

IITJEE-2009
TS7 Paper 2
Chemistry Solutions

$$45. \frac{r_x}{r_{O_2}} = \sqrt{\frac{M_{O_2}}{M_x}} \Rightarrow M_x = 50 ;$$

$$(c) d_x = 0.8 \frac{kg}{m^3} \Rightarrow V_m = \frac{1000}{800} \times 50 = 62.5$$

$$z = \frac{PV_m}{RT} = 1.56$$

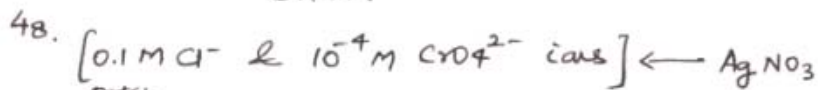
46. Melting of ice is favored at high P, high T.

(B) Vaporization of water is favored at high T, low P.
(Evaporation) \Rightarrow High P is increased, B.P. increases.

$$47. pH = pK_a + \log \frac{[phCOO^-]}{[phCOOH]} \Rightarrow 4.5 = 4.2 + \log \frac{[phCOO^-]}{[phCOOH]}$$

$$(B) \text{ Given: } \frac{[phCOO^-]}{[phCOOH]} = 2 ; \text{ let volume of acid is } V \text{ mL.}$$

$$\Rightarrow \frac{0.2 \times (300 - V)}{0.1 \times V} = 2 \Rightarrow V = 150 \text{ mL} \quad \begin{matrix} (pK_a = 4.2) \\ pH = 4.5 \end{matrix}$$



For initiating precipitation of CrO_4^{2-} ions,

$$(A) [Ag^+] = \sqrt{\frac{K_{sp} Ag_2CrO_4}{[CrO_4^{2-}]}} = \sqrt{\frac{10^{-12}}{10^{-4}}} = 10^{-4} M$$

Now for this much concentration

$$\text{of } Ag^+ \text{ ions, } [Cl^-] \text{ in soln} = \frac{K_{sp} AgCl}{[Ag^+]} = \frac{10^{-10}}{10^{-4}} = 10^{-6} M$$

Note that when Ag_2CrO_4 begins to precipitate, almost whole of $AgCl$ is precipitated out.



$$\text{moles of } Cr^{3+} \text{ electrolysed} = \frac{250}{1000} (0.2 - 0.1) = 0.025$$

$$(D) 3F \equiv 1 \text{ mol}$$

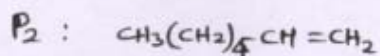
$$\Rightarrow \text{no. of } \dot{F}' \text{ used up} = 3 \times 0.025 = \frac{It}{96500}$$

$$\Rightarrow t = 75 \text{ sec}$$

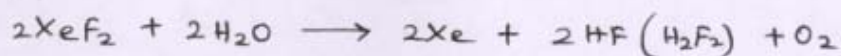
50. (B)

I. as CH_3COO^- is a weak Nu^- , it will be $\text{S}_\text{N}1$ reaction giving P_1 as: $\text{Me} \text{---} \text{CH} \text{---} \text{O} \text{---} \overset{\text{O}}{\parallel} \text{---} \text{CH}_3$ (an ester)

II. $(\text{CH}_3)_3\text{CO}^-$: a sterically hindered strong base will force $\text{E}2$ (rather than $\text{S}_\text{N}2$ in 1° alkyl halide)



51. (C)



52. (C)

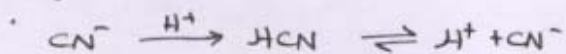
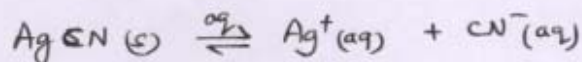
silane is: SiH_4

53. (C)

A metal that crystallizes in BCC has a coordination number as:

54. (A) 1 & 2: Both are true with obvious reason.

55. (A)

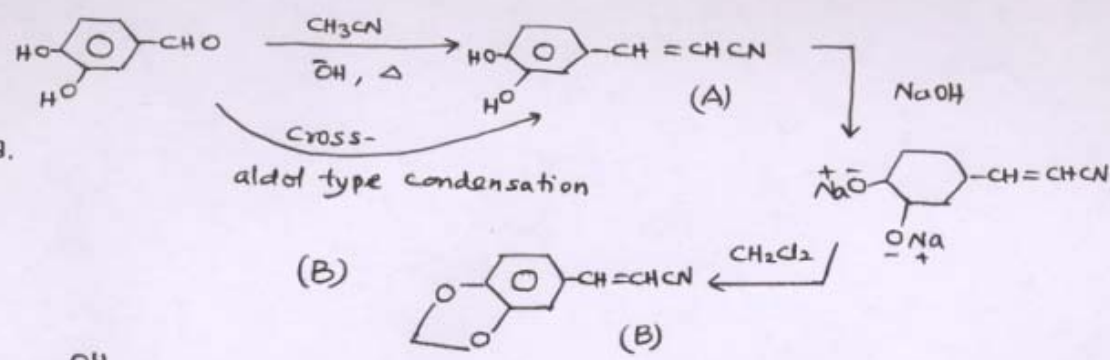


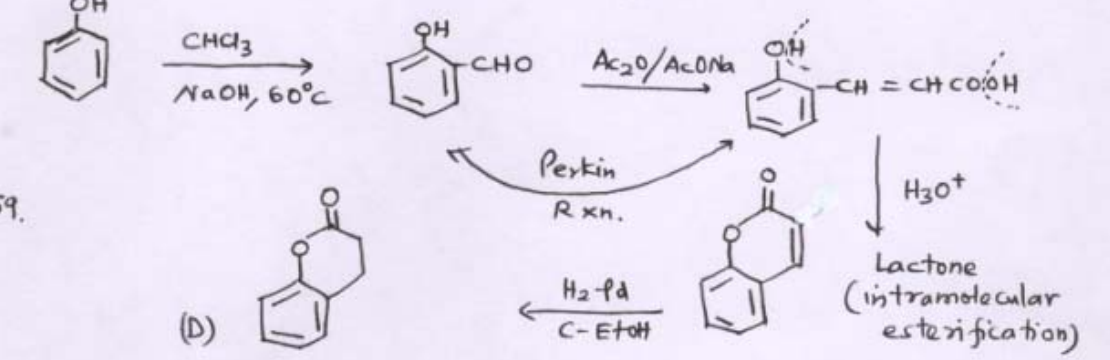
Clearly more of CN^- will be there from AgCN .

56. 1: True [Red P has linked tetrahedral structure not discrete structure.]
(C) 2: False.

57. Both 1, 2 are true & clearly statement-2 is the reason.
(A)

58 - 60

58. 

59. 

60. Claisen-Schmidt : Benzaldehyde + α ketone (α -H) $\xrightarrow[\Delta]{OH^-}$ α - β -unsaturated ketone

Clearly : I, II are the products.
 III : is not α , β -unsaturated.
 IV : is not formed from Benzaldehyde.

61 - 63

61: Ethanol + water
 $X=0.9$ $X=0.1$
 \downarrow \downarrow
 Solvent Solute.

Molality = $m = \frac{X_B}{1-X_B} \times \frac{1000}{M_A} = \frac{0.1}{0.9} \times \frac{1000}{46}$

$\Delta T_f = K_f m = 2.0 \times m$ Ans: (D)

$T_f = 155.7 - \Delta T_f = 150.9K$
 (new)

62: $P_{sol}^n = P_A^0 X_A + P_B^0 X_B$ [\because Solute is assumed to be non-volatile (given)]
 (B) $\stackrel{=0}{=} 40 \times 0.9 = 36 \text{ mmHg}$

63: When water is added such that $X_{\text{water}} = 0.9 \Rightarrow$ Solute is Ethanol

\Rightarrow Ethanol + Water
 (0.1) (0.9)
 (B) (A)

$$m = \frac{X_B}{1-X_B} \times \frac{1000}{M_A} = \frac{0.1}{0.9} \times \frac{1000}{18}$$

$$\Delta T_b = K_b \cdot m = 0.52 \text{ m}$$

$$\Rightarrow T_b = 373 + \Delta T_b$$

Ans: (B)

64: If $(\Delta G_{\text{sys}})_{T,P} = 0 \Rightarrow$ Process is in eq. & system is unable to do useful work.

$\Delta S_{\text{sys}} + \Delta S_{\text{sur}} > 0 \Rightarrow$ Irreversible Process
 (spontaneous)

$\Delta S_{\text{sys}} + \Delta S_{\text{sur}} < 0 \Rightarrow$ Non-spontaneous Process & sys. is unable to do useful work.

$(\Delta G_{\text{sys}})_{T,P} > 0 \Rightarrow$ Non-spontaneous & sys. is unable to do useful work.

\Rightarrow (A) - 1, 4

(B) - 3

(C) - 2, 4

(D) - 2, 4

66: χ : Decreases with dilution.

Λ_m : Increases with dilution & decreases with increase in the conc. of electrolyte.

$\alpha = \frac{\Lambda_m}{\Lambda_m^0}$ & increases with dilution & decrease with [electrolyte] \uparrow .

Resistance = $\frac{1}{\text{Conductance}}$ \Rightarrow Decreases with dilution.

(A) - 3

(B) - 1, 4

(C) - 1, 2, 3

(D) - 3