

14.22 $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

$$-\frac{\Delta[C_2H_4]}{\Delta t} = \frac{-1}{3} \frac{\Delta[O_2]}{\Delta t} = \frac{+1}{2} \frac{\Delta[CO_2]}{\Delta t} = \frac{+1}{2} \frac{\Delta[H_2O]}{\Delta t}$$

$0.025 M/sec$

$$\frac{\Delta[C_2H_4]}{\Delta t} = \frac{1}{2} \frac{\Delta[CO_2]}{\Delta t}$$

$$\frac{2}{1} \frac{\Delta[C_2H_4]}{\Delta t} = \frac{\Delta[CO_2]}{\Delta t}$$

$2(0.025) = 0.05 M/sec$

$0.05 M/sec \quad \frac{\Delta H_2O}{\Delta t}$

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14.22b $N_2H_4 + H_2 \rightarrow 2NH_3$

$$-\frac{\Delta[N_2H_4]}{\Delta t} = -\frac{\Delta[H_2]}{\Delta t} = \frac{+1}{2} \frac{\Delta[NH_3]}{\Delta t}$$

$\frac{63 \text{ Torr}}{hr}$

$$\frac{\Delta[N_2H_4]}{\Delta t} = \frac{1}{2} \frac{\Delta[NH_3]}{\Delta t}$$

$2(63) = 126 \text{ Torr/hr} = \frac{\Delta[NH_3]}{\Delta t}$

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(14.36)	$M [CO_2]$	$M [OH^-]$	$M [Rate] / sec$
1	0.06	0.03	0.0248
2	0.02	0.03	0.00276
3	0.02	0.09	0.00828

Resistant reactant

$2CO_2 + 2OH^- \rightarrow CO_3^{2-} + CO_2 + H_2O$

Rate = $k [CO_2]^2 [OH^-]$

OH constant

Expt 1+2
2 → 1

3 = 9

Expt. 2-3

3 = 3

CO₂ const. Rate.

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$$Rate = k [CO_2]^2 [OH^-]^1$$

$\left. \begin{array}{l} 2^{nd} \text{ order in } CO_2 \\ 1^{st} \text{ order in } OH \end{array} \right\} 3^{rd} \text{ order overall}$

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$$\text{Rate} = \underline{k} [\text{ClO}_2]^2 [\text{OH}^-]^1$$

(EPT ①) $0.0248 = k [0.06]^2 [0.03]^1$

$$k = 229.63 \frac{1}{\text{M} \cdot \text{sec}}$$

$$\text{Rate} = (229.63) (0.1)^2 (0.05)^1$$

$$\text{Rate} = 0.115 \text{ M/sec}$$

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$$2\text{NO} + 2\text{H}_2 \rightarrow \text{N}_2 + 2\text{H}_2\text{O}$$

EXPT	[NO]	[H ₂]	Rate
1	0.1	0.1	1.23×10^{-3}
2	0.1	0.2	2.46×10^{-3}
3	0.2	0.1	4.92×10^{-3}

$\text{Rate} = k [\text{NO}]^2 [\text{H}_2]^1$

(Ar Const) $\frac{1 \rightarrow 3}{[\text{NO}]}$ rate = 4
 (No Const) $\frac{1 \rightarrow 2}{[\text{H}_2]}$ rate = 2

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$$\text{Rate} = K [\text{NO}]^2 * [\text{H}_2]^1$$

K_{un}
K_{units}

If double (NO) 2^2 4 (Rate)

If double (H₂) 2 (Rate)

If double both (NO) and (H₂) 2^2 2¹

(4) (2)

8 (Rate)

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Values of K A → Products

Zero order rxn

Rate = K [A]⁰

$\frac{M}{\text{sec}} = K (1)$

$\frac{M^1}{\text{sec}} = K = \frac{1}{M^{-1} * \text{sec}}$

$\frac{X^2}{1} = \frac{1}{X^{-2}}$

First order

Rate = K [A]¹

$\frac{1 * M}{M \text{ sec}} = K \frac{M}{1} * \frac{1}{M}$

$K = \frac{1}{\text{sec}} \text{ or } \frac{1}{M^0 \cdot \text{sec}}$

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Second order

Rate = $k[A]^2$
 $= k[A]^\prime[B]^\prime$

$\frac{1}{m^2} \frac{M}{\text{Sec}} = k * m^2$

$k = \frac{1}{m^2 * \text{Sec}}$

Third order

Rate = $k[A]^2[B]^\prime$
 $= k[A]^\prime[B]^\prime[C]^\prime$

Rate = $k[A]^3$

$\frac{1}{m^3} \frac{M}{\text{Sec}} = k * m^3$

$k = \frac{1}{m^3 * \text{Sec}}$

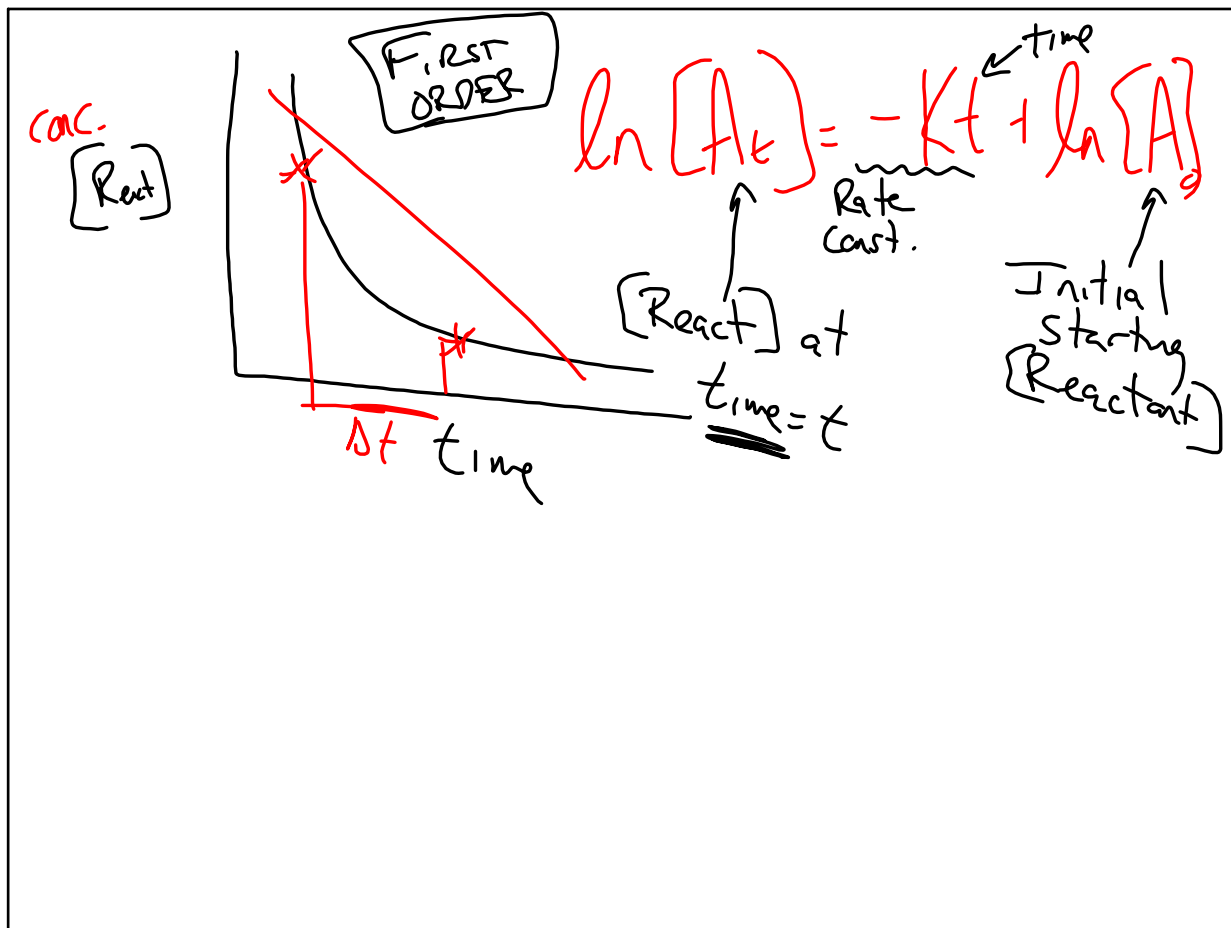
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$k = \frac{1}{M^{(\text{order}-1)} * \text{Sec}}$

5th order

$\frac{1}{M^4 * \text{Sec}}$

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HW

14 / 24 + 32

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