

## K-CET EXAMINATION – 2026

### CHEMISTRY – D4 with Key & Solutions

1. Match the reagents in List-I with products obtained from their carbonyl compounds in List-II.

| List-I                        | List-II           |
|-------------------------------|-------------------|
| a. $\text{NH}_2\text{OH}$     | (i) Cyanohydrin   |
| b. $\text{R-NH}_2$            | (ii) Oxime        |
| c. $\text{R-OH}$              | (iii) Schiff base |
| d. $\text{H-C}\equiv\text{N}$ | (iv) Acetal       |

Codes:

- (1) a - ii, b - iii, c - iv, d - i  
 (2) a - i, b - ii, c - iii, d - iv  
 (3) a - iii, b - ii, c - i, d - iv  
 (4) a - i, b - iii, c - ii, d - iv

Ans. (1)

Sol. Carbonyl compounds on reaction with

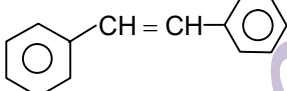
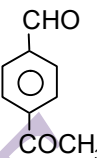
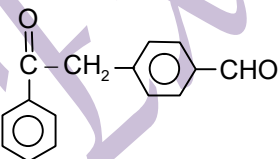
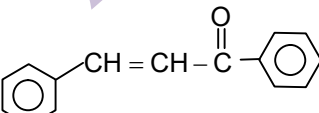
$\text{NH}_2\text{OH} \rightarrow$  gives oximes

$\text{R-NH}_2 \rightarrow$  schiff's base

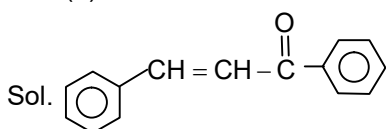
$\text{R-OH} \rightarrow$  Acetal

$\text{H-CN} \rightarrow$  cyanohydrin

2. The major product 'A' in the given reaction is  
 Benzaldehyde  $\xrightarrow[\text{OH}^-/293\text{K}]{\text{Acetophenone}}$  'A' (Major product)

- (1) 
- (2) 
- (3) 
- (4) 

Ans. (4)



On crossed aldol of condensation gives

3. Carboxylic acids are more acidic than phenols because

- (1) Formation of dimers  
 (2) Intermolecular hydrogen bonding  
 (3) More covalent nature  
 (4) More resonance stabilisation of their conjugate base

Ans. (4)

Sol. Its conjugate base carboxylate ion is stabilised by resonance

More resonance stabilisation of their conjugate base

4. The compound that does not answer iodoform test is

- (1) Ethanal  
 (2) Acetone  
 (3) Ethanoic acid  
 (4) Acetophenone

Ans. (3)

Sol. In Ethanoic acid the acidic -OH group prevents the haloform reaction due to delocalization of electrons

5. Nitration of aniline in strong acidic medium gives significant amount of m-nitroaniline because

- (1) In electrophilic substitution reaction, amino group is meta directing  
 (2) In strong acidic medium, aniline is present as anilinium ion.  
 (3)  $-\text{NH}_2$  group always directs to meta position.  
 (4) m-nitroaniline has higher molar mass than o & p nitroanilines.

Ans. (2)

Sol. In strong acidic medium, aniline is present as anilinium ion.

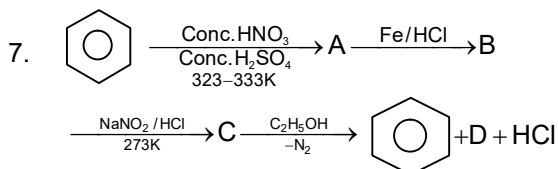
$\text{C}_6\text{H}_5 - \text{NH}_3^+$  ion is a m-directing group

6. Basic strength of alkylamines in aqueous phase is not decided by

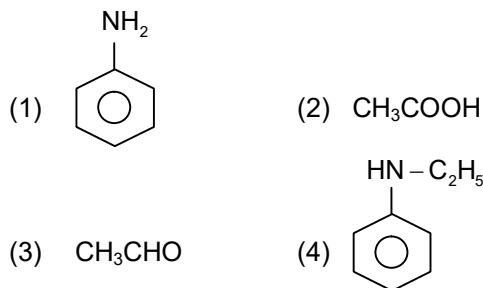
- (1) Inductive effect  
 (2) Solvation effect  
 (3) Steric hindrance  
 (4) Hyperconjugation effect

Ans. (4)

Sol. Basic strength of alkylamines in aqueous phase is not decided by hyperconjugation effect



Organic compound 'D' is



Ans. (3)

Sol.  $\text{CH}_3\text{CHO}$

8. **Statement I:** Staggered conformation of ethane is more stable than the eclipsed conformation.

**Statement II:** The torsional strain in staggered conformation is more.

Read the above statements and choose the correct answer from the options given below.

- (1) Both Statement I and Statement II are false  
 (2) Both Statement I and Statement II are true  
 (3) Statement I is true but Statement II is false  
 (4) Statement I is false but Statement II is true

Ans. (3)

Sol. The torsional strain in staggered conformation is less

9. From the given information, select the suitable law of chemical combination:

| Cupric Carbonate | % of Cu | % of C | % of O |
|------------------|---------|--------|--------|
| Natural Sample   | 51.35   | 9.74   | 38.91  |
| Synthetic Sample | 51.35   | 9.74   | 38.91  |

- (1) Law of Multiple Proportions  
 (2) Gay Lussac's Law of Gaseous Volumes  
 (3) Law of Definite Proportions  
 (4) Law of Conservation of Mass

Ans. (3)

Sol. Law of Definite Proportions

10. Match List-I with List-II and select the correct option (based on mole concept):

| List - I |                             | List-II |                                  |
|----------|-----------------------------|---------|----------------------------------|
| a.       | 2 moles of ethene           | (i)     | 11.2 L volume at STP             |
| b.       | Molar mass is equal to 66 g | (ii)    | 56 g                             |
| c.       | 1 g of $\text{H}_2$         | (iii)   | $12.04 \times 10^{23}$ molecules |
| d.       | 2 moles of water vapours    | (iv)    | 1.5 mole of $\text{CO}_2$        |

- (1) a - ii, b - iv, c - i, d - iii  
 (2) a - iii, b - i, c - iv, d - ii  
 (3) a - i, b - iv, c - ii, d - iii  
 (4) a - ii, b - iii, c - i, d - iv

Ans. (1)

Sol. a - ii, b - iv, c - i, d - iii

11. Match List-I with List-II:

| List-I<br>(Element-Atomic number) |       | List-II<br>(Position in periodic table) |  |
|-----------------------------------|-------|---|--|
| a                                 | Ra-88 | i                                       | 4 <sup>th</sup> period, 13 <sup>th</sup> group |
| b                                 | Ga-31 | ii                                      | 6 <sup>th</sup> period, 6 <sup>th</sup> group  |
| c                                 | W-74  | iii                                     | 5 <sup>th</sup> period, 10 <sup>th</sup> group |
| d                                 | Pd-46 | iv                                      | 7 <sup>th</sup> period, 2 <sup>nd</sup> group  |

Choose the correct answer from the options given below.

- (1) a-iv, b - i, c - ii, d - iii  
 (2) a-i, b - ii, c - iii, d - iv  
 (3) a-iv, b - ii, c - iii, d - i  
 (4) a-iii, b - iv, c - i, d - ii

Ans. (1)

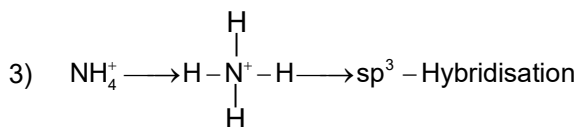
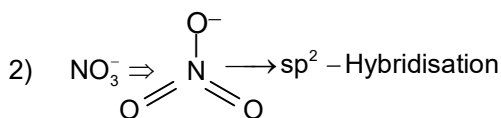
- Sol. a) Ra-88  $\rightarrow$  iv) 7<sup>th</sup> period, 2<sup>nd</sup> group  
 b) Ga-31  $\rightarrow$  i) 4<sup>th</sup> period, 13 group  
 c) W-74  $\rightarrow$  ii) 6<sup>th</sup> period, 6<sup>th</sup> group  
 d) Pd-46  $\rightarrow$  iii) 5<sup>th</sup> period, 10<sup>th</sup> group

12. The types of hybrid orbitals of nitrogen in  $\text{NO}_2^+$ ,  $\text{NO}_3^-$  and  $\text{NH}_4^+$  respectively are

- (1)  $sp$ ,  $sp^3$  and  $sp^2$  (2)  $sp$ ,  $sp^2$  and  $sp^3$   
 (3)  $sp^2$ ,  $sp$  and  $sp^3$  (4)  $sp^2$ ,  $sp^3$  and  $sp$

Ans. (2)

Sol. 1)  $\text{NO}_2^+ \Rightarrow \text{O}=\text{N}=\text{O} \rightarrow sp$ -Hybridisation



13. In which of the following option/options, the order of arrangement does not agree with the variation of property indicated against it?

- (a)  $\text{BF}_3 > \text{NF}_3 > \text{NH}_3$  (Dipole moment)  
 (b)  $\text{HgCl}_2 > \text{NH}_4^+ > \text{SF}_6$  (Bond angle)  
 (c)  $\text{NH}_3 < \text{H}_2\text{O} < \text{HF}$  (Strength of intermolecular hydrogen bonding)  
 (d)  $\text{H-I} > \text{H-Br} > \text{H-Cl}$  (Bond length)
- (1) a, b and c  
 (2) a only  
 (3) c and d only  
 (4) d only

Ans. (2)

Sol. Order of dipole moment  $\text{BF}_3 < \text{NF}_3 < \text{NH}_3$

14. With respect to resonance structures of  $\text{CO}_3^{2-}$  ion, which of the following statement are correct?
- All C–O bonds in  $\text{CO}_3^{2-}$  are equivalent
  - There are three resonance structures possible for  $\text{CO}_3^{2-}$  ion
  - The position of carbon and oxygen should change in every resonance structure
  - The formal charge on carbon atom is  $-2$
- (1) a, b and c                      (2) a and b only  
(3) b and d only                    (4) a, b and d

Ans. (2)

Sol. The position of carbon and oxygen should not change in every resonance structure. The formal charge on carbon atom is zero in  $\text{CO}_3^{2-}$

15. Given below are two statements.

**Statement I:** In  $\text{H}_2\text{O}_2$ , each oxygen atom is assigned an oxidation number of  $-1$ , in  $\text{RbO}_2$  each oxygen atom is assigned an oxidation number of  $-\frac{1}{2}$ .

**Statement II:** Representation of  $\text{HAuCl}_4$  and  $\text{MnO}_2$  in stock notation is  $\text{HAu(III)Cl}_4$  and  $\text{Mn(II)O}_2$ , respectively

Examine the above statements and choose the correct answer.

- Both Statement I and statement II are correct
- Both Statement I and Statement II is incorrect
- Statement I is correct but Statement II incorrect
- Statement I is incorrect but Statement II is correct

Ans. (3)

Sol. Statement-I In peroxide ( $\text{H}_2\text{O}_2$ ) o.s of each oxygen is  $-1$  In superoxide ( $\text{RbO}_2$ ) o.s of each oxygen is  $-1/2$

Statement-II In stock notation  $\text{HAuCl}_4$  is represented as  $\text{HAu(III)Cl}_4$   $\text{MnO}_2$  as  $\text{Mn(IV)O}_2$

There for Statement-I is correct, Statement-II is incorrect.

16.  $a\text{C}_2\text{O}_4^{2-} + b\text{MnO}_4^- + c\text{H}^+ \rightarrow x\text{Mn}^{2+} + y\text{H}_2\text{O} + z\text{CO}_2$   
a and x respectively are

- (1) 5, 2                                  (2) 4, 1  
(3) 3, 2                                  (4) 4, 2

Ans. (1)

Sol.  $5\text{C}_2\text{O}_4^{2-} + 2\text{MnO}_4^- + 16\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 8\text{H}_2\text{O} + 10\text{CO}_2$   
A=5, x = 2

17. Which of the following will not act as an oxidizing agent?

- (1)  $\text{CrO}_3$                                   (2)  $\text{MoO}_3$   
(3)  $\text{CrO}_4^{2-}$                                 (4)  $\text{Cr}_2\text{O}_7^{2-}$

Ans. (2)

Sol. In Chromium group stability of  $+6$  O.S increases down the group

18. The highest oxidation state of manganese in fluoride is  $+4$  ( $\text{MnF}_4$ ), but the highest oxidation state in oxides is  $+7$  ( $\text{Mn}_2\text{O}_7$ ), because

- Fluorine is more electronegative than oxygen
- Fluorine possesses d-orbitals
- Fluorine stabilizes lower oxidation state
- In covalent compounds, fluorine can form single bond only, while oxygen forms double bond

Ans. (4)

Sol. in covalent compounds, fluorine can form single bond only, while oxygen forms double bond and stabilizes higher oxidation state

19. The calculated spin only magnetic moment of  $\text{Cr}^{2+}$

- 3.87 BM
- 4.90 BM
- 5.92 BM
- 2.84 BM

Ans. (2)

Sol.  $\text{Cr} = 24 = 1\text{S}^2 2\text{S}^2 2\text{P}^6 3\text{S}^2 3\text{P}^6 4\text{S}^1 3\text{d}^5$

$\text{Cr}^{+2} = 22 = 1\text{S}^2 2\text{S}^2 2\text{P}^6 3\text{S}^2 3\text{P}^6 4\text{S}^0 3\text{d}^4$

$\text{Cr}^{+2} = 3\text{d}^4$

Total  $-4$  unpaired electrons

Magnetic moment formulas=  $\mu_s = \sqrt{n(n+2)}$

n = No of unpaired electrons

$= \mu_s = \sqrt{4(4+2)}$

$= \sqrt{4(6)}$

$= \sqrt{24}$

$= 4.90 \text{ B.M}$

20. Which of the following is the most stable complex?

- $[\text{Fe}(\text{CO})_5]$
- $[\text{Fe}(\text{CN})_6]^{3-}$
- $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$
- $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$

Ans. (3)

Sol.  $\text{C}_2\text{O}_4^{2-}$  (oxalate)  $\rightarrow$  This ligand will forms chelate

Ring with metals  $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$  in this  $\text{C}_2\text{O}_4^{2-}$  –

Ligand forms Three chelate Rings with metal so that  $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$  is more stable

21. How many ions per molecule are produced from the complex  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_2$  in solution?

- (1) 6    (2) 4  
(3) 3    (4) 2

Ans. (3)

Sol.  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_2 \xrightarrow{\text{H}_2\text{O}} 1[\text{Co}(\text{NH}_3)_6]^{2+} + 2\text{Cl}^-$

Total no. of ions =  $1 + 2 = 3$

22. Given below are two statements:

Statement I : The M - C  $\sigma$  bond is formed by the donation of lone pair of electrons on the carbonyl carbon into a vacant d-orbital of the metal

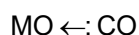
Statement II : The M - C  $\pi$  bond is formed by the donation of a pair of electrons from a filled d-orbital of metal into the vacant antibonding  $\pi^*$  orbital of carbon monoxide.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and Statement II are correct
- (2) Both Statement I and Statement II are incorrect
- (3) Statement I is correct but Statement II is incorrect
- (4) Statement I is incorrect but Statement II is correct

Ans. (1)

Sol. I) Co act as ligand lewis base and donate its lone pair of electrons from carbon to the Metal



II) The back bonding strengthens the M-C bond which is formed by donation of electrons from a filled d-orbitals of metal into vacant  $\pi^*$  (antibonding) orbital of co

23. Match List - I with List - II

| List - I<br>(Complex)   | List-II<br>(Geometry)    |
|-------------------------|--------------------------|
| (a) $[Co(NH_3)_6]^{3+}$ | (i) Trigonal bipyramidal |
| (b) $[NiCl_4]^{2-}$     | (ii) Octahedral          |
| (c) $[Ni(CN)_4]^{2-}$   | (iii) Tetrahedral        |
| (d) $[Fe(CO)_5]$        | (iv) Square planar       |

Choose the correct answer from the options given below.

- (1) a - ii, b - iii, c - iv, d - i
- (2) a - ii, b - i, c - iii, d - iv
- (3) a - iii, b - ii, c - iv, d - i
- (4) a - i, b - iii, c - iv, d - ii

Ans. (1)

|                             |                    |
|-----------------------------|--------------------|
| Sol. 1) $[Co(NH_3)_6]^{+3}$ | 2) $[NiCl_4]^{2-}$ |
| CN=6 SFL                    | CN=4               |
| Octahedral                  | WFL                |
| $d^2sp^3$                   | $sp^3$             |
|                             | Tetrahedral        |
| 3) $[Ni(CN)_4]$             | 4) $[F_3(CO)_5]$   |
| CN=4                        | CN=5               |
| SFL                         | SFL                |
| $dsp^2$                     | $dsp^3$            |
| Squarplanar                 | Trigonal bipyramid |

24. Match List - I with List - II

| List - I<br>(Vitamins) | List-II<br>(Deficiency Diseases)   |
|------------------------|------------------------------------|
| (a) B <sub>1</sub>     | (i) Convulsions                    |
| (b) B <sub>2</sub>     | (ii) RBC deficiency in haemoglobin |
| (c) B <sub>6</sub>     | (iii) Retarded growth              |
| (d) B <sub>12</sub>    | (iv) Burning sensation of the skin |

Choose the correct answer from the options given below.

- (1) a - ii, b - iv, c - iii, d - i
- (2) a - iii, b - iv, c - i, d - ii
- (3) a - i, b - ii, c - iii, d - iv
- (4) a - iv, b - iii, c - ii, d - i

Ans. (2)

Deficiency Causes

|                             |                           |                    |                               |
|-----------------------------|---------------------------|--------------------|-------------------------------|
| Sol. Vit-B <sub>1</sub>     | Vit-B <sub>2</sub>        | Vit-B <sub>6</sub> | Vit-B <sub>12</sub>           |
| (thiamine)                  | (Riboflavin)              | (Pyridoxine)       | (Cobalamin)                   |
| Retarded growth in children | Burning sensation in skin | Convulsions        | RBC deficiency in haemoglobin |

25. Consider the following statements:

**Statement I:** All monosaccharides are reducing sugars.

**Statement II:** Sucrose can reduce ammoniacal silver nitrate solution.

Choose the correct answer from the options given below.

- (1) Both Statement I and Statement II are correct
- (2) Both Statement I and Statement II are incorrect
- (3) Statement I is correct but Statement II is incorrect
- (4) Statement I is incorrect but Statement II is correct

Ans. (3)

Sol. I) All monosaccharides are reducing sugars

II) Sucrose is a non-reducing sugar due to lack of free aldehyde group

26. Incorrect statement about  $\alpha$ -amino acids of proteins among the following is

- (1) Methionine is an essential amino acid
- (2) Glycine doesn't exhibit enantiomerism
- (3) Glycylalanylglutamine has three amide linkages
- (4) Zwitterion of valine exhibits amphoteric behaviour

Ans. (3)


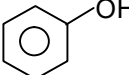
Sol. Glycylalanylglutamine contains 3 amino acids

Amide or peptide bonds (n-1)

3-1=2 amide or peptide bonds

But not (3)

27. Match List I with List II and select the correct options

| List - I<br>(Functional group)  | List-II<br>(Functional group reagent) |
|---|---------------------------------------|
| (a)  | (i) Neutral ferric chloride test      |
| (b) $C_6H_5NH_2$  | (ii) Azo dye test                     |
| (c) $CH_3CH_2CHO$   | (iii) Ceric ammonium nitrate test     |
| (d)  | (iv) Tollen's reagent test            |

Codes:

- (1) a - iv, b - i, c - ii, d - iii  
 (2) a - iii, b - ii, c - iv, d - i  
 (3) a - iii, b - ii, c - i, d - iv  
 (4) a - ii, b - iii, c - iv, d - i

Ans. (2)

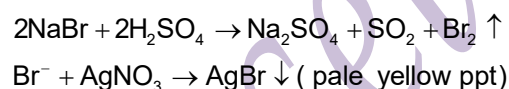
- Sol. a) Alcohols were detected by : Ceric ammonium test = red colour  
 b)  $C_6H_5-NH_2$  i- amines (Aromatic) identified by Azo dye test  
 c)  $CH_3-CH_2-CHO$  identified by Tollen's test  
 d)  $C_6H_5-OH$ : Phenol identified by Neutral  $FeCl_3 \neq$  violet

28. When salt BA is treated with Conc.  $H_2SO_4$  reddish brown gas is liberated. The aqueous solution of BA gives pale yellow precipitate with  $AgNO_3$  solution. Which of the following anion (A<sup>-</sup>) is present in the salt BA?

- (1)  $Cl^-$  (2)  $CO_3^{2-}$   
 (3)  $SO_4^{2-}$  (4)  $Br^-$

Ans. (4)

Sol.  $Br^-$



29. Which of the following represents de Broglie equation?

- (1)  $\lambda = \frac{h}{\sqrt{mv}}$  (2)  $\lambda = \frac{h}{mv}$   
 (3)  $\lambda = \frac{h}{mp}$  (4)  $\lambda = \frac{h}{p}$

Ans. (2)

Sol.  $\lambda = \frac{h}{mv}$

30. Which of the following is the CORRECT statement about  $\Psi^2$ ?

- (1)  $\Psi^2$  represents atomic orbit  
 (2) Probability density of the electron at that point  
 (3)  $\Psi^2 \neq 0$  for nodes  
 (4)  $\Psi^2$  has no physical meaning

Ans. (2)

Sol.  $\Psi^2$  indicates probability of finding  $e^-$  (density)

31. **A:** Entropy of a perfect crystalline solid at absolute zero approaches zero.

**B:** For spontaneity of a reaction,  $T\Delta S > \Delta H$

Among the two statements given above, identify the correct answer from the options given below

- (1) Both 'A' and 'B' are true  
 (2) 'A' is true but 'B' is false  
 (3) Both 'A' and 'B' are false  
 (4) 'A' is false but 'B' is true

Ans. (1)

Sol. Statement A is true according to third law of thermodynamics

Statement B is true: for a reaction to be spontaneous. The Gibbs free energy change  $\Delta G$  must be negative.

$$\Delta G = \Delta H - T\Delta S < 0 \Rightarrow T\Delta S > \Delta H$$

32. Which of the following is a correct statement for a thermodynamic system?

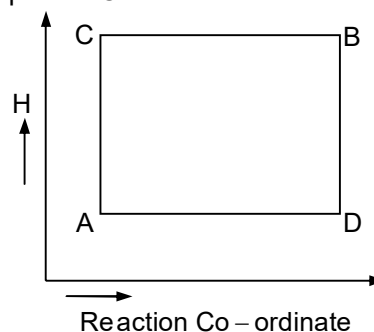
- (1) The internal energy changes in all processes  
 (2) Internal energy and entropy are state functions  
 (3) Work is a state function  
 (4) The work done in an adiabatic process is always zero

Ans. (2)

Sol. Internal energy (E (or) U)

And Entropy(s) are state functions

33. A gas can be taken from A to B via two different paths ACB and ADB



When path ACB is used, 60J of heat flows into the system and 30J of work is done by the system. If path ADB is used, work done by the system is 10J

The heat flow into the system in path ADB is

- (1) 80J (2) 20J  
 (3) 100J (4) 40J

Ans. (4)

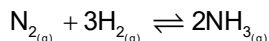
Sol.  $\Delta U = Q_{ACB} - W_{ACB}$

$$\Delta U = 60 - 30 = 30J$$

$$Q_{ADB} = \Delta U + W_{ADB}$$

$$Q_{ADB} = 30J + 10J = 40J$$

34. For the reversible reaction,



When the partial pressure is measured in atmosphere, the value of  $K_p$  at  $500^\circ\text{C}$  is  $1.44 \times 10^{-5}$ . The value of  $K_c$  when the concentration is expressed in  $\text{mol L}^{-1}$  is

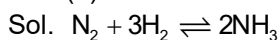
$$(1) \frac{1.44 \times 10^{-5}}{(0.082 \times 500)^{-2}}$$

$$(2) \frac{1.44 \times 10^{-5}}{(8.314 \times 773)^{-2}}$$

$$(3) \frac{1.44 \times 10^{-5}}{(0.082 \times 773)^2}$$

$$(4) \frac{1.44 \times 10^{-5}}{(0.082 \times 773)^{-2}}$$

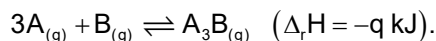
Ans. (4)



$$K_p = K_c (\text{RT})^{\Delta n}$$

$$K_c = \frac{K_p}{(\text{RT})^{\Delta n}} = \frac{1.44 \times 10^{-5}}{(0.0821 \times 773)^{-2}}$$

35. For the following gaseous reversible reaction:



The amount of product  $\text{A}_3\text{B}_{(g)}$  is affected by....

- (1) Temperature alone
- (2) Pressure alone
- (3) Both temperature and pressure
- (4) Temperature, pressure and catalyst

Ans. (3)

Sol. Product  $\text{A}_3\text{B}$  is affected by both temperature and pressure

36. A 0.15 mole of pyridinium chloride has been added to  $500 \text{ cm}^3$  of 0.2 M pyridine solution (a base). Assuming there is no change in volume upon mixing, the pH of the resulting solution is

- (1) 5
- (2) 6
- (3) 7
- (4) 8

Ans. (1)

Sol.  $n_{\text{salt}} = 0.15$

$$M_{\text{base}} = 0.2\text{M}$$

$$V = 500 \text{ cm}^3 = 0.5\text{L}$$

$$n_{\text{base}} = 0.2 \times 0.5 = 0.1$$

$$p^{\text{OH}} = p_{k_b} + \log \frac{[\text{salt}]}{[\text{Base}]}$$

$$p^{\text{OH}} = 9 + \log \frac{0.15}{0.1}$$

$$= 9 + \log 1.5 = 9.17$$

$$p^{\text{H}} = 14 - p^{\text{OH}}$$

$$= 14 - 9.17$$

$$= 4.824 \approx 5$$

37. Which of the following is CORRECT with respect to the property mentioned against it?

- (1) Osmotic pressure : 0.1 M NaCl solution at 298 K < 0.1 M Urea solution
- (2) Concentration of NaCl in the solution : 2 ppm > 2M
- (3)  $\Delta T_b$  : 0.02M Urea solution > 0.02M NaCl solution
- (4) Vapour pressure at 298K : Salt water < Pure water

Ans. (4)

Sol. Vapour pressure : The addition of a non-volatile solute (salt) lowers the vapour pressure of the solvent

38. Match the List (Laws) with the List - II (Mathematical expressions):

| List - I                        | List - II  |
|---------------------------------|--|
| (a) Henry's Law                 | (i) $p_1 = \chi_1 p_1^0$                               |
| (b) Raoult's law                | (ii) $p = K_H \chi$                                    |
| (c) First law of thermodynamics | (iii) $\Delta_m^0 = v_+ \lambda_+^0 + v_- \lambda_-^0$ |
| (d) Kohlrausch's law            | (iv) $\Delta U = q + w$                                |

Codes:

- (1) a-i, b-ii, c-iii, d-iv
- (2) a-ii, b-i, c-iii, d-iv
- (3) a-ii, b-i, c-iv, d-iii
- (4) a-i, b-ii, c-iv, d-iii

Ans. (3)

Sol. Henry's law .....  $p = K_H \chi$

Raoult's law .....  $p_1 = \chi_1 p_1^0$

First law of thermodynamics .....  $\Delta U = q + w$

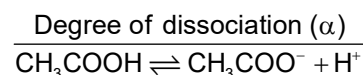
Kohlrausch's law .....  $\Delta_m^0 = v_+ \lambda_+^0 + v_- \lambda_-^0$

39. When 0.0106 mole of acetic acid was dissolved in 1 kg of water, the freezing point depression for this strength of acid was 0.0205 K. If the calculated freezing point depression is 0.0197K. Van't Hoff factor (i) and degree of dissociation of acetic acid respectively are

- (1) 0.041 and 1.041
- (2) 1.041 and 0.1041
- (3) 0.041 and 0.041
- (4) 1.041 and 0.041

Ans. (4)

$$\text{Sol. } i = \frac{\Delta T_{f_{\text{obs}}}}{\Delta T_{f_{\text{calc}}}} = \frac{0.0205\text{K}}{0.0197\text{K}} \approx 1.041$$



$$i = 1 + \alpha$$

$$1.041 = 1 + \alpha \Rightarrow \alpha = 0.041$$

40. The relative lowering of vapour pressure produced by dissolving 18 g of urea (Molar mass =  $60 \text{ g mol}^{-1}$ ) in 100 g of water is

- (1) 0.025                      (2) 0.5  
(3) 0.05                        (4) 0.25

Ans. (3)

$$\text{Sol. } \frac{p^0 - p^s}{p^0} = X_{\text{solute}}$$

$$= \frac{n_1}{n_1 + n_2}$$

$$n_{\text{urea}} = \frac{18}{60} = 0.3 \text{ mol}$$

$$n_{\text{water}} = \frac{100}{18} = 5.55$$

$$X_{\text{solute}} = \frac{0.3}{0.3 + 5.55} = \frac{0.3}{5.85} = 0.051$$

41. During the electrolysis of acidified water, 16g of  $\text{O}_2$  gas is formed at anode. The volume of  $\text{H}_2$  gas liberated at cathode under STP conditions is

- (1) 22.4 L                      (2) 11.2 L  
(3) 2.24 L                     (4) 1.12 L

Ans. (1)

$$\text{Sol. } \frac{V_{\text{H}_2}}{V_e} = \frac{w_{(\text{O}_2)}}{E_{(\text{O}_2)}}$$

$$\frac{V_{\text{H}_2}}{11.2} = \frac{16}{8}$$

$$\therefore V_{(\text{H}_2)} = 22.4 \text{ Lt}$$

42.  $\Lambda_{\text{m}(\text{NH}_4\text{OH})}^0$  is equal to \_\_\_\_\_

(1)  $\Lambda_{\text{m}(\text{NH}_4\text{OH})}^0 + \Lambda_{\text{m}(\text{NH}_4\text{Cl})}^0 - \Lambda_{\text{m}(\text{HCl})}^0$

(2)  $\Lambda_{\text{m}(\text{NH}_4\text{Cl})}^0 + \Lambda_{\text{m}(\text{NaOH})}^0 - \Lambda_{\text{m}(\text{NaCl})}^0$

(3)  $\Lambda_{\text{m}(\text{NH}_4\text{Cl})}^0 + \Lambda_{\text{m}(\text{NaCl})}^0 - \Lambda_{\text{m}(\text{NaOH})}^0$

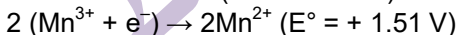
(4)  $\Lambda_{\text{m}(\text{NaOH})}^0 + \Lambda_{\text{m}(\text{NaCl})}^0 - \Lambda_{\text{m}(\text{Na}_4\text{Cl})}^0$

Ans. (2)

$$\text{Sol. } \Lambda_{\text{m}(\text{NH}_4\text{OH})}^0 = \Lambda_{\text{m}(\text{NH}_4\text{Cl})}^0 + \Lambda_{\text{m}(\text{NaOH})}^0 - \Lambda_{\text{m}(\text{NaCl})}^0$$

(Weak base)

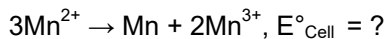
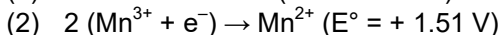
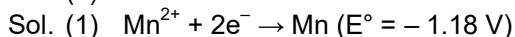
43. Given below are the half – cell reactions:



The  $E^\circ_{\text{cell}}$  for  $3\text{Mn}^{2+} \rightarrow \text{Mn} + 2\text{Mn}^{3+}$  will be

- (1)  $-2.69 \text{ V}$ , the reaction will not occur (Non – Spontaneous)  
(2)  $-2.69 \text{ V}$ , the reaction will occur (Spontaneous)  
(3)  $-0.33 \text{ V}$ , the reaction will not occur (Non – Spontaneous)  
(4)  $-0.33 \text{ V}$ , the reaction will occur (Spontaneous)

Ans. (1)



$$E^\circ_{\text{cell}} = \text{Eq. (1)} + \text{Reverse of Eq. (2)}$$

$$= E^\circ_{\text{R,P}} + E^\circ_{\text{O,P}}$$

$$= -1.18 \text{ V} + (-1.51 \text{ V})$$

$$= (-) 2.69 \text{ V} \quad (\text{Non – Spontaneous})$$

44. The conductivity of centimolar solution of KCl at 298 K is  $0.021 \text{ Ohm}^{-1} \text{ cm}^{-1}$  and the resistance of the cell containing the solution at 298K is 60 $\Omega$ .

The value of cell constant ( $G^*$ ) is \_\_\_\_\_

- (1)  $3.28 \text{ cm}^{-1}$                       (2)  $1.26 \text{ cm}^{-1}$   
(3)  $3.34 \text{ cm}^{-1}$                      (4)  $1.34 \text{ cm}^{-1}$

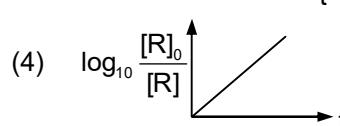
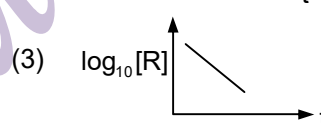
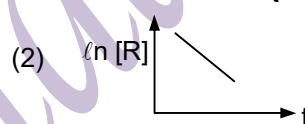
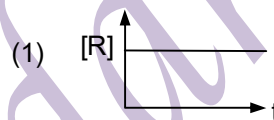
Ans. (2)

$$\text{Sol. } \frac{\ell}{a} = K \times R$$

$$= \frac{0.021}{\text{ohm}^{-1} \cdot \text{cm}^{-1}} \times \frac{60}{\text{ohm}}$$

$$= 1.26 \text{ cm}^{-1}$$

45. Which one of the following graph is not applicable for a 1st order reaction ( $\text{R} \rightarrow \text{P}$ )?



Ans. (1)

Sol. 1<sup>st</sup> order reaction

$$kt = \ln \frac{[\text{R}]_0}{[\text{R}]}$$

46. For a reaction having three steps, the overall rate constant is  $K = \frac{k_1 k_2}{k_3}$ . The values of  $E_{a1}$ ,  $E_{a2}$  and

$E_{a3}$  (activation energies stepwise) are 40, 50 and 60  $\text{kJ mol}^{-1}$  respectively. Then the overall  $E_a$  (activation energy) of the reaction is

- (1)  $30 \text{ kJ mol}^{-1}$   
(2)  $40 \text{ kJ mol}^{-1}$   
(3)  $50 \text{ kJ mol}^{-1}$   
(4)  $60 \text{ kJ mol}^{-1}$

Ans. (1)

$$\text{Sol. } k = \frac{k_1 k_2}{k_3}$$

$$\ln k = \ln k_1 + \ln k_2 - \ln k_3$$

$$\therefore E_a = E_{a1} + E_{a2} - E_{a3}$$

$$= 40 + 50 - 60$$

$$= +30 \text{ kJ mol}^{-1}$$

47. For a 1st order change  $R \rightarrow P$ , the concentration of Reactant R changes from 0.1 M to 0.025 M in 40 minutes. The rate of reaction when the concentration of R is 0.01 M is

- (1)  $1.73 \times 10^{-5} \text{ M min}^{-1}$
- (2)  $3.47 \times 10^{-4} \text{ M min}^{-1}$
- (3)  $3.47 \times 10^{-5} \text{ M min}^{-1}$
- (4)  $1.73 \times 10^{-4} \text{ M min}^{-1}$

Ans. (2)

Sol. 1<sup>st</sup> order :

$$k = \frac{2.303}{t} \log_{10} \frac{[R]_0}{[R]_t}$$

$$= \frac{2.303}{40} \log_{10} \frac{0.1}{0.025} = \frac{2.303}{40} \log_{10} 4$$

$$= \frac{2.303}{40} \times 0.602 = 0.0347$$

$$= 3.47 \times 10^{-2}$$

Now,

$$r = k[R]^1$$

$$= [3.47 \times 10^{-2}] \times 0.01$$

$$= 3.47 \times 10^{-4}$$

48. The activation energy for the reaction  $X \rightarrow Y$  is  $150 \text{ kJ mol}^{-1}$ . The change in enthalpy for the above reaction is  $-135 \text{ kJ mol}^{-1}$ . Then the activation energy for  $Y \rightarrow X$  is

- (1)  $280 \text{ kJ mol}^{-1}$
- (2)  $285 \text{ kJ mol}^{-1}$
- (3)  $270 \text{ kJ mol}^{-1}$
- (4)  $15 \text{ kJ mol}^{-1}$

Ans. (2)

Sol.  $X \xrightarrow{E_{a(f)}} Y$ ;  $\Delta H_r = -135$   
 $E_{a(b)} = ?$

Now,

$$\Delta H_r = E_{a(f)} - E_{a(b)}$$

$$-135 = 150 - E_{a(b)}$$

$$\therefore E_{a(b)} = 150 + 135$$

$$= + 285 \text{ kJ mol}^{-1}$$

49. The intermediates in heteropolar reactions are

- (1) Free radical only
- (2) Cations only
- (3) Anions only
- (4) Both anions and cations

Ans. (4)



50. **Statement I** : Nitrogen in pyridine cannot be estimated by Kjeldhal's method

**Statement II** : Nitrogen in pyridine changes to ammonium sulphate when heated with conc.  $H_2SO_4$  in Kjeldhal's method

Read the above given statements and choose the correct answer from the given options

- (1) Statement I is true but Statement II is false
- (2) Both Statement I and Statement II are false
- (3) Both Statement I and Statement II are true
- (4) Statement I is false but Statement II is true

Ans. (1)

Sol. Statement I is correct

Since, nitrogen in ring compounds doesn't produce  $(NH_4)_2SO_4$ , hence not give Kjeldhal's method

Statement – II is incorrect

51. The number of chain isomers possible for the hydrocarbon with molecular formula  $C_5H_{12}$  is

- (1) 4
- (2) 3
- (3) 2
- (4) 1

Ans. (3)

Sol. 1)  $CH_3CH_2CH_2CH_2CH_3$  (n-pentane)

2)  $CH_3 - CH - CH_2 - CH_3$  (iso pentane)



3)  $CH_3 - C - CH_3$  (neo pentane)



52. The compound with molecular formula  $C_{20}H_{42}$  is

- (1) Decane
- (2) Dodecane
- (3) Eicosane
- (4) Hicosane

Ans. (3)

Sol.  $C_{20}H_{42}$  is Eicosane

( $C_nH_{2n+2}$ ).

53. C – Cl bond in methyl chloride compared to C – Cl bond in chlorobenzene is

- (1) Longer and stronger
- (2) Shorter and stronger
- (3) Shorter and weaker
- (4) Longer and weaker

Ans. (4)

Sol. (Due to resonance effect in chlorobenzene C–Cl bond gets partial double bond character making shorter and stronger) In methyl chloride no such resonance, so it has pure single bond.

In chlorobenzene carbon attached to chlorine  $sp^2$  hybridized, more s-character (33%) and more EN. So bond length is less.

In methyl chloride carbon is  $sp^3$  hybridization s-character is 25%. It is longer and weaker bond.

54. The compound from which chlorobenzene cannot be prepared easily is

- (1) Aniline
- (2) Benzene
- (3) Phenol
- (4) Benzene diazonium chloride

Ans. (3)

Sol. Due to resonance stabilization of phenoxide ion.

55. In  $S_N1$  reaction, the alkyl halide that on hydrolysis produces racemic mixture is

- (1) Tertiary butyl bromide
- (2) 2-bromobutane
- (3) Isopropyl bromide
- (4) Methyl bromide

Ans. (2)

Sol. 2-bromobutane is chiral

2<sup>nd</sup> carbon is chiral, upon forming

A planar carbocation, the OH<sup>-</sup> group

Can attack from both sides resulting in a racemic mixture.

56. Match the compounds of List-I with their effects in List-II

| List – I            |       | List – II     |  |
|---------------------|-------|---------------|--|
| (a) Chloromphenicol | (i)   | Malaria       |  |
| (b) Thyroxine       | (ii)  | Anaesthetic   |  |
| (c) Chloroquine     | (iii) | Goiter        |  |
| (d) Chloroform      | (iv)  | Typhoid fever |  |

Codes:

(1) a – i, b – ii, c – iii, d – iv

(2) a – iv, b – iii, c – i, d – ii

(3) a – i, b – iii, c – iv, d – ii

(4) a – iv, b – iii, c – ii, d – i

Ans. (2)

Sol. a - iv, b - iii, c - i, d - ii.

57. R – CH<sub>2</sub>OH is converted into R – CHO by reacting with \_\_\_\_\_.

(1) Alkaline KMnO<sub>4</sub>

(2) LiAlH<sub>4</sub>

(3) Na/C<sub>2</sub>H<sub>5</sub>OH

(4) PCC (Pyridinium Chlorochromate)

Ans. (4)

Sol. PCC-Pyridinium chloro chromate

PCC is mild oxidizing agent, which converted 1°-alcohol to aldehyde.

58. Glycerol is a trihydric alcohol. It contains \_\_\_\_\_.

(1) One primary, one secondary and one tertiary alcoholic groups

(2) Two primary and one secondary alcoholic groups

(3) Two secondary and one primary alcoholic groups

(4) One primary and two tertiary alcoholic groups

Ans. (2)

Sol. CH<sub>2</sub> – OH 1°

CH – OH 2°

CH<sub>2</sub> – OH 1°

Two primary alcohol and one secondary alcohol.

59. The correct IUPAC name of  $\text{CH}_3 - \overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{C}}} - \text{O} - \text{C}_2\text{H}_5$

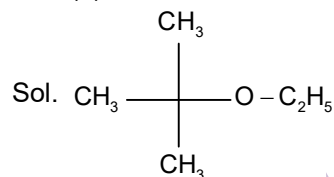
(1) Tertiary butoxy ethane

(2) 1, 1-Dimethyl 1-1-ethoxyethane

(3) 2-ethoxy-2-methyl propane

(4) Ethoxy tertiary butane

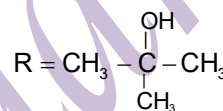
Ans. (3)



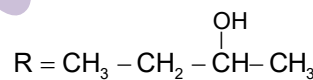
2-ethoxy-2-methyl propane.

60.  $\text{C}_3\text{H}_6 \xrightarrow[\text{ii) H}_2\text{O}_2/\text{NaOH}]{\text{i) (BH}_3)_2} \text{P} \xrightarrow[\text{anhydrous medium}]{\text{CrO}_3} \text{Q}$   
 $\xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) CH}_3\text{MgBr}} \text{R} + \text{Mg(OH)Br}$

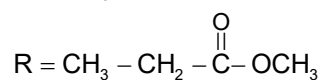
(1) P =  $\text{CH}_3 - \overset{\text{OH}}{\text{C}} - \text{CH}_3$  Q =  $\text{CH}_3 - \overset{\text{O}}{\text{C}} - \text{CH}_3$



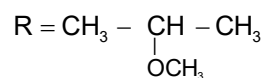
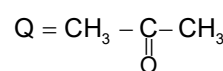
(2) P = CH<sub>3</sub> – CH<sub>2</sub> – OH  
Q = CH<sub>2</sub> – CH<sub>2</sub> – CHO



(3) P = CH<sub>3</sub> – CH<sub>2</sub> – CH<sub>2</sub> – OH  
Q = CH<sub>3</sub> – CH<sub>2</sub> – COOH



(4) P =  $\text{CH}_3 - \overset{\text{OH}}{\text{C}} - \text{CH}_3$



Ans. (2)

