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23-33
23-34
J-Adv TD-2

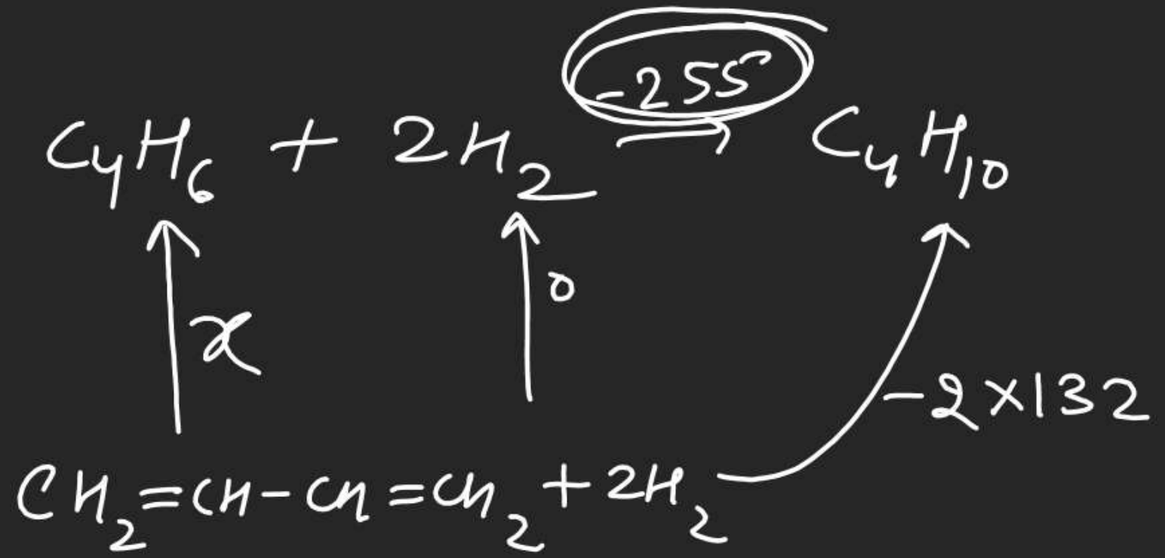
(23) $CH_2=CH_2 + H_2 \xrightarrow{-132} CH_3-CH_3$

$C_4H_6 + 2H_2 \xrightarrow{-255} C_4H_{10}$

$CH_2=CH-CH=CH_2 + 2H_2$

$\Delta H_r = -140 - 115$

$= -255$



(27) $H_2C_2O_4$ -10 kJ/mol

-57 kJ/mol

-114

$$-10 = -57 \times 2 + \Delta H_{ion}$$

(30)

C_2H_5OH (1 mol) $\rightarrow$ $P_1\left(\frac{8}{9} \times 45.54\right)$

C_2H_5OH (1 mol) $\rightarrow$ $P_2\left(\frac{1}{9} \times 68.91\right)$

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(31)

eq (1) − eq (2) $\quad \Delta H = -28$ kcal

$$HAuBr_4 + 4HCl \longrightarrow HAuCl_4 + 4HBr \qquad \Delta H = 8.8 \text{ kcal/mol}$$

$8.8 \longrightarrow 1$ mol

$0.44 \longrightarrow \frac{1}{8.18} \times \frac{0.44}{10}$

$= 0.05$

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S-I

(28)

400 ml 0.2 M 80 mmol 0.08 mol

100 ml 0.8 M 80 0.08 mol

$2^\circ \longrightarrow 26.2^\circ C$

$\Delta T = 1.2$

$|Q| = m s \Delta T$

$= \frac{500 \times 4.2 \times 1.2}{0.08}$ J

(29)

$CaCl_2 + Na_2CO_3 \rightarrow CaCO_3 + 2NaCl$

$Ca^{2+} + CO_3^{2-} \longrightarrow CaCO_3 (ppt)$

$\Delta H_r = \Delta H_f(R) - \Delta H_f(R)$

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$$(\Delta H_r)_{T_2} - (\Delta H_r)_{T_1} = \int (\Delta C_p)_r \, dT$$

31

$$=$$

$$C + \tfrac{1}{2}O_2 \rightarrow CO \qquad \Delta H = -110 \text{ kJ}$$

34

$$C + H_2O \rightarrow CO + H_2 \qquad \Delta H = 130 \text{ kJ}$$

x

y

$$220 \times x = 130 \times y$$

$$\frac{x}{y} = \frac{130}{220}$$

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THERMOCHEMISTRY

(32) $PCl_5 \longrightarrow PCl_3 + Cl_2$

$$\Delta G_r^\circ = \Delta G_f^\circ(Pr) - \Delta G_f^\circ(R)$$

$$\Delta G_r^\circ = -60 - 0 + 74 = 14 = -RT\ln K$$

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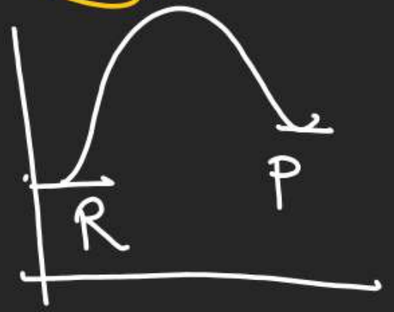
Chemical Kinetics

This chapter mainly deals with speed of Rxn.

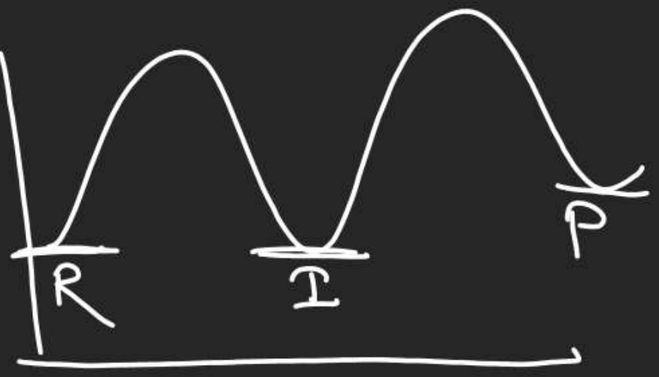
Chemical Rxn

$A \longrightarrow B$

- elementary (Single step)
  - elementary → $2NO \rightarrow N_2O_2$
  - $\rightarrow N_2O_2 + O_2 \rightarrow 2NO_2$



- complex (Multi step)
  - $2NO + O_2 \rightarrow 2NO_2$



$$\text{Rate} = \frac{\text{change in no of moles}}{\text{time taken}} \qquad \text{mole/time}$$

if Volume is constant

$$= \frac{\text{change in no. of moles}/V}{\text{time taken}}$$

$$\left[\text{Rate} = \frac{\text{change in concentration}}{\text{time taken}}\right] \qquad \text{mol/lit/time}$$

for gases

$$\text{Rate} = \frac{\text{change in pressure}}{\text{time taken}} \qquad \text{atm/time} \quad \text{Pa/time}$$

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$$A + 2B \longrightarrow 4C$$

$$\text{Rate of disappearance of } A = \frac{[A]_i - [A]_f}{\Delta t} = -\frac{[A]_f - [A]_i}{\Delta t} = -\frac{\Delta[A]}{\Delta t}$$

$$\text{RoD of } B = -\frac{\Delta[B]}{\Delta t}$$

$$\text{Rate of appearance of } C = \frac{[C]_f - [C]_i}{\Delta t} = \frac{\Delta[C]}{\Delta t}$$

$$A + 2B \longrightarrow 4C$$

$$\left(-\frac{\Delta[A]}{\Delta t}\right) = \frac{1}{2}\times\left(-\frac{\Delta[B]}{\Delta t}\right) = \frac{1}{4}\times\left(\frac{\Delta[C]}{\Delta t}\right)$$

$$\left(-\frac{\Delta[A]}{\Delta t}\right) = \frac{1}{4}\left(\frac{\Delta[C]}{\Delta t}\right)$$

$$aA = bB$$

$$\frac{1}{a}\left(-\frac{\Delta[A]}{\Delta t}\right) = \frac{1}{b}\left(\frac{\Delta[B]}{\Delta t}\right) = \text{Rate of Rxn}$$

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$-\frac{\Delta[H_2O_2]}{\Delta t} = 20 \text{ mol/lit/sec}$

$H_2O_2(aq) \longrightarrow H_2O(\ell) + \frac{1}{2}O_2(g)$

$ROR = \frac{1}{1}\left(-\frac{\Delta[H_2O_2]}{\Delta t}\right) = 20$

$2H_2O_2(aq) \longrightarrow 2H_2O(\ell) + O_2(g)$

$ROR = \frac{1}{2}\left(-\frac{\Delta[H_2O_2]}{\Delta t}\right) = 10$

$ROD = ROR \times \text{stoichiometric}$

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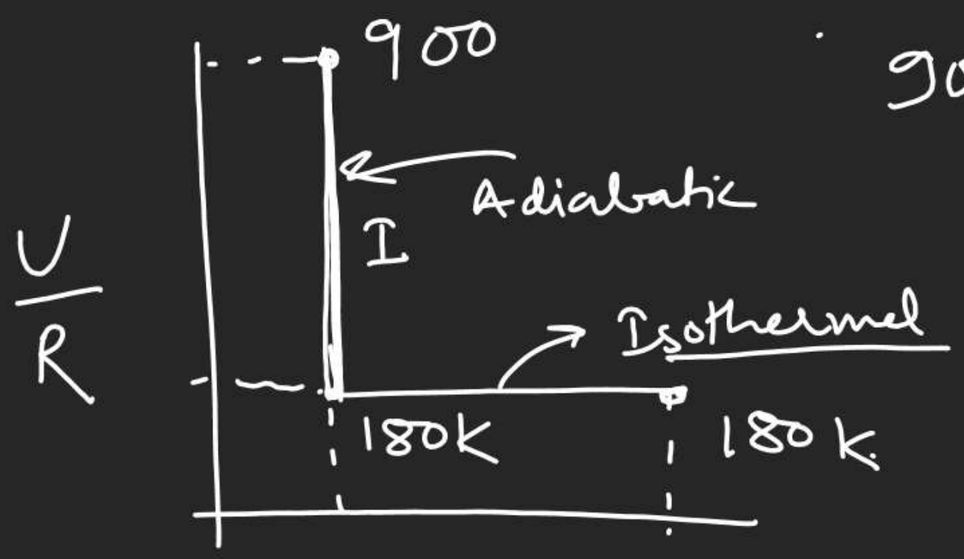
2021

$\ln V_3/V_2$

7/5

(1)



$900 - T_f = 720$

$T_f = 180\,K$

$T_1 V_1^{\gamma-1} = T_2 V_2^{\gamma-1}$

$\frac{V_2}{V_1} = \left(\frac{T_1}{T_2}\right)^{\gamma-1} = \left(\frac{900}{180}\right)^{7/5-1}$

S

$\Delta U = n C_v \Delta T = \frac{5}{2} R \Delta T$

$\frac{\Delta U}{R} = \frac{5}{2}\Delta T = 1800$

$\Delta T = \frac{3600}{5} = 720$

$\Delta U = W_I = W_{II} = nR\,180 \ln \frac{V_3}{V_2}$

$1800\,R = 180\,R \ln V_3/V_2$

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J-M last 15 Q

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To calculate RoR

if balanced chemical reaction is not given than balanced it with minimum integral coefficient