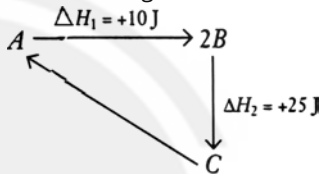



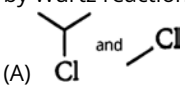

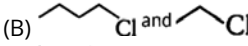
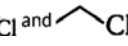
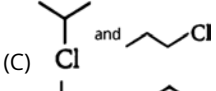
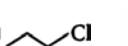
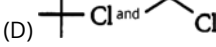

TEST 03

Ultimate KCET Crash Course 2026

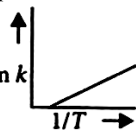
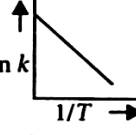
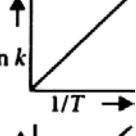
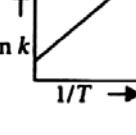
CHEMISTRY

- Q1** A pure compound contains 2.4 g of C, 1.2×10^{23} atoms of H, 0.2 moles of oxygen atoms. Its empirical formula is
(A) CHO (B) CH₂O
(C) C₂H₂O (D) C₂H₂O₂
- Q2** A gas mixture contains 25% He and 75% CH₄ by volume at a given temperature and pressure. The percentage by mass of methane in the mixture is _____. approximately
(A) 8% (B) 92%
(C) 75% (D) 25%
- Q3** The maximum number of electrons in the shell with principal quantum number n is equal to
(A) $2(n-1)^2$ (B) $2n^2$
(C) $2(n+1)^2$ (D) n^2
- Q4** The energy associated with first orbit of He⁺ is
(A) 0 J
(B) -0.545×10^{-18} J
(C) -4.58×10^{-18} J
(D) -8.72×10^{-18} J
- Q5** Which of the following represents a noble gas configuration?
(A) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4f^{14} 5s^2 5p^6 5d^1$
(B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6$
(C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6 5d^6 6s^2$
(D) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6 5d^1 6s^2$
- Q6** Elements X, Y and Z have atomic numbers 19, 37 and 55 respectively. Which of the following statements is true about them?
(A) Y would have an ionisation potential between those of X and Z.
(B) Y would have the highest ionisation potential.
(C) Z would have the highest ionisation potential.
(D) Their ionisation potential would increase with increasing atomic number.
- Q7** In oxygen and carbon molecule the bonding is
(A) O₂ : 1σ, 1π; C₂ : 1σ, 1π
(B) O₂ : 1σ, 1π; C₂ : 0σ, 2π
(C) O₂ : 2σ, 0π; C₂ : 0σ, 2π
(D) O₂ : 0σ, 2π; C₂ : 2σ, 0π
- Q8** Which of the following has π - π bonding?
(A) CO₃²⁻ (B) SO₃²⁻
(C) NO₃⁻ (D) BO₃³⁻
- Q9** The percentage of s-character in the hybrid orbitals of nitrogen in NO₂⁺, NO₃⁻ and NH₄⁺ respectively are
(A) 33.3%, 50%, 25%
(B) 25%, 50%, 33.3%
(C) 33.3%, 25%, 50%
(D) 50%, 33.3%, 25%
- Q10** From the diagram,

 $\Delta_r H$ for the reaction C → A is
(A) +35 J (B) -15 J
(C) +15 J (D) -35 J
- Q11** A weak acid with pK_a 5.9 and weak base with pK_b 5.8 are mixed in equal proportions. pH of the resulting solution is
(A) 7 (B) 7.05
(C) 7.5 (D) 7.005
- Q12** The solubility products of Al(OH)₃ and Zn(OH)₂ are 8.5×10^{-23} and 1.8×10^{-14} respectively. If NH₄OH is added to a solution containing Al³⁺ and Zn²⁺ ions, then the substance precipitated first is
(A) both together (B) Al(OH)₃
(C) none of these (D) Zn(OH)₂
- Q13** The equilibrium constant for the reaction, $aA + bB \rightleftharpoons cC + dD$ is K, then the equilibrium constant for the reaction, $naA + nbB \rightleftharpoons ncC + ndD$ will be
(A) $\frac{1}{K^n}$ (B) Kⁿ
(C) $\frac{1}{K^{n-1}}$ (D) K
- Q14** For the redox reaction, $xMnO_4^- + yH_2C_2O_4 + zH^+ \rightarrow mMn^{2+} + nCO_2 + pH_2O$ values of x, y, m and n are
(A) 2, 5, 2, 10 (B) 10, 2, 5, 2
(C) 3, 5, 2, 10 (D) 6, 4, 2, 4



- Q15** An organic compound is estimated through Dumas method and was found to evolve 6 moles of CO_2 , 4 moles of H_2O and 1 mole of nitrogen gas. The formula of the compound is
 (A) $\text{C}_{12}\text{H}_8\text{N}$ (B) $\text{C}_{12}\text{H}_8\text{N}_2$
 (C) $\text{C}_6\text{H}_8\text{N}$ (D) $\text{C}_6\text{H}_8\text{N}_2$
- Q16** The structure of tertiary butyl carbonium ion is
 (A) trigonal planar
 (B) square planar
 (C) tetrahedral
 (D) pyramidal
- Q17** Which of the following compounds possesses the "C - H" bond with the lowest bond dissociation energy?
 (A) Benzene
 (B) n-Pentane
 (C) 2, 2-Dimethylpropane
 (D) Toluene
- Q18** The alkyl halides required to prepare  by Wurtz reaction are
 (A)  and 
 (B)  and 
 (C)  and 
 (D)  and 
- Q19** One mole of a symmetrical alkene on ozonolysis gives two moles of an aldehyde having a molecular mass of 44 u. The alkene is
 (A) propene (B) ethene
 (C) 1-butene (D) 2-butene
- Q20** Vapour pressure of a solution containing 18 g of glucose and 178.2 g of water at 100°C is (Vapour pressure of pure water at 100°C = 760 torr)
 (A) 76.0 torr (B) 3207.6 torr
 (C) 752.4 torr (D) 7.6 torr
- Q21** The solutions A and B are 0.1 M and 0.2 M in a substance. If 100 mL of A is mixed with 25 mL of B and there is no change in volume, the final molarity of the solution is
 (A) 0.12 M (B) 0.30 M
 (C) 0.18 M (D) 0.15 M
- Q22** A mixture of phenol and aniline shows negative deviation from Raoult's law. This is due to the formation of
 (A) intermolecular hydrogen bond
 (B) non-polar covalent bond
 (C) intramolecular hydrogen bond
 (D) polar covalent bond
- Q23** The vapour pressure of pure liquids A and B are 450 and 700 mm of Hg at 350 K respectively. If the total vapour pressure of the mixture is 600 mm of Hg, the composition of the mixture in the solution is
 (A) $x_A=0.4$, $x_B=0.6$
 (B) $x_A=0.7$, $x_B=0.3$
 (C) $x_A=0.6$, $x_B=0.4$
 (D) $x_A=0.3$, $x_B=0.7$
- Q24** A sample of water is found to contain 5.85% (w/w) of AB (molecular mass 58.5) and 9.50% (w/w) XY_2 (molecular mass 95). Assuming 80% ionisation of AB and 60% ionisation of XY_2 , the freezing point of water sample is [Given: K_f for water is 1.86 K kg mol. Freezing point of pure water is 273 K and A, B and Y are monovalent ions.]
 (A) 281.75 K (B) 264.93 K
 (C) 265.56 K (D) 280.44 K
- Q25** E° for the cell, $\text{Zn}|\text{Zn}^{2+}_{(\text{aq})}||\text{Cu}^{2+}_{(\text{aq})}|\text{Cu}$ is 1.10 V at 25°C . The equilibrium constant for the cell reaction, $\text{Zn} + \text{Cu}^{2+}_{(\text{aq})} \rightleftharpoons \text{Cu} + \text{Zn}^{2+}_{(\text{aq})}$ is of the order of
 (A) 10^{17} (B) 10^{-17}
 (C) 10^{-37} (D) 10^{37}
- Q26** A conductivity cell filled with 0.02 M H_2SO_4 gives at 25°C resistance of 122 ohms. If the molar conductivity of 0.02 M H_2SO_4 is $618 \Omega^{-1} \text{cm}^2 \text{mol}^{-1}$, what is the cell constant?
 (A) 3.7 (B) 2.5
 (C) 8.5 (D) 1.51
- Q27** For a cell the reaction is $\text{Mg}_{(\text{s})} + \text{Cu}^{2+}_{(\text{aq})} \rightarrow \text{Cu}_{(\text{s})} + \text{Mg}^{2+}_{(\text{aq})}$ If the standard reduction potentials of Mg and Cu are -2.37 V and 0.34 V respectively, the EMF of the cell is
 (A) 2.03 V (B) -2.71 V
 (C) 2.71 V (D) -2.03 V
- Q28** For which case A values vs \sqrt{C} shows a straight line?
 (A) CH_3NH_2 (B) HCOOH
 (C) KCl (D) CH_3COOH



- Q29** A current of 3 A is passed through a molten calcium salt for 1 hr 47 min 13 sec. The mass of calcium deposited is (Molar mass of Ca = 40 g mol⁻¹)
 (A) 4.0 g (B) 6.0 g
 (C) 8.0 g (D) 2.0 g
- Q30** For an endothermic reaction, ΔH represents the enthalpy of the reaction in kJ mol⁻¹. The minimum amount of activation energy will be
 (A) more than ΔH
 (B) equal to ΔH
 (C) less than ΔH
 (D) less than zero
- Q31** The energy of activation for a certain second order reaction is 85.2 kJ mol⁻¹ and its frequency factor is 3.1×10^{11} L mol⁻¹ s⁻¹ at 310 K. Calculate the rate constant of the reaction.
 ($R = 8.314$ J K⁻¹ mol⁻¹)
 (A) 13.72×10^{-3} L mol⁻¹ s⁻¹
 (B) 1.592×10^{-3} L mol⁻¹ s⁻¹
 (C) 1.372×10^{-3} L mol⁻¹ s⁻¹
 (D) 1.372 L mol⁻¹ s⁻¹
- Q32** For a reaction $P + Q \rightarrow 3R + S$. Which of the following statements is incorrect?
 (A) Rate of disappearance of Q = 2 \times Rate of appearance of R
 (B) Rate of disappearance of Q = $\frac{1}{3}$ \times Rate of appearance of R
 (C) Rate of disappearance of P = Rate of disappearance of Q
 (D) Rate of disappearance of P = Rate of appearance of S
- Q33** According to Arrhenius equation which of the following options represents the graph of $\ln k$ vs $\frac{1}{T}$?
 (A) 
 (B) 
 (C) 
 (D) 
- Q34** The activation energy of exothermic reaction A B is 80 kJ. The heat of reaction is 200 kJ mol⁻¹. The activation energy for the reaction B A in kJ/mol will be
 (A) 120 (B) 280
 (C) 200 (D) 80
- Q35** Manganese achieves its highest oxidation state in its compound
 (A) KMnO₄ (B) Mn₂O₄
 (C) MnO₂ (D) K₂MnO₄
- Q36** A violet compound of manganese (P) decomposes on heating to liberate oxygen and compounds (Q) and (R) of manganese are formed. Compound (R) reacts with KOH in the presence of air or potassium nitrate to give compound (Q). On heating compound (R) with conc. H₂SO₄ and NaCl, chlorine gas is liberated and a compound (S) of manganese along with other products is formed. Compounds P to S are
 (A) P – K₂ MnO₄; Q – KMnO₄; R – MnO₂; S – MnCl₂
 (B) P – K₂ MnO₄; Q – MnO₂; R – KMnO₄; S – MnCl₂
 (C) P – KMnO₄; Q – K₂ MnO₄; R – MnO₂; S – MnCl₂
 (D) P – KMnO₄; Q – K₂ MnO₄; R – MnCl₂; S – MnO₂
- Q37** What is the correct order of spin-only magnetic moment (in B.M.) of Mn²⁺, Cr²⁺ and V²⁺?
 (A) Mn²⁺ > Cr²⁺ > V²⁺
 (B) V²⁺ > Cr²⁺ > Mn²⁺
 (C) Mn²⁺ > V²⁺ > Cr²⁺
 (D) Cr²⁺ > V²⁺ > Mn²⁺
- Q38** Coinage metals show the properties of
 (A) inert elements
 (B) typical elements
 (C) normal elements
 (D) transition elements
- Q39** Which of the following statements are correct when a mixture of NaCl and K₂Cr₂O₇ is gently warmed with conc. H₂SO₄?
 I. A deep red vapour is evolved.
 II. The vapour when passed into NaOH solution gives a yellow solution of Na₂CrO₄.
 III. Chlorine gas is evolved.
 IV. Chromyl chloride is formed.
 Choose the correct option.
 (A) I, II and III only
 (B) III and IV only
 (C) I and II only
 (D) I, II and IV only



- Q40** The hybridization states of the central atom in the complex ions $[\text{FeF}_6]^{3-}$, $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{Ni}(\text{NH}_3)_6]^{2+}$ are
 (A) all are dsp^3
 (B) $\text{sp}^3 \text{d}^2$, dsp^2 and sp^3 respectively
 (C) all are $\text{sp}^3 \text{d}^2$
 (D) $\text{sp}^3 \text{d}^2$, dsp^3 and $\text{d}^2 \text{sp}^3$ respectively

- Q41** Among the following complexes, the complex which has the highest value for CFSE is
 (A) $[\text{Co}(\text{NCS})_4]^{2-}$
 (B) $[\text{Co}(\text{NH}_3)_6]^{3+}$
 (C) $[\text{CoF}_4]^{2-}$
 (D) $[\text{CoCl}_4]^{2-}$

- Q42** Increasing value of magnetic moments of
 I. $[\text{Fe}(\text{CN})_6]^{4-}$
 II. $[\text{Fe}(\text{CN})_6]^{3-}$
 III. $[\text{Cr}(\text{NH}_3)_6]^{3+}$
 iv. $[\text{Ni}(\text{H}_2\text{O})_4]^{2+}$ is
 (A) I < II < IV < III
 (B) I < II < III < IV
 (C) IV < III < II < I
 (D) II < III < I < IV

- Q43** Which of the following complex species involves d^2sp^3 hybridization?
 (A) All of these
 (B) $[\text{CoF}_6]^{3-}$
 (C) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
 (D) $[\text{Fe}(\text{CN})_6]^{3-}$

- Q44** The arrangement of following compounds
 i. bromomethane
 ii. chloroform
 iii. chloromethane
 in the increasing order of their boiling point is
 (A) ii < iii < i
 (B) ii < i < iii
 (C) i < ii < iii
 (D) iii < i < ii

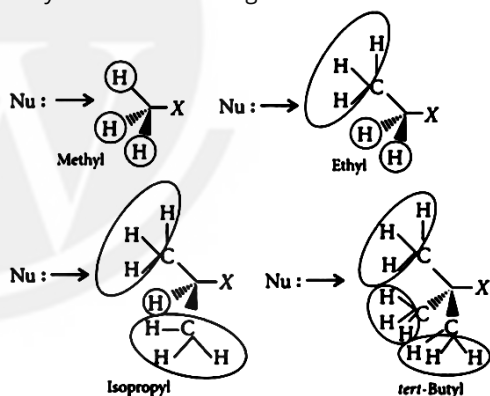
- Q45** Match the column I with column II and mark the appropriate choice.

Column I	Column II
(A)	(i) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$
(B)	(ii)
(C)	(iii)
(D)	(iv)

- (A) (A) (ii), (B) (i), (C) (iii), (D) (iv)
 (B) (A) (i), (B) (iii), (C) (iv), (D) (ii)
 (C) (A) (iv), (B) (ii), (C) (i), (D) (iii)
 (D) (A) (iii), (B) (iv), (C) (ii), (D) (i)

- Q46** Name the major product formed when 2-methylpropane is heated with bromine vapours in presence of sunlight.
 (A) 2-Bromobutane
 (B) 1-Bromo-2-methylpropane
 (C) 2-Bromo-2-methylpropane
 (D) 1, 2-Dibromo-2-methylpropane

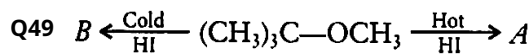
- Q47** In which case of approach of nucleophile is easy as shown in the figure?



- (A) tert-Butyl (B) Methyl
 (C) Isopropyl (D) Ethyl

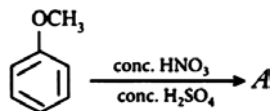
- Q48** Propan-1-ol and propan-2-ol can be best distinguished by
 (A) oxidation with concentrated H_2SO_4 followed by reaction with Fehling's solution
 (B) oxidation with acidic dichromate followed by reaction with Fehling's solution
 (C) oxidation by heating with copper followed by reaction with Fehling's solution
 (D) oxidation with KMnO_4 followed by reaction with Fehling's solution



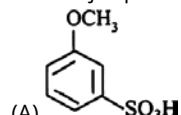
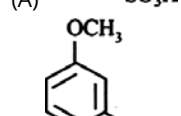
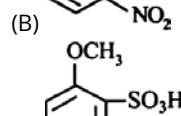
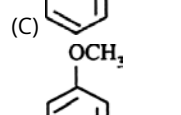


- (A) A and B are identical mixtures of CH_3I and $(\text{CH}_3)_3\text{C}-\text{OH}$
 A is the mixture of $(\text{CH}_3)_3\text{C}-\text{OH}$ and CH_3-I
 (B) B is the mixture of $(\text{CH}_3)_3\text{C}-\text{I}$ and CH_3-OH
 A is the mixture of $(\text{CH}_3)_3\text{C}-\text{I}$ and CH_3-I
 (C) B is the mixture of $(\text{CH}_3)_3\text{C}-\text{I}$ and CH_3-OH
 (D) None of these

Q50 In the reaction



The major product A is

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

Q51 Which of the following orders is true regarding the acidic nature of phenol?

- (A) Phenol < o-cresol > o-nitrophenol
 (B) Phenol > o-cresol > o-nitrophenol
 (C) o-Cresol < phenol < o-nitrophenol
 (D) Phenol < o-cresol < o-nitrophenol

Q52 When the vapours of tertiary butyl alcohol are passed through heated copper at 573 K, the product formed is

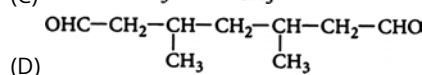
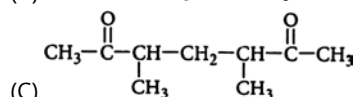
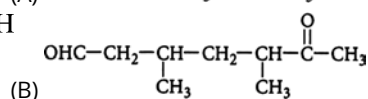
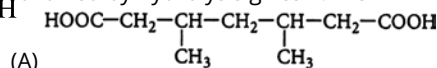
- (A) but-2-ene
 (B) 2-butanone
 (C) 2-methyl propene
 (D) butanal

Q53 $\text{CH}_3\text{CHO} \xrightarrow{\text{HCN}} A \xrightarrow{\text{HOH}} B$. The product B is

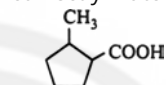
- (A) glycolic acid (B) lactic acid
 (C) formaldehyde (D) malonic acid

Q54 1,4-Pentadiene reacts with excess of HCl in absence of peroxide to give a compound X, X

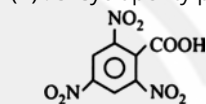
Upon reaction with excess of Mg in dry ether forms Y. Y on treatment with ethyl acetate followed by hydrolysis gives Z. Z is



Q55 Which of the following IUPAC names is not correctly matched ?



(A) : 3-Cyclopentylpropanoic acid

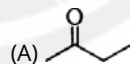
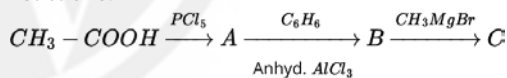


(B) : 2, 4, 6-Trinitrobenzoic acid

(C) $(\text{CH}_3)_2\text{C} = \text{CHCOOH}$: 3-Methylbut-2-enoic acid

(D) $\text{PhCH}_2\text{CH}_2\text{COOH}$: 3-Phenylpropanoic acid

Q56 Predict the product ' ' in the following series of reactions:

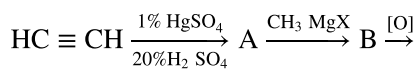


(B) $(\text{CH}_3)_2\text{C}(\text{OH})\text{C}_6\text{H}_5$

(C) $\text{CH}_3\text{CH}(\text{OH})\text{C}_6\text{H}_5$

(D) $\text{CH}_3\text{CH}(\text{OH})\text{C}_2\text{H}_5$

Q57 The end product in the following sequence of reactions is



(A) iso-propyl alcohol

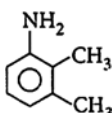
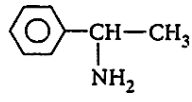
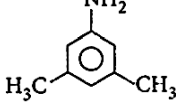
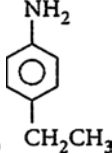
(B) ethanol

(C) acetone

(D) acetic acid



Q58 Suggest a structural formula of a compound having molecular formula $C_8H_{11}N$ which is optically active, dissolves in dil. aqueous HCl and releases N_2 with nitrous acid.

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

Q59 If aniline is treated with 1: 1 mixture of conc. HNO_3 and conc. H_2SO_4 , p-nitroaniline and m-nitroaniline are formed nearly in equal amounts. This is due to

- (A) isomerization of some p-nitroaniline into m-nitroaniline.
 (B) m-directing property of $-NH_2$ group
 (C) protonation of $-NH_2$ which causes deactivation of benzene ring
 (D) m- and p-directing property of $-NH_2$ group

Q60 Which of the following is a fat soluble vitamin?

- (A) Riboflavin (B) Pyridoxine
 (C) Thiamine (D) Vitamin A



Answer Key

Q1	A	Q31	C
Q2	B	Q32	A
Q3	B	Q33	B
Q4	D	Q34	B
Q5	B	Q35	A
Q6	A	Q36	C
Q7	B	Q37	A
Q8	B	Q38	D
Q9	D	Q39	D
Q10	D	Q40	C
Q11	B	Q41	B
Q12	B	Q42	A
Q13	B	Q43	D
Q14	A	Q44	D
Q15	D	Q45	D
Q16	A	Q46	C
Q17	D	Q47	B
Q18	C	Q48	C
Q19	D	Q49	C
Q20	C	Q50	D
Q21	A	Q51	C
Q22	A	Q52	C
Q23	A	Q53	B
Q24	B	Q54	C
Q25	D	Q55	A
Q26	D	Q56	B
Q27	C	Q57	C
Q28	C	Q58	B
Q29	A	Q59	C
Q30	A	Q60	D



Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

$$2.4 \text{ g of C} = \frac{2.4}{12} = 0.2 \text{ mol}$$

$$1.2 \times 10^{23} \text{ atoms of H} = \frac{1.2 \times 10^{23}}{6 \times 10^{23}} = 0.2 \text{ mol}$$

0.2 mol of oxygen atoms

∴ Simplest ratio = C : H : O = 0.2 : 0

$$.2 : 0.2 = 1 : 1 : 1$$

Empirical formula = CHO

Video Solution:



Q2 Text Solution:

$$75 \text{ mL of CH}_4 + 25 \text{ mL of He} = 100 \text{ mL of gas}$$

$$16 \text{ g of CH}_4 \text{ has volume } 22400 \text{ mL (At STP)}$$

$$\text{Mass of CH}_4 \text{ by volume} = \frac{75 \times 16}{22400} = 0.5357$$

$$\text{Mass of He by volume} = \frac{25 \times 4}{22400} = 0.004464$$

$$\text{Mass percentage of CH}_4 = \frac{0.5357}{0.5357 + 0.004464} \times 100 \approx 92\%$$

Video Solution:



Q3 Text Solution:

The maximum number of electrons in the shell with principal quantum number 'n' is equal to $2n^2$

Video Solution:



Q4 Text Solution:

$$E_n = \frac{-2.18 \times 10^{-18}}{n^2} \times Z^2 \text{ J}$$

For first orbit of He^+ : $n = 1, Z = 2$

$$E_1 = \frac{-2.18 \times 10^{-18} \times 4}{1^2} = -8.72 \times 10^{-18} \text{ Joule}$$

Video Solution:



Q5 Text Solution:

Noble gases have configuration ns^2np^6

Video Solution:



Q6 Text Solution:

Y would have an ionisation potential between those of X and Z.

Video Solution:



Q7 Text Solution:

O_2 has 1σ and 1π bond but C_2 molecule has 2π bonds.

Video Solution:



Q8 Text Solution:

In SO_3^{2-} , d-orbital of sulphur overlaps with p-orbital of oxygen to form a π bond. N, B and C do not have d-orbitals

Video Solution:**Q9 Text Solution:**

$$\text{Hybridisation} = \frac{1}{2}(V + M - C + A)$$

Where, V

= Number of valence electrons in central atom

M = Number of monovalent atom

C = Total positive charge

A = Total negative charge

$$\text{NO}_2^+ = \frac{1}{2}(5 - 1) = 2$$

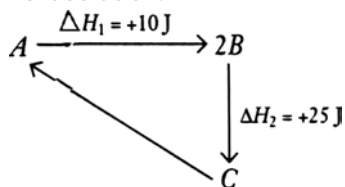
⇒ sp hybridisation (50% s - character)

$$\text{NO}_3^- = \frac{1}{2}(5 + 1) = 3$$

⇒ sp² hybridisation (33.3% s - character)

$$\text{NH}_4^+ = \frac{1}{2}(5 + 4 - 1) = 4$$

⇒ s³ hybridisation (25% s - character)

Video Solution:**Q10 Text Solution:**

According to Hess's law

$$(A \rightarrow C)\Delta H_3 = \Delta H_1 + \Delta H_2$$

$$\Delta H_3 = 10\text{J} + 25\text{J} = 35\text{J}$$

ΔH_3 is for the reaction $A \rightarrow C$

So $\Delta_r H$ for $C \rightarrow A$ is -35J .

Video Solution:**Q11 Text Solution:**

$$\begin{aligned} \text{pH} &= \frac{1}{2}(\text{p}K_w + \text{p}K_a - \text{p}K_b) \\ &= \frac{1}{2}(14 + 5.9 - 5.8) = 7 + 0.05 = 7.05 \end{aligned}$$

Video Solution:**Q12 Text Solution:**

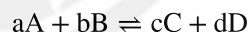
For same concentration of Al^{3+} and Zn^{2+} ions, the concentration of OH^- ions required for precipitation are

$$\text{For } \text{Al}^{3+}, [\text{OH}^-] = \left(\frac{8.5 \times 10^{-23}}{C}\right)^{1/3}$$

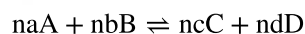
$$\text{For } \text{Zn}^{2+}, [\text{OH}^-] = \left(\frac{1.8 \times 10^{-14}}{C}\right)^{1/2}$$

$$[\text{OH}^-] (\text{for } \text{Al}^{3+}) < [\text{OH}^-] (\text{for } \text{Zn}^{2+})$$

Hence $\text{Al}(\text{OH})_3$ will be precipitated first.

Video Solution:**Q13 Text Solution:**

$$\text{Equilibrium constant, } K = \frac{[\text{C}]^c [\text{D}]^d}{[\text{A}]^a [\text{B}]^b}$$



$$\text{Equilibrium constant, } K' = \frac{[\text{C}]^{nc} [\text{D}]^{nd}}{[\text{A}]^{na} [\text{B}]^{nb}}$$

$$= \left(\frac{[\text{C}]^c [\text{D}]^d}{[\text{A}]^a [\text{B}]^b}\right)^n = K^n$$

Video Solution:

Q14 Text Solution:

The balanced reaction is given as
 $2 \text{MnO}_4^- + 5 \text{H}_2\text{C}_2\text{O}_4 + 6 \text{H}^+ \rightarrow 2 \text{Mn}^{2+} + 10 \text{CO}_2 + 8 \text{H}_2\text{O}$
 Thus, $x = 2, y = 5, m = 2$ and $n = 10$

Video Solution:**Q15 Text Solution:**

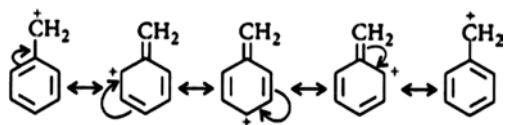
Molar ratio of C: H: N:: 6 : 8 : 2 i.e., 3 : 4 : 1
 Thus, the correct formula is $\text{C}_6\text{H}_8\text{N}_2$.

Video Solution:**Q16 Text Solution:**

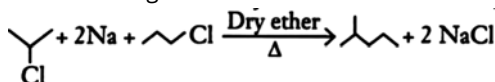
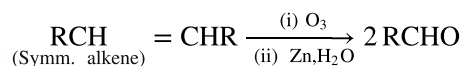
Any carbonium ion possesses trigonal planar geometry.

Video Solution:**Q17 Text Solution:**

Toluene will form the most stable carbocation hence, bond dissociation energy of "C - H" bond will be minimum in case of toluene.

**Video Solution:****Q18 Text Solution:**

In Wurtz reaction, an ethereal solution of an alkyl halide forms symmetrical alkane when heated with metallic sodium. Tertiary halides do not undergo this reaction.

**Video Solution:****Q19 Text Solution:**

Molecular mass of $\text{RCHO} = 44$

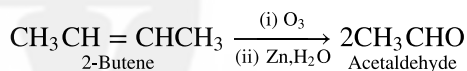
$$\Rightarrow \text{R} + 12 + 1 + 16 = 44$$

$$\text{Mol. mass of R} = 44 - 29 = 15$$

This is possible, only when R is

– CH_3 group.

The aldehyde is CH_3CHO and the symmetrical alkene is $\text{CH}_3\text{CH} = \text{CHCH}_3$.

**Video Solution:****Q20 Text Solution:**

$$\text{Moles of glucose} = \frac{18}{180} = 0.1$$

$$\text{Moles of water} = \frac{178.2}{18} = 9.9$$

$$\text{Mole fraction of glucose} = \frac{0.1}{9.9+0.1} = 0$$

.01

$$\text{Now, } \frac{P^\circ - P_S}{P^\circ} = x_2 \text{ [Where, } x_2$$

= mole fraction of solute]

$$\text{or, } P^\circ - P_S = P^\circ x_2$$

$$\text{or, } P_S = P^\circ - P^\circ x_2 = P^\circ(1 - x_2)$$

$$= 760(1 - 0.01)$$

$$= 760 \times 0.99 = 752.4 \text{ torr}$$

Video Solution:



Q21 Text Solution:

$$M_1 = 0.1M, M_2 = 0.2M$$

$$V_1 = 100 \text{ mL}, V_2 = 25 \text{ mL}$$

$$\text{Resulting Molarity} = \frac{M_1 V_1 + M_2 V_2}{V_1 + V_2}$$

$$= \frac{(0.1 \times 100) + (0.2 \times 25)}{100 + 25} = 0.12M$$

Video Solution:



Q22 Text Solution:

intermolecular hydrogen bond

Video Solution:



Q23 Text Solution:

$$p_{\text{total}} = p_A^\circ x_A + p_B^\circ x_B = p_A^\circ x_A + p_B^\circ (1 - x_A)$$

$$600 = 450x_A + 700(1 - x_A)$$

$$x_A = 0.4$$

$$x_B = 1 - 0.4 = 0.6$$

Video Solution:



Q24 Text Solution:

Let van't Hoff factor for AB be i .

$$\alpha = \frac{i-1}{n-1}; 0.8 = \frac{i-1}{2-1}; 0.8 = i-1; i = 1.8$$

Let van't Hoff factor for XY_2 be i' .

$$\alpha' = \frac{i'-1}{n-1}; 0.6 = \frac{i'-1}{3-1}; i'-1 = 1.2; i' = 2.2$$

$$\Delta T_f = i K_f m_1 + i' K_f m_2$$

$$= (1.8 \times K_f \times \frac{5.85 \times 1000}{58.5 \times 94.15})$$

$$+ (2.2 \times K_f \times \frac{9.5 \times 1000}{95 \times 90.5})$$

$$= K_f(1.91 + 2.43) = 1.86 \times 4.34 = 8.07$$

The freezing point of water will be

$$= (273 - 8.07) = 264.93 \text{ K}$$

Video Solution:



Q25 Text Solution:

$$E_{\text{cell}}^\circ = \frac{0.059}{n} \log K_c \text{ or } \log K_c = \frac{1.10 \times 2}{0.059}$$

$$= 37.2881 \text{ or } K_c = 1.9 \times 10^{37}$$

Video Solution:



Q26 Text Solution:

Concentration, $C = 0.02 \text{ M H}_2 \text{ SO}_4$

$$\text{Resistance of H}_2 \text{ SO}_4 \text{ solution, } R_{\text{soln}} = 122 \Omega$$

$$\text{Molar conductivity, } \Lambda_m = 618 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$$

Cell constant, $b = ?$

$$\Lambda_m = \frac{\kappa \times 1000}{C}$$

$$\kappa = \frac{\Lambda_m \times C}{1000} = \frac{618 \times 0.02}{1000} = 0.01236 \Omega^{-1} \text{ cm}^{-1}$$

$$\text{Now, } \kappa = \frac{\text{cell constant}}{R_{\text{soln}}} = \frac{G^*}{R_{\text{soln}}}$$

$$\therefore G^* = \kappa \times R_{\text{soln}} = 0.01236 \times 122 = 1.51 \text{ cm}^{-1}$$

Video Solution:



Q27 Text Solution:

$$E_{\text{cell}}^\circ = E_{\text{cathode}}^\circ - E_{\text{anode}}^\circ$$

$$= 0.34 - (-2.37) = 2.71 \text{ V}$$

Video Solution:



Q28 Text Solution:

For strong electrolytes, Λ vs \sqrt{C} plots are straight lines.

Video Solution:**Q29 Text Solution:**

Given, current = 3A

time = 1 hr 47 min 13 sec = 6433 sec.

Quantity of electricity passed = 3
 $\times 6433C \approx 19300C$

$Ca^{2+} + 2e^{-} \rightarrow Ca$

$2 \times 96500C$ will deposit 1 molar 40 g Ca

$\therefore 19300C$ will deposit = $\frac{40 \times 19300}{2 \times 96500} = 4g$

Video Solution:**Q30 Text Solution:**

For endothermic reaction, the minimum amount of activation energy will be more than ΔH .

Video Solution:**Q31 Text Solution:**

The logarithmic form of Arrhenius equation is $\log_{10} \frac{A}{k}$

$$= \log_{10} A - \frac{E_a}{2.303 RT}$$

$$\text{or } \log_{10} \frac{A}{k} = \frac{E_a}{2.303 RT}$$

$$E_a = 85.2 \text{ kJ mol}^{-1} = 85.2 \times 10^3 \text{ J}$$

$$\text{mol}^{-1}, T = 310 \text{ K}, A = 3.1 \times 10^{11} \text{ L}$$

$$\text{mol}^{-1} \text{ s}^{-1}$$

$$\text{Hence, } \log_{10} \frac{3.1 \times 10^{11}}{k} = \frac{85.2 \times 10^3}{2.303 \times 8.314 \times 310}$$

$$= 14.354$$

$$\text{That is } \frac{3.1 \times 10^{11}}{k} = \text{antilog}(14.354) = 2$$

$$.26 \times 10^{14}$$

$$\text{and } k = \frac{3.1 \times 10^{11}}{2.26 \times 10^{14}} = 1.372 \times 10^{-3} \text{ L mol}^{-1}$$

$$\text{s}^{-1}$$

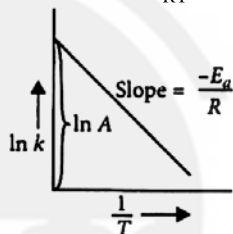
Video Solution:**Q32 Text Solution:**

Rate of disappearance of Q = 2 \times Rate of appearance of R

Video Solution:**Q33 Text Solution:**

Arrhenius equation, $k = Ae^{-E_a/RT}$

$$\ln k = \ln A - \frac{E_a}{RT}$$



This equation is of the form, $y - mx + c$, i.e., the equation of a straight line.

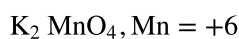
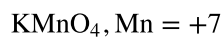
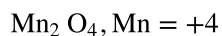
Video Solution:**Q34 Text Solution:**

$$\Delta H = E_f - E_b$$

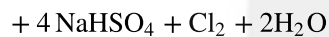
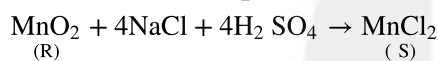
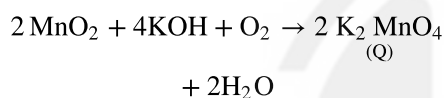
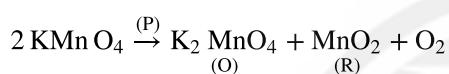
$$-200 = 80 - E_b$$

$$E_b = 200 + 80 = 280 \text{ kJ/mol}$$

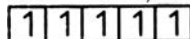
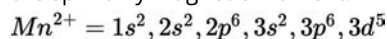
Video Solution:

Q35 Text Solution:

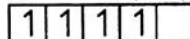
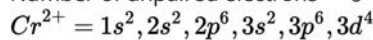
Mn achieves its highest oxidation state, +7 in KMnO_4 .

Video Solution:**Q36 Text Solution:****Video Solution:****Q37 Text Solution:**

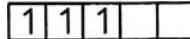
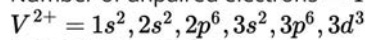
Spin-only magnetic moment depends upon the number of unpaired electrons, more the number of unpaired electrons, greater will be the spin-only magnetic moment.



Number of unpaired electrons = 5



Number of unpaired electrons = 4



Number of unpaired electrons

So, the correct order of spin-only magnetic moment is $\text{Mn}^{2+} > \text{Cr}^{2+} > \text{V}^{2+}$

Video Solution:**Q38 Text Solution:**

Coinage metals (Cu, Ag, Au) show the properties of transition elements.

Video Solution:**Q39 Text Solution:**

On warming the mixture of NaCl and $\text{K}_2\text{Cr}_2\text{O}_7$ gently with conc. H_2SO_4 a deep red vapour is evolved. When it is passed into NaOH solution gives a yellow solution of Na_2CrO_4 and chromyl chloride.

Video Solution:

Q40 Text Solution:
all are $sp^3 d^2$

Video Solution:



Q41 Text Solution:
 $[\text{Co}(\text{NH}_3)_6]^{3+}$

Video Solution:



Q42 Text Solution:
 $[\text{Fe}(\text{CN})_6]^{4-}$, unpaired electron = 0;
 $[\text{Fe}(\text{CN})_6]^{3-}$, unpaired electron = 1;
 $[\text{Cr}(\text{NH}_3)_6]^{3+}$, unpaired electron = 3;
 $[\text{Ni}(\text{H}_2\text{O})_4]^{2+}$ unpaired electron = 2

Since, $\mu_B \propto \text{no. of unpaired electrons } (n)$

Hence,

the correct order is I < II < IV < III.

Video Solution:



Q43 Text Solution:
 $[\text{Fe}(\text{CN})_6]^{3-}$

Video Solution:



Q44 Text Solution:
The intermolecular forces of attraction become stronger with the increase in size of the molecules.
Hence, the order of boiling points will be:
 $\text{CH}_3\text{Cl} < \text{CH}_3\text{Br} < \text{CHCl}_3$

Video Solution:



Q45 Text Solution:
(A) (iii), (B) (iv), (C) (ii), (D) (i)

Video Solution:



Q46 Text Solution:

$$\text{C(CH}_3)_3 + \text{Br}_2 \xrightarrow{h\nu} \text{C(CH}_3)_2\text{Br} + \text{HBr}$$

It is free radical substitution reaction, formation of stable 3° free radical is favoured.

Video Solution:

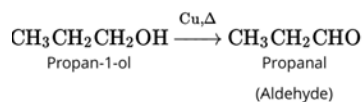


Q47 Text Solution:
Methyl

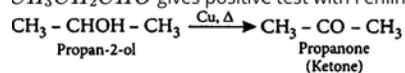
Video Solution:



Q48 Text Solution:



$\text{CH}_3\text{CH}_2\text{CHO}$ gives positive test with Fehling's solution.



CH_3COCH_3 does not give positive test with Fehling's solution.

With KMnO_4 or acidic dichromate 1-propanol is oxidised to propanoic acid which cannot be tested with Fehling's solution, whereas with conc. H_2SO_4 propanol undergoes dehydration to form propene which again cannot be tested with Fehling's solution.

Video Solution:



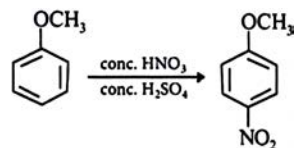
Q49 Text Solution:

When one of the alkyl group is a tertiary group, the halide formed is a tertiary halide. When HI is in excess and the reaction is carried out at high temperature, the alcohol formed reacts with another molecule of HI and is converted to corresponding alkyl iodide.

Video Solution:



Q50 Text Solution:



Video Solution:



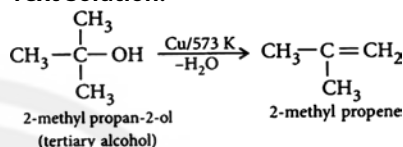
Q51 Text Solution:

o-Cresol is less acidic than phenol due to stronger +I effect of methyl group while o-nitrophenol is more acidic than phenol due to -I effect of $-\text{NO}_2$ group. So, the correct order of acidic nature will be: o-Cresol < Phenol < o-Nitrophenol

Video Solution:



Q52 Text Solution:



Video Solution:



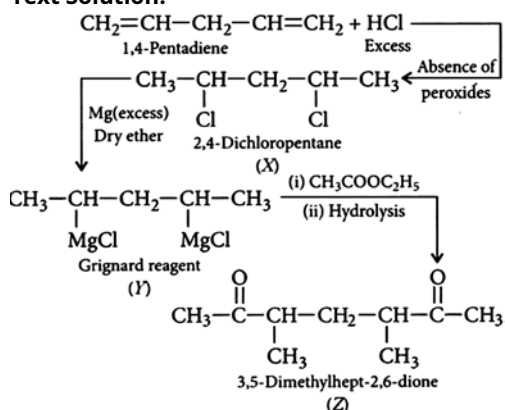
Q53 Text Solution:

lactic acid

Video Solution:



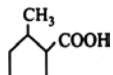
Q54 Text Solution:



Video Solution:



Q55 Text Solution:

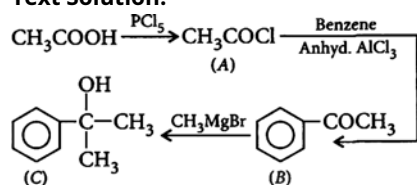


is 2-methylcyclopentanecarboxylic acid.

Video Solution:



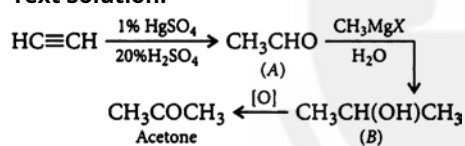
Q56 Text Solution:



Video Solution:



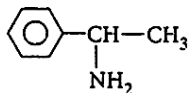
Q57 Text Solution:



Video Solution:



Q58 Text Solution:



Video Solution:



Q59 Text Solution:

$-\text{NH}_2$ group in aniline is o, p-directing and activating while in presence of acids, most of the aniline + gets protonated to form anilinium ion i.e., $-\text{NH}_3^+$ which is m-directing and deactivating.

Video Solution:



Q60 Text Solution:

Vitamin A is a fat soluble vitamin.

Video Solution:

