

Sagnafur -

Kinetics (2) Order of Reaction:

Exp.	[A]*	[B]*	Initial Rate m/s
1	0.12	0.010	2.2×10^{-3}
2	0.36	0.010	6.6×10^{-3}
3	0.12	0.020	7.2×10^{-3}

The above is the data for a reaction $A + 2B \rightarrow 2C + D$.

- (a) What is the rate law?
 → (b) What is the rate constant? (k)
 → (c) What is the overall order of reaction?
 → (d) What is the rate when $[A] = 0.50M$ & $[B] = 0.25M$?

(a) $[A]$ const $[B]$ change

exp 3	0.020	$\frac{7.2 \times 10^{-3}}{2.2 \times 10^{-3}}$	$\frac{6.6 \times 10^{-3}}{2.2 \times 10^{-3}}$
exp 1	0.010	$\frac{7.2 \times 10^{-3}}{2.2 \times 10^{-3}}$	$\frac{6.6 \times 10^{-3}}{2.2 \times 10^{-3}}$
	2	3	3
	2	2	2

(b) $[B]$ const $[A]$ change

exp 2	0.36	$\frac{6.6 \times 10^{-3}}{2.2 \times 10^{-3}}$
exp 1	0.12	$\frac{2.2 \times 10^{-3}}{2.2 \times 10^{-3}}$
	3	1

$$\text{Rate} = k[A]^1[B]^2$$

$$= k[A][B]^2$$

(b) $k = \frac{\text{Rate}}{[A][B]^2} = \frac{2.2 \times 10^{-3} \text{ M/s}}{(0.12 \text{ M})(0.010 \text{ M})^2} = \boxed{183 \text{ M}^{-2}\text{s}^{-1}}$

(c) $[A]^1 [B]^2 \quad 1+2 = \boxed{3}$

(d) $\text{Rate} = k[A][B]^2$

$$= \frac{183}{\text{M}^2\text{s}} \times (0.50 \text{ M}) \times (0.25)^2 \text{ M}^2$$

$$= 5.73 \text{ M/s}$$

Sepnalya -

Kinetics (2) Order of Reaction:

Exp.	$[A]^*$	$[B]^*$	Initial Rate m/s.
→ 1	0.12	0.010	2.2×10^{-3} ←
→ 2	0.36	0.010	6.6×10^{-3}
→ 3	0.12	0.020	7.2×10^{-3}

The above is the data for a reaction $A + 2B \rightarrow 2C + D$.

- (a) What is the rate law?
- (b) What is the rate constant? (k)
- (c) What is the overall order of reaction?
- (d) What is the rate when $[A] = 0.50M$ & $[B] = 0.25M$

(a) $[A] \text{ const } [B] \text{ change}$ $\frac{\text{exp 3}}{\text{exp 1}} = \frac{0.020}{0.010} = \frac{7.2 \times 10^{-3}}{2.2 \times 10^{-3}}$ $\frac{2}{2} = \frac{4}{2.2}$	$[B] \text{ const } [A] \text{ change}$ $\frac{\text{exp 2}}{\text{exp 1}} = \frac{0.36}{0.12} = \frac{6.6 \times 10^{-3}}{2.2 \times 10^{-3}}$ $3 = 3$
---	---

$$\text{Rate} = k[A]^1[B]^2$$

$$= k[A][B]^2$$

(b) $k = \frac{\text{Rate}}{[A][B]^2} = \frac{2.2 \times 10^{-3} \text{ M/s}}{[0.12] \text{ M} [0.010]^2 \text{ M}^2} = \boxed{183 / \text{M}^2 \text{ s}}$

(c) $[A]^1 [B]^2 \quad 1+2 = \boxed{3}$

(d)
$$\text{Rate} = k[A][B]^2$$

$$= \frac{183}{\text{M}^2 \text{ s}} \times (0.50 \text{ M}) \times (0.25)^2 \text{ M}^2$$

$$= 5.73 \text{ M/s}$$