

Practice Rate Law

A

1.

$$r = k[\text{ClO}^-]^m$$

trial 1
 $[\text{ClO}^-] = x$

$$r = y$$

trial 2

$$[\text{ClO}^-] = 2x$$

$$r = 4y$$

$$\frac{4y}{y} = \frac{k(2x)^m}{k(x)^m}$$

$$4 = 2^m$$

$$m = 2$$

$$r = k[\text{ClO}^-]^2$$

2. $r = k[\text{C}_6\text{H}_5\text{N}_2\text{Cl}]$

3. $r = k[\text{H}_3\text{PO}_4][\text{I}^-][\text{H}^+]^2$

→ want to double rate of rxn

→ could double $[\text{H}_3\text{PO}_4]$ or $[\text{I}^-]$

4. a) 2

b) 0

c) 1.5

d) 3

5

8

$$r = k[\text{NO}]^m[\text{Cl}_2]^n$$

| trial | [] | [NO] | [Cl ₂] |
|-------|-------|------|--------------------|
| 1 | y | z | z |
| 2 | 1/9 y | 3x | z |
| 3 | 1/2 y | z | 1/2 z |

$$\therefore r = k[\text{NO}]^{1/2}[\text{Cl}_2]$$

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$$r = k[\text{NH}_3]^m$$

↑ no affect of changing [NH₃]

$$\therefore m = 0$$

$$r = k$$

7. $r = k[A]^2$

a) [A] tripled

r increase by a factor of 9

b) [A] reduced to 1/3

r decrease by a factor of 9

8. a) $r = k[\text{NO}_2][\text{O}_3]$

b) rate doubles

c) rate triples

9.

$$r = k[A]^m[B]^n$$

$$m = 1$$

$$n = 0$$

$$r = k[A]$$

| trial | [A] | [B] | rate |
|-------|-----|------|------|
| 1 | x | y | z |
| 2 | 2x | y | 2z |
| 3 | x | 1/2y | z |

10

10.

[]

temp

SA

nature.

$$11. \quad r = k[A]^m[B]^n$$

a) $n = 1$
 $m = 2$

b) overall order = 3

d) $k = 5.04 \frac{L^2}{mol^2 \cdot s}$

c) $r = 5.04 \frac{L^2}{mol^2 \cdot s} [A]^2[B]$

$$12. \quad r = k[A]^m[B]^n$$

a) $m = 1$
 $n = 2$

b) overall order = 3

d) $k = 3.56 \frac{L^2}{mol^2 \cdot s}$

c) $r = 3.56 \frac{L^2}{mol^2 \cdot s} [A]^2[B]$

(D)

$$14. \quad r = k[A]^m[B]^n$$

a) $m=1 \quad n=2$

b) overall = 3

d) $k = 2.54 \frac{L^2}{mol^2 \cdot s}$

c) $r = 2.54 \frac{L^2}{mol^2 \cdot s} [A][B]^2$

$$15. \quad r = k[A]^m[B]^n$$

a) $m=2 \quad n=1$

b) overall = 3

d) $k = 35.1 \frac{L^2}{mol^2 \cdot s}$

c) $r = 35.1 \frac{L^2}{mol^2 \cdot s} [A]^2[B]$

$$16. \quad r = k[A]^m[B]^n$$

a) $m=2 \quad n=1$

b) overall = 3

d) $k = 3.54 \frac{L^2}{mol^2 \cdot s}$

c) $r = 3.54 \frac{L^2}{mol^2 \cdot s} [A]^2[B]$

(17)

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

| | [A] | [B] | r |
|---------|-----|-----|---|
| trial 1 | x | 0.1 | 2 |
| 2 | x | 0.3 | — |

↑ by factor of 9

(18)

$$r = 1.25 \times 10^{-2} \frac{\text{L}^2}{\text{mol}^2 \cdot \text{s}} [A]^2 [B]^2$$

$$[A] = 0.27 \text{ mol/L}$$

$$[B] = 0.32 \text{ mol/L}$$

$$r = 9.3 \times 10^{-5} \frac{\text{mol}}{\text{L} \cdot \text{s}}$$

(19)

$$r = 1.94 \times 10^2 \frac{\text{L}}{\text{mol} \cdot \text{s}} [A][B]$$

$$[A] = 0.68 \text{ mol/L}$$

$$[B] = 0.14 \text{ mol/L}$$

$$r = 18.5 \frac{\text{mol}}{\text{L} \cdot \text{s}}$$

(20)

$$r = 13.01 \times 10^2 \frac{\text{L}}{\text{mol} \cdot \text{s}} [A][B]$$

$$[A] = 0.47 \text{ mol/L}$$

$$[B] = 0.79 \text{ mol/L}$$

$$r = 112 \frac{\text{mol}}{\text{L} \cdot \text{s}}$$

(E)