Nishant Jindal

S-1 1-4, 15-23

O-I 1-10

Kinetics
J-Adv 9-17

O-I ⑨ (B)

(7) $[H^+] = 10^{-2}$

$[H^+] = 10^{-3}$

(8) $\frac{1}{200}$ M

(3) $\alpha = \frac{3.6 \times 10^{-7}}{100}$

$[H^+] = C\alpha = \frac{1000}{18}\alpha$

$K_W = (C\alpha)^2$

Ans

$10^{-2} = 10 \times 10^{-3}$

$10^{-3} = 1 \times 10^{-3}$

$= 9 \times 10^{-3}$

$= 0.009$

$$1.8 \times 10^{-4} = K_a = \frac{x^2}{0.05 - x}$$

$$[HCl] = \frac{0.01}{100/1000} = 0.1\,M$$

$$HCOOH \longrightarrow H^+ + HCOO^-$$

$0.05 - x$	$0.1 + x$	x

$$1.8 \times 10^{-4} = \frac{10 \times (0.1)\, x}{0.05}$$

$$9 \times 10^{-5} = x$$

(9) $E_a = 20$ $E_a = 40$ $\frac{dk}{dT}$

$$\frac{k_{T_2}}{k_{T_1}} < \frac{k_{T_2}}{k_{T_1}}$$

(11) ✓ $\left[\underline{Fe}^{(+3)}(C_2O_4)_2(H_2O)_2\right]^{2-} \longrightarrow \underline{Fe^{3+}} + 4CO_2 + 2H_2O + 5e^-$

$5e^- + 8H^+ + MnO_4^- \longrightarrow Mn^{2+} + 4H_2O$

8 : 1

$t_{1/2} = \frac{\ln 2}{k} \uparrow$

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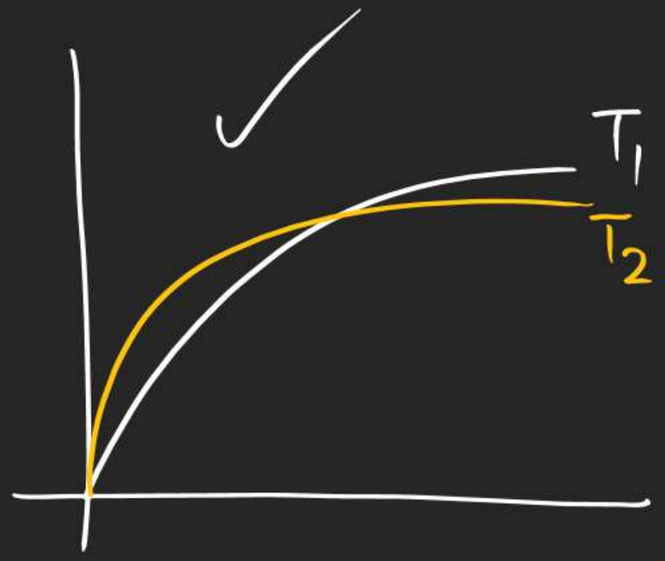
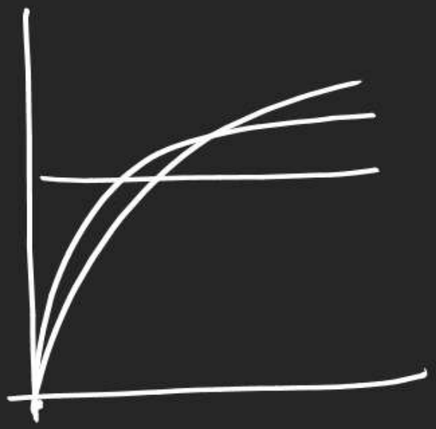
(10)

% yield



ex0

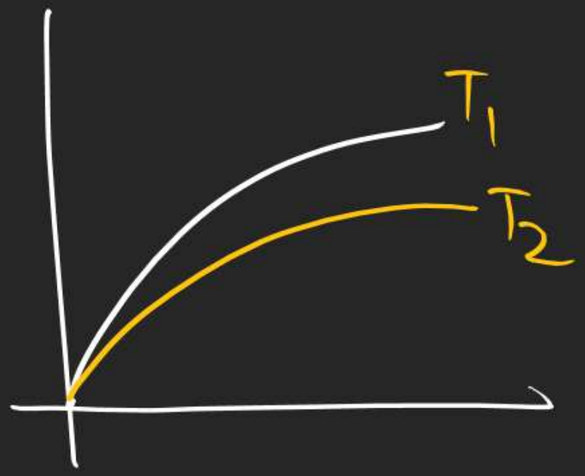
$T \uparrow \quad K_{eq} \downarrow$



$A \underset{k_b}{\overset{k_f}{\rightleftharpoons}} B$

$R_f = k_f[A]$

$R_b = k_b[B]$



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Remaining

J – Adv Kinetics

Bronsted acid base theory

Arrhenius

acid – gives H^+

base → gives OH^-

Bronsted

acid → gives H^+

base → accept H^+

① $CH_3COOH(aq) \rightarrow CH_3COO^-(aq) + H^+(aq)$ $\quad K_a = \dfrac{[CH_3COO^-][H^+]}{[CH_3COOH]} = 10^{-5}$

Acc to Bronsted

② $CH_3COOH(aq) + H_2O(l) \rightarrow CH_3COO^-(aq) + H_3O^+(aq)$ $\quad K_a = \dfrac{[CH_3COO^-][H_3O^+]}{[CH_3COOH]} = 10^{-5}$

acid (WA) | base (WB) | base (SB) | acid (SA)

③ $CH_3COOH(aq) + OH^-(aq) \rightarrow CH_3COO^-(aq) + H_2O(aq)$ $\quad K = \dfrac{[CH_3COO^-][H^+]}{[CH_3COOH][OH^-][H^+]}$

SA | SB | WB | WA

$= \dfrac{K_a}{K_w} = \dfrac{10^{-5}}{10^{-14}} = 10^9$

④ $CH_3COO^-(aq) + H_2O(l) \rightarrow CH_3COOH + OH^-$

WB

$K_b = \dfrac{K_w}{K_a} = 10^{-9}$

$K_a K_b = K_w$

⑤ $CH_3COO^-(aq) + H_3O^+(aq) \rightarrow CH_3COOH(aq) + H_2O(l)$ $\quad K = 10^5$

SB

$K_b = \dfrac{K_w}{K_a}$

- Conjugate base of a weak acid is also a weak base

$$K_b = \frac{K_w}{K_a}$$

- Conjugate base of a V. V weak acid is a stoong base
- Conjugate base of a stoong acid is <u>V. V weak</u> base

HCl SA	Cl^- V. V weak base
NaOH SB	Na^+ V. V weak acid

All anion are base

All the cations are acid

NH_4^+

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SA	SB	WA	WB
HCl	KOH	CH_3COOH, NH_4^+	NH_4OH or NH_3, CH_3COO^-
HNO_3	$NaOH$	$HCOOH$, $C_6H_5NH_3^+$	$C_6H_5NH_2$, $HCOO^-$
HI	$CsOH$	HCN, $C_5H_5NH^+$	C_5H_5N, CN^-
HBr		H_3PO_2	
$HClO_4$		H_2S	
	$Ba(OH)_2$	H_2CO_3	
H_2SO_4		$H_2C_2O_4$	
		H_3PO_3	
		H_3PO_4	

en

CH_3COONa

CH_3COO^- Na^+

NH_4Cl

NH_4^+ Cl^-

$$CH_3COOH + H_2O \rightarrow \underset{x}{CH_3COO^-} + \underset{x}{H_3O^+} \qquad K_a = \frac{x^2}{C-x}$$
$$\underset{C-x}{}$$

K_a — NH_4^+ + H_2O ⟶ NH_3 + H_3O^+ — K_b

NH_4^+: $C-x$; NH_3: x ; H_3O^+: x

$$\frac{K_w}{K_b} = K_a = \frac{x^2}{C-x}$$

$$H_3O^+(aq) + H_2O(\ell) \longrightarrow H_2O(\ell) + H_3O^+(aq)$$

$$K_a = 1$$

$$OH^-(aq) + H_2O(\ell) \longrightarrow H_2O(\ell) + OH^-$$

$$K_b = 1.$$

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Rxn -2