xrightarrow{LiAlH_4} RCH_2OH$   
 (C)  $RCOOH \xrightarrow[-H_2O]{+NH_3, \Delta} RCONH_2$   
 (D)  $RCOOH + R'OH \xrightarrow{H_3O^+} RCOOR' + H_2O$
- 47) The carboxyl functional group ( $-COOH$ ) is present in .....  
 (A) Picric acid (B) Barbituric acid  
 (C) Ascorbic acid (D) Aspirin

- 48) Which of the following order of acidic strength is correct for the following compounds?



- (A) (ii) < (i) < (iv) < (iii) (B) (iii) < (iv) < (i) < (ii)  
 (C) (iii) < (iv) < (ii) < (i) (D) (ii) < (iv) < (i) < (iii)
- 49) Which product is not obtained by aldol condensation reaction between propanal and ethanal?  
 (A) but-2-enal (B) 2-methylbut-2-enal  
 (C) 3-methylpent-2-enal (D) pent-2-enal
- 50) Molality 30% w/w aqueous solution of NaOH is.... [March-2020]  
 (A) 10.71 m (B) 8.32 m (C) 7.5 m (D) 9.17 m

Time : 2 Hours]

PART - B

[Total Marks : 50

## Section - A

- ◆ Write the answer of any 8 questions from given question number 1 to 12. (Each of 2 marks) [16]
- Write two difference order of reaction and molecularity. [March-2020]
  - Write reactions occurring at anode and cathode in mercury cell.
  - Draw structures of geometrical isomers of  $[Fe(NH_3)_2(CN)_4]^-$ . [March-2020]
  - Write any four limitations of valence bond theory of complex compound. [March-2020]
  - What is meant by 'Disproportionation' of an oxidation state? Give an example.
  - Give Reason :  $TiCl_3$  is paramagnetic while  $TiCl_4$  is diamagnetic.
  - Write two step-equation for the following conversion : Benzene to Diphenyl [March-2020]
  - Give difference between  $S_N1$  and  $S_N2$  (Any two points).
  - Write chemical reaction to form Salicylic acid from phenol.
  - Write the reaction of aniline and ethenamine with nitrous acid. [March-2020]

- Write the reaction equation to show the presence of  $-CHO$  and  $>CO$  group in Glucose. [March-2020]
- Give explanation about heterocyclic base present in structure of nucleic acid (Structure are not required).

## Section - B

- ◆ Write the answer of any 6 questions from given question number 13 to 21. (Each of 3 marks) [18]
- Calculate (a) molality (b) molarity and (c) mole fraction of KI if the density of 20% (w/w) aqueous KI is  $1.202 \text{ g mL}^{-1}$ .
  - Write a note on Lead-storage cell.
  - Derive the formula of first order reaction for,  
 (i) Rate constant K,  
 (ii) Half life period  $t_{1/2}$  (graph is not required). [March-2020]
  - Describe the preparation of potassium dichromate from iron chromite ore with equation. [March-2020]
  - Give reactions of aryl halides with metals.



18) Write the equation of the reaction of hydrogen iodide with : [March-2020]

- (i) 1-Propoxypropane
- (ii) Methoxybenzene
- (iii) Benzyl ethyl ether

19) Write reduction reaction of aldehyde and ketone by Wolff-Kishner reduction reaction.

20) Explain bromination of aniline by electrophilic substitution reaction.

21) How will you convert 4-nitrotoluene to 2-bromobenzoic acid ?

### Section - C

❖ Write the answer of any 4 questions from given question number 22 to 27. (Each of 4 marks) [16]

22) Two elements A and B form compounds having formula  $AB_2$  and  $AB_4$ . When dissolved in 20g of benzene ( $C_6H_6$ ), 1g of  $AB_2$  lowers the freezing point by 2.3 K whereas 1g of  $AB_4$  lowers it by 1.3 K. The molar depression constant for benzene is  $5.1 K \text{ kg mol}^{-1}$ . Calculate atomic masses of A and B. [March-2020]

23) Resistance of conductivity cell filled with  $0.1 \text{ mol L}^{-1}$  KCl solution is  $100 \Omega$ . If the resistance of the same cell when filled with  $0.03 \text{ mol L}^{-1}$  KCl

solution is  $520 \Omega$ , calculate the conductivity and molar conductivity of  $0.03 \text{ mol L}^{-1}$  KCl solution. The conductivity of  $0.1 \text{ mol L}^{-1}$  KCl solution is  $1.29 \text{ S m}^{-1}$ . [March-2020]

24) For a first order reaction, show that time required for 99% completion is twice the time required for the completion of 90% of reaction.

25) (i) Explain that complex  $[Ti(H_2O)_6]^{3+}$  is violet in colour, on the basis of crystal field theory.

(ii) Discuss the nature of bonding in metal carbonyls. [March-2020]

26) Give only chemical equation for following reaction :

(i) Ethanol heating with conc.  $H_2SO_4$  at  $413 \text{ K}$  temperature.

(ii) Phenol react with conc.  $HNO_3$ .

(iii) Preparation of anisol from phenol.

(iv) Preparatin of benzene from phenol.

27) (i) Explain Tollen's test for identification of aldehyde with chemical equation.

(ii) Write only equation of propanone of the following reactions.

(a) Wolff-kishner reductions

(b) Aldol condensation [March-2020]