CHEMISTRY - CET 2025 - VERSION CODE - D1
KEYS

1. The correct sequence of α - amino acid, hormone, vitamin, carbohydrates respectively is

    (1) Aspartic acid, Insulin, Ascorbic acid, rhamnose

    (2) Thiamine, Thyroxine, Vitamin A, Glucose

    (3) Glutamine, Insulin, Aspartic acid, Fructose

    (4) Arginine, Testosterone, Glutamic acid, Maltose

    Ans (1)

    Aspartic acid : α-amino acid

    Insulin : Hormone

    Ascorbic acid : Vitamin A

    Rhamnose : Carbohydrate

2. Which examples of carbohydrates exhibit α-link (α-glycosidic link) in their structure?

    (1) Glucose and Fructose   (2) Maltose and Lactose

    (3) Amylose and Amylopectin   (4) Cellulose and Glycogen

    Ans (3)

    α-glycosidic linkage is present in both amylose and amylopectin.

3. In the titration of potassium permanganate ($KMnO_4$) against Ferrous ammonium sulphate (FAS) solution, dilute sulphuric acid but not nitric acid is used to maintain acidic medium, because

    (1) Nitric acid is a weak acid than sulphuric acid

    (2) It is difficult to identify the end point

    (3) Nitric acid doesn't act as an indicator

    (4) Nitric acid itself is an oxidising agent

    Ans (4)

    Nitric acid being itself an oxidising agent, oxidises FAS.

4. The group reagent $NH_4Cl(s)$ and aqueous NH_3 will precipitate which of the following ion?

    (1) Ca^{2+} (2) NH_4^+ (3) Al^{3+} (4) Ba^{2+}

    Ans (3)

    NH_4Cl and NH_3 (aq) are group reagents for 3rd group basic radicals.

5. In the preparation of sodium fusion extract, the purpose of fusing organic compound with a piece of sodium metal is to

    (1) Decrease the melting point of the compound

    (2) Convert the organic compound into vapour state

    (3) Convert the elements of the compound from covalent form to ionic form

    (4) Convert the elements of the compound from ionic form to covalent form

    Ans (3)

   Sodium metal reacts with organic compound and convert the elements present in it to ionic compounds.

6. The sodium fusion extract is boiled with concentrated nitric acid while testing for halogens. By doing so, it

   (1) decomposes Na_2S and NaCN, if formed
   (2) helps in precipitation of AgCl
   (3) increases the solubility of AgCl
   (4) increases the concentration of NO_3^- ion

   Ans (1)

   Concentrated nitric acid decomposes Na_2S and NaCN and prevents the interference of S^{2-} and CN^- ions with the test for X^- ions.
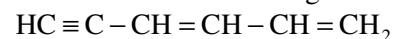
7. Which of the following is not an aromatic compound?

   (1)   (2)   (3)   (4)
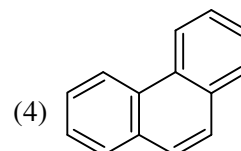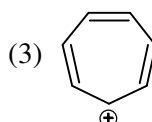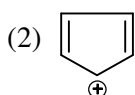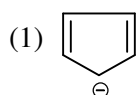
   Ans (2)

   Cyclopenta-1, 3-dienyl cation in option 2 does not satisfy (4n + 2) π electrons rule (Huckel's rule).

8. The IUPAC name of the given organic compound is
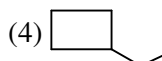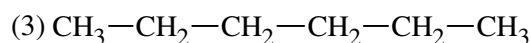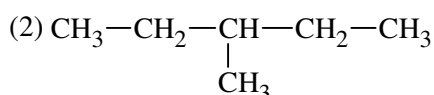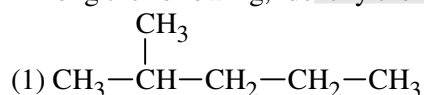 $$HC \equiv C - CH = CH - CH = CH_2$$

   (1) Hexa-3, 5-dien-1-yne
   (2) Hexa-1-yn-3, 5-diene
   (3) Hexa-5-yn-1, 3-diene
   (4) Hexa-1, 3-dien-5-yne
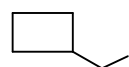
   Ans (4)
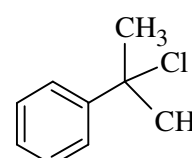
   According to IUPAC nomenclature, C=C is given higher priority while numbering the parent chain whereas the name of molecule must end with yne if C≡C is also present.

9. Among the following, identify the compound that is not an isomer of hexane

   (1) $CH_3-\overset{\overset{\displaystyle CH_3}{|}}{CH}-CH_2-CH_2-CH_3$
   (2) $CH_3-CH_2-\underset{\underset{\displaystyle CH_3}{|}}{CH}-CH_2-CH_3$

   (3) $CH_3-CH_2-CH_2-CH_2-CH_2-CH_3$
   (4)

   Ans (4)

    Cycloalkane satisfies the general formula C_nH_{2n} whereas alkanes satisfy the general formula C_nH_{2n+2}.

10. The organic compound can be classified as _____

    (1) Alkyl halide
    (2) Allylic halide
    (3) Benzyl halide
    (4) Aryl halide

    Ans (3)

    Cl is attached to sp^3 hybridised carbon which in turn is attached to sp^2 hybridised carbon of benzene ring. Therefore, it is a Benzylic halide.

11. Chlorobenzene reacts with bromine gas in the presence of Anhyd AlBr₃ to yield p-Bromochlorobenzene. This reaction is classified as _____

(1) Addition reaction

(2) Elimination reaction
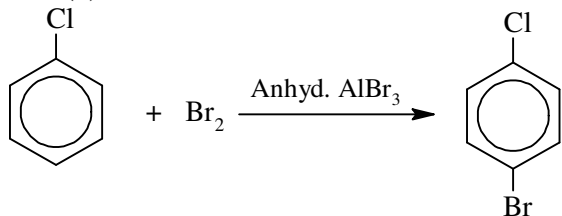
(3) Nucleophilic substitution reaction

(4) Electrophilic substitution reaction

Ans (4)

This an example for electrophilic substitution reaction.

12. The organometallic compound $(CH_3)_3 CMgBr$ on reaction with D_2O produces _____

(1) $(CH_3)_3 CD$

(2) $(CH_3)_3 COD$

(3) $(CD_3)_3 CD$

(4) $(CD_3)_3 COD$

Ans (1)

$$(CH_3)_3 C\,Mg\,Br + D_2O \longrightarrow (CH_3)_3 C-D + Mg(OD)Br$$
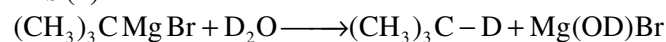
13. The major product formed when 1-Bromo-3-Chlorocyclobutane reacts with metallic sodium in dry ether is

(1)

(2)

(3)

(4)

Ans (4)

 ; Intramolecular Wurtz reaction
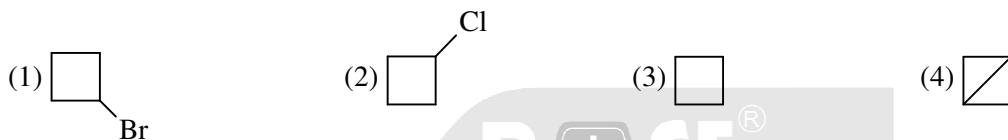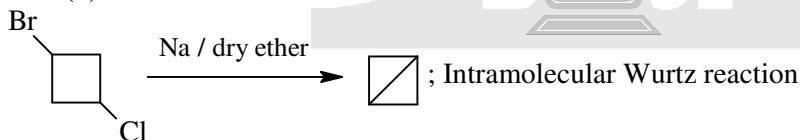
14. Ethyl alcohol is heated with concentrated sulphuric acid at 413 K. The major product formed is

(1) $CH_3\,COO\,C_2H_5$

(2) $C_2H_5 - O - C_2H_5$

(3) $CH_3 - O - C_3H_7$

(4) $CH_2 = CH_2$

Ans (2)

$$2CH_3CH_2OH \xrightarrow[413K]{\Delta,\,conc.H_2SO_4} CH_3CH_2OCH_2CH_3 + H_2O \text{ (Dehydration)}$$

15. Phenol can be distinguished from propanol by using the reagent

(1) Sodium metal

(2) Bromine water

(3) Iron metal

(4) Iodine in alcohol

Ans (2)

White ppt
2,4,6-Tribromophenol

$$CH_3\,CH_2\,CH_2OH \xrightarrow{Br_2/H_2O} \text{No reaction}$$

Propan-1-ol

16. Match the following with their pKa values

Acid		pKa
(I)	Phenol	(a)	16
(II)	p-Nitrophenol	(b)	0.78
(III)	Ethyl alcohol	(c)	10
(IV)	Picric acid	(d)	7.1

(1) I – b, II – a, III – d, IV – c   (2) I – c, II – d, III – a, IV – b

(3) I – a, II – d, III – c, IV – b   (4) I – a, II – b, III – c, IV – d

Ans (2)

$$pK_a \propto \frac{1}{\text{acidic nature}}$$

Order of acidic nature:

$$\underset{16}{\text{Ethanol}} < \underset{10}{\text{Phenol}} < \underset{7.1}{p-\text{Nitrophenol}} < \underset{0.78}{\text{Picric acid}}$$

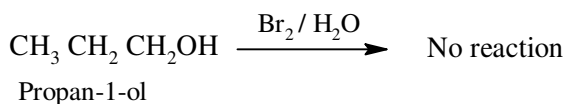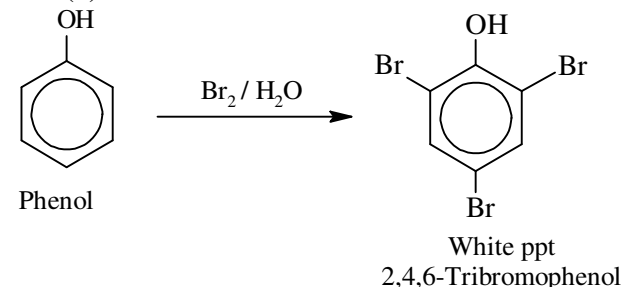Match of acid with their pK_a values : I – c, II – d, III – a, IV – b

17. $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-OCH_3 + HI \longrightarrow A + B$. A and B respectively are

(1) $A = CH_3OH, B = CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-OH$ (2) $A = CH_3-I, B = CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-OH$

(3) $A = CH_3OH, B = CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-I$ (4) $A = CH_3-I, B = CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-I$

Ans (3)

$$H_3C-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-OCH_3 + HI \longrightarrow \underset{(A)}{CH_3OH} + \underset{(B)}{H_3C-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-I}$$

18. Oxidation of Toluene with chromyl chloride followed by hydrolysis gives Benzaldehyde. This reaction is known as _____

(1) Cannizzaro reaction   (2) Etard reaction   (3) Kolbe reaction   (4) Stephen reaction

Ans (2)

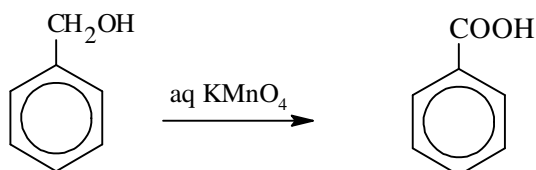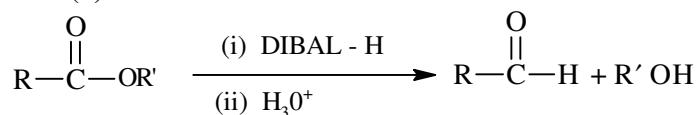Name of the reaction: Etard reaction

19. **Statement-I**: Reduction of ester by DIBAL-H followed by hydrolysis gives aldehyde.

    Statement-II: Oxidation of benzyl alcohol with aqueous $KMnO_4$ leads to the formation of Benzaldehyde.

    Among the above statements, identify the correct statement.

    (1) Both statements-I and II are true   (2) Both statements-I and II are false

    (3) Statement-I is true but statement-II is false   (4) Statement-I is false but statement-II is true

    Ans (3)

    $$R-\overset{\overset{\displaystyle O}{||}}{C}-OR' \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) DIBAL - H}} R-\overset{\overset{\displaystyle O}{||}}{C}-H + R'OH$$

20. Arrange the following compounds in their decreasing order of reactivity towards Nucleophilic addition reaction.

    CH_3COCH_3, $CH_3COC_2H_5$, CH_3CHO

    (1) $CH_3CHO > CH_3COC_2H_5 > CH_3COCH_3$ (2) $CH_3CHO > CH_3COCH_3 > CH_3COC_2H_5$

    (3) $CH_3COCH_3 > CH_3CHO > CH_3COC_2H_5$ (4) $CH_3COC_2H_5 > CH_3COCH_3 > CH_3CHO$

    Ans (2)

    Decreasing order of reactivity towards nucleophilic addition reaction:

    $CH_3CHO > CH_3COCH_3 > CH_3COC_2H_5$

21. Which of the following has most acidic Hydrogen?

    (1) Chloroacetic acid   (2) Propanoic acid   (3) Dichloroacetic acid   (4) Trichloroacetic acid

    Ans (4)

    $$Cl-\overset{\overset{\displaystyle Cl}{|}}{\underset{\underset{\displaystyle Cl}{|}}{C}}-\overset{\overset{\displaystyle O}{||}}{C}-OH$$
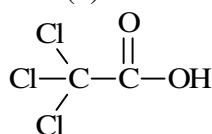
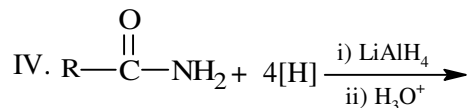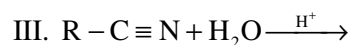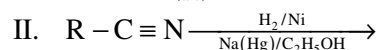   More the number of EWG, more the acidic strength of carboxylic acid.
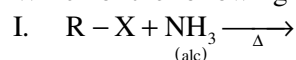
22. Which of the following reagents are suitable to differentiate Aniline and N-methylaniline chemically?

    (1) Chloroform and Alcoholic potassium hydroxide

    (2) Acetic anhydride

    (3) Br_2 water

    (4) Conc. Hydrochloric acid and anhydrous zinc chloride

    Ans (1)

    Carbylamine reaction is answered only by amine (Aniline) not by 2° amine (N-methylaniline).

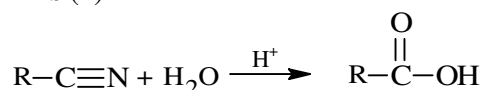23. Which of the following reaction/s does not yield an amine?

I. $R - X + NH_3 \underset{(alc)}{\xrightarrow{\Delta}}$

II. $R - C \equiv N \xrightarrow[Na(Hg)/C_2H_5OH]{H_2/Ni}$

III. $R - C \equiv N + H_2O \xrightarrow{H^+}$

IV. $R - \overset{\overset{O}{\parallel}}{C} - NH_2 + 4[H] \xrightarrow[\text{ii) } H_3O^+]{\text{i) } LiAlH_4}$

(1) Both II and IV   (2) Both I and III   (3) Only II   (4) Only III

Ans (4)

$R - C \equiv N + H_2O \xrightarrow{H^+} R - \overset{\overset{O}{\parallel}}{C} - OH$

24. Match the compounds given in List-I with the items given in List-II

	List-I		List-II
(I)	Benzenesulphonyl Chloride	(a)	Zwitterion
(II)	Sulphanilic acid	(b)	Hinsberg reagent
(III)	Alkyl Diazonium salts	(c)	Dyes
(IV)	Aryl Diazonium salts	(d)	Conversion to alcohols

(1) I – b, II – a, III – d, IV - c   (2) I - c, II – b, III – a, IV - d

(3) I – a, II – c, III – b, IV - d   (4) I – c, II – a, III – d, IV - b

Ans (1)

25. The number of orbitals associated with 'N' shell of an atom is

(1) 4   (2) 16   (3) 32   (4) 3

Ans (2)

N-shell has n = 4

$L = 0, 1, 2, 3 \therefore \overset{1}{4s}, \overset{3}{4p}, \overset{5}{4d}, \overset{7}{4f} = 16$ orbitals

26. According to the Heisenberg's Uncertainty principle, the value of $\Delta v.\Delta x$ for an object whose mass is 10^{-6} kg is (h = 6.626×10^{-34} Js)

(1) 5.2×10^{-29} m^{-2} s^{-1} (2) 3.0×10^{-24} m^{-2} s^{-1} (3) 4.0×10^{-26} m^{-2} s^{-1} (4) 3.5×10^{-25} m^{-2} s^{-1}

Ans (1)

$$\Delta x \times \Delta v \geq \frac{h}{4\pi m}$$

$$\geq \frac{6.6 \times 10^{-34}}{4 \times 3.14 \times 10^{-6}}$$

$$\geq 0.52 \times 10^{-28}$$

$$\geq 5.2 \times 10^{-29} \text{ m}^{-2} \text{ s}^{-1}$$

27. Given below are two statements.

    Statement-I: Adiabatic work done is positive when work is done on the system and internal energy of the system increases.

    Statement-II: No work is done during free expansion of an ideal gas.

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

    (1) Both statement-I and statement-II are true   (2) Both statement-I and statement-II are false

    (3) Statement-I is true but statement-II is false   (4) Statement-I is false but statement-II is true

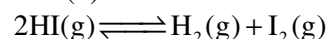   **Ans** (1)

    Adiabatic condition, q = 0

    $\Delta U = +w$

    Ideal gas upon free expansion, no work is done (since $p_{ext} = 0$).

28. Which one of the following reactions has $\Delta H = \Delta U$?

    (1) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

    (2) $CaCO_3(s) \xrightarrow{\Delta} CaO(s) + CO_2(g)$

    (3) $C_6H_6(l) + \dfrac{15}{2}O_2(g) \longrightarrow 6CO_2(g) + 3H_2O(l)$

    (4) $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$

    Ans (4)

    $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$

    $\Delta n = 0$

    $\Delta H = \Delta U + \Delta nRT$

    $\Delta H = \Delta U$

29. Identify the incorrect statements among the following:

    (a) All enthalpies of fusion are positive.

    (b) The magnitude of enthalpy change does not depend on the strength of the intermolecular interactions in the substance undergoing phase transformations.

    (c) When a chemical reaction is reversed, the value of $\Delta rH°$ is reversed in sign.

    (d) The change in enthalpy is dependent of path between initial state (reactants) and final state (products).

    (e) For most of the ionic compounds, $\Delta_{sol}H°$ is negative.

    (1) a and c only   (2) a, b and d   (3) b, d and e   (4) a, d and e

    Ans (3)

30. Which of the following statements is/are true about equilibrium?

    (a) Equilibrium is possible only in a closed system at a given temperature.

    (b) All the measurable properties of the system remain constant at equilibrium.

    (c) Equilibrium constant for the reverse reaction is the inverse of the equilibrium constant for the reaction in the forward direction.

   (1) Only a   (2) Only b   (3) Only c   (4) a, b and c

    Ans (4)

31. According to Le Chatelier's principle, in the reaction $CO(g) + 3H_2(g) \rightleftharpoons CH_4(g) + H_2O(g)$, the formation of methane is favoured by

    (a) increasing the concentration of CO

    (b) increasing the concentration of H_2O

    (c) decreasing the concentration of CH_4

    (d) decreasing the concentration of H_2

    (1) a and b   (2) a and c   (3) b and d   (4) a and d

    Ans (2)

32. The equilibrium constant at 298K for the reaction $A + B \rightleftharpoons C + D$ is 100. If the initial concentrations of all the four species were 1M each, then equilibrium concentration of D (in mol L^{-1}) will be

    (1) 0.818   (2) 0.182   (3) 1.818   (4) 1.182

    Ans (3)

    $$A \quad + \quad B \rightleftharpoons C \quad + \quad D$$
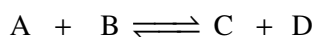
    $t = 0 \qquad 1 \qquad 1 \qquad 1 \qquad 1$

    $t = t \qquad (1-x) \quad (1-x) \quad (1+x) \quad (1+x)$

    $$K_{eq} = \frac{[C][D]}{[A][B]}$$

    $$K_{eq} = \frac{(1+x)(1+x)}{(1-x)(1-x)}$$

    $$100 = \frac{(1+x)^2}{(1-x)^2}$$

    $$\sqrt{\frac{(1+x)^2}{(1-x)^2}} = \sqrt{100}$$

    $$\frac{1+x}{1-x} = 10$$

    $1 + x = 10 - 10x$

    $11x = 9$

    $x = 0.818$

    $[D] = 1 + x$

 $\quad\quad = 1 + 0.818 = 1.818$

33. Among the following 0.1 m aqueous solutions, which one will exhibit the lowest boiling point elevation, assuming complete ionisation of the compounds in solution?

    (1) Sodium chloride   (2) Aluminium chloride

    (3) Aluminium sulphate   (4) Potassium sulphate

    Ans (1)

    Colligative properties depend only on the number of particles in solution.

34. Variation of solubility with temperature T for a gas in liquid is shown by the following graphs. The correct representation is

(1)   (2)   (3)   (4)
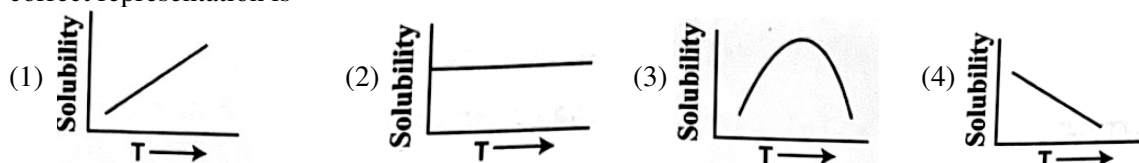
Ans (4)

Dissolution of a gas in a liquid is an exothermic process. Solubility decreases with increase in temperature.

35. 180 g of glucose, $C_6H_{12}O_6$, is dissolved in 1 kg of water in a vessel. The temperature at which water boils at 1.013 bar is _____ (given, K_b for water is 0.52K kg mol^{-1}. Boiling point for pure water is 373.15 K)

(1) 373.202 K   (2) 373.67 K   (3) 373.15 K   (4) 373.0 K

Ans (2)

$$\Delta T_b = \frac{K_b w_2 1000}{M_2 w_1}$$

$$= \frac{0.52 \times 180 \times 1000}{180 \times 1000}$$

$$T_b = 373.15 + 0.52$$

$$= 373.67 \text{ K}$$

36. If N_2 gas is bubbled through water at 293 K, how many moles of N_2 gas would dissolve in 1 litre of water? Assume that N_2 exerts a partial pressure of 0.987 bar. [Given K_H for N_2 at 293 K is 76.48 K bar]

(1) 7.16×10^{-3} (2) 0.716×10^{-3} (3) 7.16×10^{-5} (4) 7.16×10^{-4}

Ans (2 and 4)

$$x_{N_2} = \frac{p_{N_2}}{K_H} = \frac{0.987}{76.48 \times 10^3} = 1.29 \times 10^{-5}$$

$$n_{H_2O} = \frac{10^3}{18} = 55.55 \text{ moles}$$

$$x_{N_2} = \frac{n_{N_2}}{n_{N_2} + 55.55} = \frac{n_{N_2}}{55.55}$$

$$1.29 \times 10^{-5} = \frac{n_{N_2}}{55.55}$$

$$n_{N_2} = 1.29 \times 10^{-5} \times 55.55$$

$$= 7.16 \times 10^{-4} \textbf{ (OR) } 0.716 \times 10^{-3}$$

37. The correct statement/s about Galvanic cell is/are

(a) Current flows from cathode to anode

(b) Anode is positive terminal

(c) If $E_{cell} < 0$, then it is spontaneous reaction

(d) Cathode is positive terminal

(1) b only   (2) a and b only   (3) a, b and c   (4) a and d only

Ans (4)

38. The electronic conductance depends on
    (1) Size of the ions
    (2) Nature of electrolyte added
    (3) The number of valence electrons per atom
    (4) Concentration of the electrolyte
    Ans (3)

39. For a given half cell, $Al^{3+} + 3e^- \longrightarrow Al$ on increasing the concentration of aluminium ion, the electrode potential will
    (1) Increase
    (2) Decrease
    (3) No change
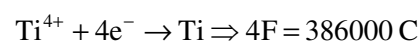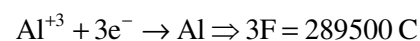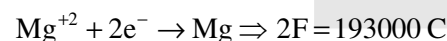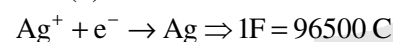   (4) First increase then decrease
    Ans (1)
    $$E_{cell} = E^o_{cell} + \frac{0.0591}{n} \log[Al^{3+}] \text{ i.e., } E_{cell} \propto [Al^{3+}]$$

40. Match the following and select the correct option for the quantity of electricity, in $Cmol^{-1}$, required to deposit various metals at cathode.

	List - I		List - II
(a)	Ag^+	(i)	$386000\ Cmol^{-1}$
(b)	Mg^{2+}	(ii)	$289500\ Cmol^{-1}$
(c)	Al^{3+}	(iii)	$96500\ Cmol^{-1}$
(d)	Ti^{4+}	(iv)	$193000\ Cmol^{-1}$

(1) a – i; b – ii; c – iii; d – iv
(2) a – ii; b – i; c – iv; d – iii
(3) a – iii; b – iv; c – ii; d – i
(4) a – iv; b – iii; c – i; d – ii
    Ans (3)
    $Ag^+ + e^- \to Ag \Rightarrow 1F = 96500\ C$
    $Mg^{+2} + 2e^- \to Mg \Rightarrow 2F = 193000\ C$
    $Al^{+3} + 3e^- \to Al \Rightarrow 3F = 289500\ C$
    $Ti^{4+} + 4e^- \to Ti \Rightarrow 4F = 386000\ C$

41. Catalysts are used to increase the rate of a chemical reaction. Because it
    (1) Increases the potential energy barrier
    (2) Increases the activation energy of the reaction
    (3) Decreases the activation energy of the reaction
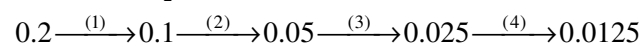   (4) Brings about improper orientation of reactant molecules
    Ans (3)

42. Half-life of a first order reaction is 20 seconds and initial concentration of reactant is 0.2M. The concentration of reactant left after 80 seconds is
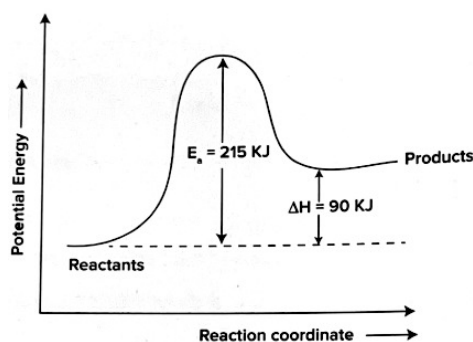   (1) 0.2 M
    (2) 0.1 M
    (3) 0.05 M
    (4) 0.0125 M
    Ans (4)
    Number of $t_{\frac{1}{2}} = \dfrac{\text{total time taken}}{\text{half-life period}} = \dfrac{80}{20} = 4$
    $0.2 \xrightarrow{(1)} 0.1 \xrightarrow{(2)} 0.05 \xrightarrow{(3)} 0.025 \xrightarrow{(4)} 0.0125$

43. In the given graph, E_a for the reverse reaction will be

(1) 305 KJ   (2) 125 KJ   (3) 215 KJ   (4) 90 KJ

Ans (2)

$\Delta H = E_a$ forward $- E_a$ backward

$90 = 215$

E_a backward $= 215 - 90$

      $= 125$ kJ

44. For the reaction $2N_2O_5(g) \longrightarrow 4NO_2(g) + O_2(g)$ initial concentration of N_2O_5 is 2.0 mol L^{-1} and after 300 min, it is reduced to 1.4 mol L^{-1}. The rate of production of NO_2 (in mol L^{-1} min^{-1}) is

(1) 4×10^{-3} (2) 2.5×10^{-4} (3) 4×10^{-4} (4) 2.5×10^{-3}

Ans (1)

$$\frac{1}{2}\frac{d[N_2O_5]}{dt} = \frac{1}{4}\frac{d[NO_2]}{dt}$$

$$\frac{d[NO_2]}{dt} = 2\left\{-\frac{d[N_2O_5]}{dt}\right\}$$

$$= \frac{2\{-(1.4-2.0)\}}{300}$$

$$= 4 \times 10^{-3} \text{ mol L}^{-1} \text{ min}^{-1}$$

45. Which of the following methods of expressing concentration are unitless?

(1) Molality and Molarity

(2) Mole fraction and Mass percent (W/W)

(3) Molality and Mole fraction

(4) Mass percent (W/W) and Molality

Ans (2)

46. Select the INCORRECT statement/s from the following:

(a) 22 books have infinite significant figures

(b) In the answer of calculation 2.5×1.25 has four significant figures.

(c) Zero's preceding to first non-zero digit are significant.

(d) In the answer of calculation $12.11 + 18.0 + 1.012$ has three significant figures.

(1) (a) and (b) only   (2) (b), (c) and (d)

(3) (b) and (c) only   (4) (b) and (d) only

Ans (3)

47. Given below are the atomic masses of the elements

Element	Li	Na	Cl	K	Ca	Br	Sr	I	Ba
Atomic mass (g mol^{-1})	7	23	35.5	39	40	80	88	127	137

Which of the following doesn't form triad?

(1) Li, Na, K   (2) Ba, Sr, Ca   (3) Cl, Br, I   (4) Cl, K, Ca

Ans (4)

48. The change in hybridization (if any) of the 'Al' atom in the following reaction is $AlCl_3 + Cl^- \rightarrow AlCl_4^-$

(1) sp^3 to sp^2 (2) No change in the hybridisation state

(3) sp^2 to sp^3 (4) sp^3 to sp^3 d

Ans (3)

49. Match List I with List II and select the correct option:

List – I		List – II	
(Molecule / ion)		(Bond order)	
(a)	NO	(i)	1.5
(b)	CO	(ii)	2.0
(c)	O_2^-	(iii)	2.5
(d)	O_2	(iv)	3.0

(1) a – iv, b – iii, c – ii, d – i   (2) a – iii, b – iv, c – i, d – ii

(3) a – i, b – iv, c – iii, d – ii   (4) a – ii, b – iii, c – iv, d – i

Ans (2)

NO (15 electrons) : $\sigma 1s^2 \; \sigma*1s^2 \sigma 2s^2 \; \sigma*2s^2 \; \sigma 2p_z^2 \pi 2p_x^2 = \pi 2p_y^2 \; \pi*2p_x^1 = \pi*2p_y^0$

$$B.O = \frac{1}{2}(10-5)$$
$$= 2.5$$

CO (14 electrons) : $\sigma 1s^2 \sigma*1s^2 \sigma 2s^2 \sigma*2s^2 \sigma 2p_z^2 \pi 2p_x^2 = \pi 2p_y^2$

$$B.O = \frac{1}{2}(10-4)$$
$$= 3$$

O_2^- (17 electrons) : $\sigma 1s^2 \sigma*1s^2 \sigma 2s^2 \sigma*2s^2 \sigma 2p_z^2 \; \pi 2p_x^2 = \pi 2p_y^2 \; \pi*2p_x^2 = \pi*2p_y^1$

$$B.O = \frac{1}{2}(10-7)$$
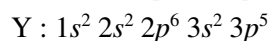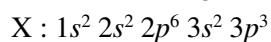$$= 1.5$$

O_2 (16 electrons) : $\sigma 1s^2 \; \sigma*1s^2 \sigma 2s^2 \sigma*2s^2 \sigma 2p_z^2 \pi 2p_x^2 = \pi 2p_y^2 \pi*2p_x^1 = \pi*2p_y^1$

$$B.O = \frac{1}{2}(10-6)$$
$$= 2$$

50. The electronic configuration of X and Y are given below:

    X : $1s^2\, 2s^2\, 2p^6\, 3s^2\, 3p^3$

    Y : $1s^2\, 2s^2\, 2p^6\, 3s^2\, 3p^5$

    Which of the following is the correct molecular formula and type of bond formed between X and Y?

    (1) X_2Y, covalent bond

    (2) X_3y, ionic bond

    (3) X_2Y_3, coordinate bond

    (4) XY_3, covalent bond

    Ans (4)

51. Match List – I with List – II.

	List – I (Types of redox reactions)		List – II (Examples)
(a)	Combination reaction	(i)	$Cl_2(g) + 2Br^-(aq) \longrightarrow 2Cl^-(aq) + Br_2(l)$
(b)	Decomposition reaction	(ii)	$2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$
(c)	Displacement reaction	(iii)	$CH_4(g) + 2O_2(g) \xrightarrow{\Delta} CO_2(g) + 2H_2O(l)$
(d)	Disproportionation reaction	(iv)	$2H_2O(l) \xrightarrow{\Delta} 2H_2(g) + O_2(g)$

    Choose the correct answer from the options given below.

    (1) a – iii, b – ii, c – i, d – iv

    (2) a – iv, b – iii, c – i, d – ii

    (3) a – ii, b – i, c – iv, d – iii

    (4) a – iii, b – iv, c – i, d – ii

    Ans (4)

52. In the following pairs, the one in which both transition metal ions are colourless is

    (1) Ti^{4+}, Cu^{2+} (2) Sc^{3+}, Zn^{2+} (3) V^{2+}, Ti^{3+} (4) Zn^{2+}, Mn^{2+}

    Ans (2)

53. In the reaction between hydrogen sulphide and acidified permanganate solution,

    (1) H_2S is oxidised to S, MnO_4^- is reduced to Mn^{2+}

    (2) H_2S is reduced to S, MnO_4^- is oxidised to Mn^{2+}

    (3) H_2S is oxidised to SO_2, MnO_4^- is reduced to MnO_2

    (4) H_2S is reduced to SO_2, MnO_4^- is oxidised to Mn^{2+}

    Ans (1)

    $5H_2S + 2KMnO_4 + 8H_2SO_4 \rightarrow 5S + 2MnSO_4 + K_2SO_4 + 8H_2O$
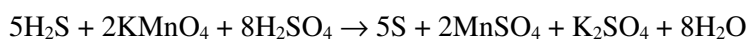
54. A member of the Lanthanoid series which is well known to exhibit +4 oxidation state is

    (1) Cerium   (2) Samarium   (3) Europium   (4) Erbium

    Ans (1)

55. In which of the following pairs, both the elements do not have $(n-1)\, d^{10}\, ns^2$ configuration?

    (1) Ag, Cu   (2) Cu, Zn   (3) Zn, Cd   (4) Cd, Hg

    Ans (1)

56. A ligand which has two different donor atoms and either of the two ligates with the central metal atom/ion in the complex is called _____

    (1) Ambidentate ligand

    (2) Chelate ligand

    (3) Unidentate ligand

    (4) Polydentate ligand

    Ans (1)

57. Which of the following statements are true about $[NiCl_4]^{2-}$?

    (a) The complex has tetrahedral geometry.

    (b) Co-ordination number of Ni is 2 and oxidation state is +4.

    (c) The complex is sp^3 hybridised.

    (d) It is a high spin complex.

    (e) The complex is paramagnetic.

    (1) a, b, c and d   (2) a, c, d and e   (3) a, b, d and e   (4) b, c, d and e

    Ans (2)

58. Which formula and its name combination is incorrect?

    (1) [Pt(NH$_3$)$_2$ Cl(NO$_2$)] Diamine chloridonitrito-N-platinum (II)

    (2) K$_3$[Cr(C$_2$O$_4$)$_3$], Potassium trioxalatochromate (III)

    (3) [CoCl$_2$(en)$_2$]Cl, Dichloridobis (ethane – 1, 2 – diamine) cobalt (III) chloride

    (4) [Co(NH$_3$)$_5$(CO$_3$)]Cl, Pentaamine carbonylcobalt (III) chloride

    Ans (1 and 4)

    The correct IUPAC name of $\left[Co\left(NH_3\right)_5\left(CO_3\right)\right]Cl$ is pentaamine carbonatocobalt (III) chloride

Formula	IUPAC Name
[Pt(NH$_3$)$_2$ Cl (NO$_2$)]	Diamminechloridonitrito-N-platinum(II)
[Co(NH$_3$)$_5$ (CO$_3$)Cl]	Pentamminecarbonatochloridocobalt(III)

59. In the complex ion [Fe(C$_2$O$_4$)$_3$]$^{3-}$, the Co-ordination number of Fe is

    (1) 3   (2) 4   (3) 5   (4) 6

    Ans (4)

60. Match List-I with List-II for the following reaction pattern

    $Glucose \xrightarrow{\text{Reagent}} Product \longrightarrow Structural\ prediction.$

	List-I (Reagents)		List-II (Structural prediction)
(a)	Acetic anhydride	(i)	Glucose has an aldehyde group
(b)	Bromine water	(ii)	Glucose has a straight chain of six carbon atoms
(c)	Hydroiodic acid	(iii)	Glucose has five hydroxyl groups
(d)	Hydrogen cyanide	(iv)	Glucose has a carbonyl group

    Choose the correct answer from the options given below.

    (1) a – iii, b – ii, c – i, d – iv   (2) a – iv, b – iii, c – ii, d – i

    (3) a – iii, b – i, c – ii, d – iv   (4) a – i, b – ii, c – iii, d – iv

    Ans (3)

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