

Name: Key Period: _____

Reaction Order and Rate Law Expression Worksheet # 2

1. Reaction: $C + D \rightarrow E$

Exp #	[C]	[D]	Rate (mole dm ⁻³ s ⁻¹)
1	0.1	0.01	0.02
2	0.1	0.02	0.04
3	0.1	0.03	0.06
4	0.1	0.04	0.08
5	0.2	0.04	0.08
6	0.3	0.04	0.08

a. What is the rate order of reactant C?

$$\left(\frac{.2}{.1}\right)^x = \frac{.08}{.02} \quad 2^x = 2 \quad x = 1 \quad [C]^0$$

b. What is the rate order of reactant D?

$$\left(\frac{.02}{.01}\right)^x = \frac{.04}{.02} \quad 2^x = 2 \quad x = 1 \quad [D]^1$$

c. What is the rate law for the reaction?

$$\text{rate} = k[D]$$

2. Reaction: $F + G \rightarrow H$

Exp #	[F]	[G]	Rate (mole dm ⁻³ s ⁻¹)
1	0.01	0.4	0.02
2	0.02	0.4	0.04
3	0.03	0.4	0.06
4	0.1	0.2	5
5	0.1	0.4	10
6	0.1	0.6	15

a. What is the rate order of reactant F?

$$\left(\frac{.02}{.01}\right)^x = \frac{.04}{.02} \quad 2^x = 2 \quad x = 1 \quad [F]^1$$

b. What is the rate order of reactant G?

$$\left(\frac{.4}{.2}\right)^x = \frac{5}{10} \quad 2^x = 2 \quad x = 1 \quad [G]^1$$

c. What is the rate law for the reaction?

$$\text{rate} = k[F][G]$$

3. Reaction: $C + D \rightarrow E$

Exp #	[C]	[D]	Rate (mole dm ⁻³ s ⁻¹)
1	0.1	0.01	0.02
2	0.1	0.02	0.08
3	0.1	0.03	0.18
4	0.1	0.04	0.32
5	0.2	0.04	1.28
6	0.3	0.04	2.88

- a. What is the rate order of reactant C?
 $\left(\frac{0.2}{0.1}\right)^x = \frac{1.28}{0.02}$ $2^x = 4$ $x = 2$ $[C]^2$
- b. What is the rate order of reactant D?
 $\left(\frac{0.02}{0.01}\right)^x = \frac{0.08}{0.02}$ $2^x = 4$ $x = 2$ $[D]^2$
- c. What is the rate law for the reaction?
 $rate = k [C]^2 [D]^2$

4. Reaction: $F + G \rightarrow H$

Exp #	[F]	[G]	Rate (mole dm ⁻³ s ⁻¹)
1	0.01	0.4	0.02
2	0.02	0.4	0.16
3	0.03	0.4	0.54
4	0.1	0.2	5
5	0.1	0.4	20
6	0.1	0.6	45

- a. What is the rate order of reactant F?
 $\left(\frac{0.02}{0.01}\right)^x = \frac{0.16}{0.02}$ $2^x = 8$ $x = 3$ $[F]^3$
- b. What is the rate order of reactant G?
 $\left(\frac{0.4}{0.2}\right)^x = \frac{20}{5}$ $2^x = 4$ $x = 2$ $[G]^2$
- c. What is the rate law for the reaction?
 $rate = k [F]^3 [G]^2$

5. Reaction: $A_2 + B_2 \rightarrow 2 AB$

Exp #	[A ₂]	[B ₂]	Rate (mole dm ⁻³ s ⁻¹)
1	0.001	0.001	0.01
2	0.001	0.002	0.02
3	0.001	0.003	0.03
4	0.001	0.004	0.04
5	0.002	0.004	0.16
6	0.003	0.004	0.36

- a. What is the rate order of reactant A₂?
 $\left(\frac{0.002}{0.001}\right)^x = \frac{0.16}{0.01}$ $2^x = 4$ $x = 2$ $[A_2]^2$
- b. What is the rate order of reactant B₂?
 $\left(\frac{0.002}{0.001}\right)^x = \frac{0.02}{0.01}$ $2^x = 2$ $x = 1$ $[B_2]^1$
- c. What is the rate law for the reaction?
 $rate = k [A_2]^2 [B_2]$