Nishant Jindal

(30)

$$S = \sqrt{K_{sp}\left(1 + \frac{[H^+]}{K_a}\right)}$$

J-Mains
(last 15)
JEE Adv

(28)

~~NaOH~~ 0.01 | Na_2CO_3 0.01 | $NaHCO_3$ 0.01 | ~~H_2CO_3~~ ~~0.01~~

$$H_2CO_3 + NaOH \rightarrow NaHCO_3 + H_2O$$

	0.01	0.01		
	0	0	0.01	0.02

$NaHCO_3$ 0.02 | Na_2CO_3 0.01

$$pH = pK_{a_2} + \log\frac{0.01}{0.02}$$

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(27)

S-II Q. 9

$$[Zn^{2+}][S^{2-}] = 1.25 \times 10^{-22}$$

$$[S^{2-}] = \frac{1.25 \times 10^{-22}}{0.05}$$

10^{-21}

$$H_2S \longrightarrow 2H^+ + S^{2-}$$

0.1

$$10^{-21} = \frac{[H^+]^2 \left[\frac{1.25 \times 10^{-22}}{0.05}\right]}{0.1}$$

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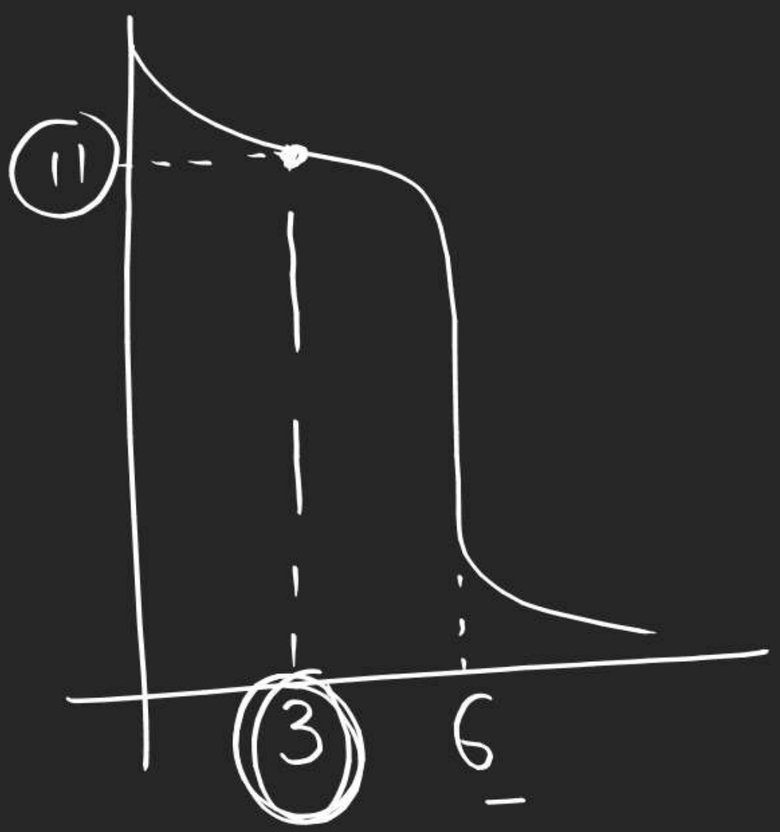
26



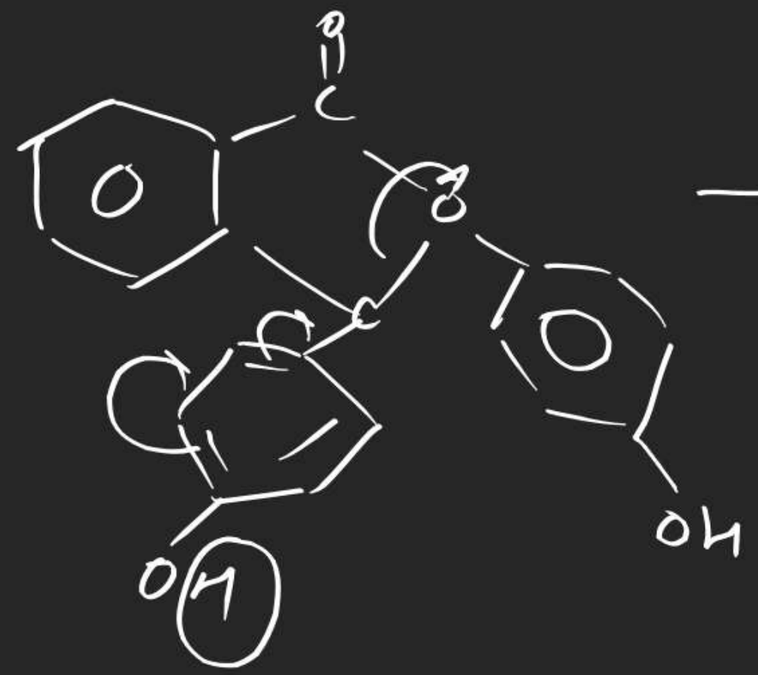
$$\underline{BOH} + HA \longrightarrow BA + H_2O$$

a — $a/2$

$a/2$

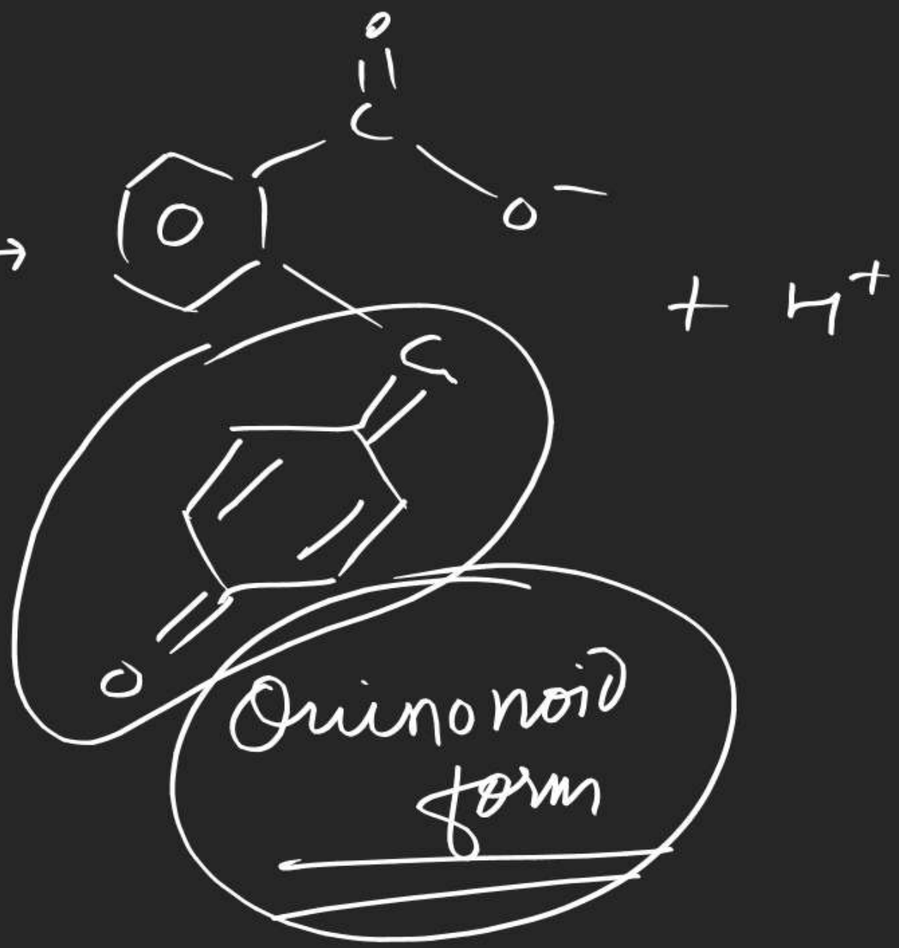
$$pOH = pK_b = 3$$

BOH + HA



Benzenoid

Basic soln



| lit

$$Ag^+ + 2NH_3 \longrightarrow Ag(NH_3)_2^+$$

Ag^+	$2NH_3$	$Ag(NH_3)_2^+$
0.8	a	
0	a − 1.6	0.8
x	a − 1.6 + ~~2x~~	0.8 − ~~x~~
$= 5 \times 10^{-8}$		

$$K_f = 10^8 = \frac{0.8}{(5 \times 10^{-8})(a-1.6)^2}$$

(2a)

(99)

$$S = \sqrt{K_{sp}\left(1 + \frac{[H^+]}{K_a}\right)}$$

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(48) $Pb(NO_3)_2$ 0.15 M 35 ml $n_{Pb^{2+}} = 0.15 \times 35$

$Cr_2(SO_4)_3$ 0.12 M 20 ml $n_{SO_4^{2-}} = 0.12 \times 60$

$$\frac{35 \times 0.15}{1000 \times 100} =$$

$Cd(OH)_2$ $\quad S = 1.84 \times 10^{-5}$

$K_{sp} = 4S^3$

$Cd(OH)_2 \rightarrow Cd^{2+} + 2OH^-$

$(S) \quad (10^{-2} + 2S)^2 = K_{sp}$

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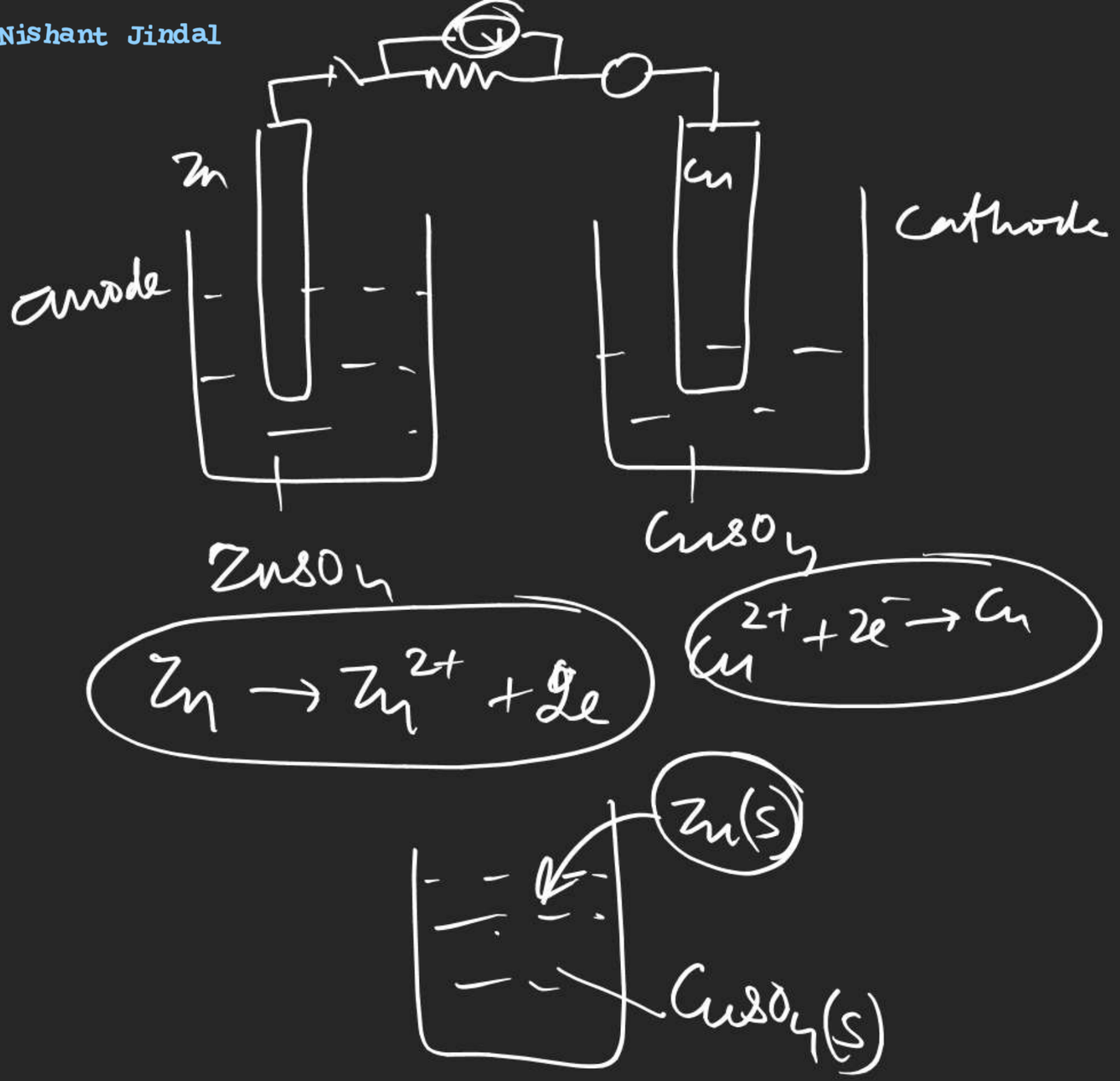

flow of e^- → anode to cathode

dirⁿ of i → cathode to anode

Cell Rxn

$$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$$

A cell rxn must be a Redox Rxn

Redⁿ & oxidⁿ must occur at separate places

e^- don't appear in cell Rxn

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Relationship bet^{n} ΔG & E :→

$$-\Delta G = W_{non\text{-}PV,\,by}$$

$$\left[\text{electric work} = qV = \eta F E\right]$$

$$-\Delta G = \eta F E$$

$$\boxed{\Delta G = -\eta F E}$$

$$q = I \times t$$

Charge on 1 mole e^- $= 1.6 \times 10^{-19} \times N_A$

$\simeq 96500$ Coulombs

$= 1F$

Charge on 'n' mole e^- $= \eta F$

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① $Zn \longrightarrow Zn^{2+} + 2e^-$ ΔG_1, E_1 | $2Zn \longrightarrow 2Zn^{2+} + 4e^-$ ΔG_2, E_2

$$\Delta G_2 = 2\Delta G_1$$

$$-4FE_2 = 2(-2FE_1)$$

$$E_2 = E_1$$

$A \longrightarrow B$	ΔH
$2A \longrightarrow 2B$	$\Delta H \times 2$
	K_{eq}^2

② $Zn \longrightarrow Zn^{2+} + 2e^-$ ΔG_1, E_1 | $Zn^{2+} + 2e^- \longrightarrow Zn$ ΔG_2, E_2

$$\Delta G_2 = -\Delta G_1$$

$$-2FE_2 = -(-2FE_1)$$

$E_2 = -E_1$

K_r	$K_r/2$
E	E

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(3) $Zn(s) \longrightarrow Zn^{2+}(aq) + 2e^-$ $\quad \Delta G_1 \quad E_{oxid}$

$Cu^{2+}(aq) + 2e^- \longrightarrow Cu(s)$ $\quad \Delta G_2 \quad E_{Red^n}$

✓ $Zn(s) + Cu^{2+}(aq) \rightarrow Cu(s) + Zn^{2+}(aq)$ $\quad \Delta G_3 \quad E_{cell}$

$$\Delta G_3 = \Delta G_1 + \Delta G_2$$

$$-n_3 F E_3 = -n_1 F E_1 - n_2 F E_2$$

$$\boxed{E_{cell} = E_{oxid} + E_{Red^n}}$$

A Galvanic cell Rxn is spontaneous

$\Delta G < 0$

$E_{cell} > 0$

Q: find E_{cell} & write cell Rxn if any two of the following half cells are connected to form a cell.

(i) $Zn \longrightarrow Zn^{2+}(aq) + 2e^-$ $E^\circ =$ 0.76 volt

(ii) $Cu \longrightarrow Cu^{2+}(aq) + 2e^-$ $E^\circ = -0.34$ volt

(iii) $Fe \longrightarrow Fe^{2+}(aq) + 2e^-$ $E^\circ =$ 0.44 volt

(A) (i) + (ii)

$Zn \longrightarrow Zn^{2+} + 2e^-$ $E^\circ_{oxid} = 0.76$

$Cu^{2+} + 2e^- \longrightarrow Cu$ $E^\circ_{Redn} = 0.34$

$Zn + Cu^{2+} \longrightarrow Cu + Zn^{2+}$ $E^\circ_{cell} = 0.76 + 0.34 = 1.1$

Q: $Fe \longrightarrow Fe^{2+} + 2e^-$ $E^\circ = 0.44$

$A \longrightarrow A^+ + e^-$ $E^\circ = -1$ volt

$2A^+ + 2e^- \longrightarrow 2A$ $E^\circ = 1$ volt

$Fe + 2A^+ \longrightarrow 2A + Fe^{2+}$ $E^\circ_{cell} = 1.44$

(B) (ii) + (iii)

$Fe + Cu^{2+} \longrightarrow Cu + Fe^{2+}$ $E^\circ = 0.78$

(C) (i) + (iii)

$Zn + Fe^{2+} \longrightarrow Zn^{2+} + Fe$ $E^\circ = 0.76 - 0.44 =$ 0.32

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Q. $Cu^{2+} + 2e^- \longrightarrow Cu$ E_1 ✓ ΔG_1

$Cu \longrightarrow Cu^+ + e^-$ E_2 ✓ ΔG_2

✓ $Cu^{2+} + e^- \longrightarrow Cu^+$ $E_3 \neq E_{cell}$ ΔG_3

$\Delta G_3 = \Delta G_1 + \Delta G_2$

$-n_3 F E_3 = -n_1 F E_1 - n_2 F E_2$

$n_3 E_3 = n_1 E_1 + n_2 E_2$

$\boxed{E_3 = 2E_1 + E_2}$

$Cu^{2+} + 2e^- \rightarrow Cu$ E_1 ✓

$2Cu \rightarrow 2Cu^+ + 2e^-$ E_2

$Cu^{2+}(aq) + \underset{a}{2Cu(s)} \rightarrow \underset{c}{Cu(s)} + 2Cu^+(aq)$

$E_{cell} = E_1 + E_2$

$Cu^{2+} + Cu \longrightarrow 2Cu^+$

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