

Show all work

rate = k rate = k[A] rate = k[A]² [A]_t = -kt + [A]₀ ln[A]_t = -kt + ln[A]₀

1/[A]_t = kt + 1/[A]₀ t_{1/2} = [A]₀/2k t_{1/2} = 0.693/k t_{1/2} = 1/k[A]₀

ln(k₂/k₁) = (E_a/R)(1/T₁ - 1/T₂) R = 8.314 J/(mol•K) e = mc²

1. Determine the rate law and the rate constant that corresponds to the data shown for the following reaction?



Exp.	Initial [A]	Initial [B]	Initial rate
1	0.015	0.022	0.125
2	0.030	0.044	0.500
3	0.060	0.044	0.500
4	0.060	0.066	1.125

General form: rate = k[A]^x[B]^y

for A use Exp 2 + 3

rate 2 / rate 3 = ~~k(A)^x(B)^y / k(A)^x(B)^y~~

0.5 / 0.5 = (0.030 / 0.060)^x

1 = (1/2)^x

x = 0

for B use Exp 4

1.125 / 0.500 = (0.066 / 0.044)^y

2.25 = (1.5)^y

ln 2.25 = y ln 1.5

y = 2

rate = k[B]²
k = 0.125 / (0.022)²
k = 258 M⁻¹t⁻¹

2. Nitric oxide reacts with hydrogen to form nitrous oxide, and water. Use the following data to determine the rate law for the reaction.



Expt. #	[NO] ₀	[H ₂] ₀	Initial rate
1	0.021	0.065	1.46 M/min
2	0.021	0.260	1.46 M/min
3	0.042	0.065	5.84 M/min

- A. rate = k[NO]
- B. rate = k[NO]²
- C. rate = k[NO][H₂]
- D. rate = k[NO]²[H₂]
- E. rate = k[NO]²[H₂]²

rate = k[NO]^x[H₂]^y

for [NO]: rate 3 / rate 1 = ~~k[NO]^x[H₂]^y / k[NO]^x[H₂]^y~~

5.84 / 1.46 = (0.042 / 0.021)^x

y = 2

x = 2

for H₂: Exp 1 shows 0 order

so rate = k[NO]²

(more on back)

3. At 25°C, the rate constant for the first-order decomposition of a pesticide solution is $6.40 \times 10^{-3} \text{ min}^{-1}$. If the starting concentration of pesticide is 0.0314 M, what concentration will remain after 62.0 min at 25°C?

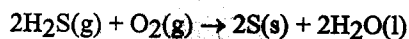
$$\ln[A]_t = -kt + \ln[A]_0$$

$$\ln[A]_t = -6.40 \times 10^{-3} (62) + \ln[0.0314]$$

$$\ln[A]_t = -3.8577$$

$$e^{-3.8577} = \underline{\underline{0.0211 \text{ M}}}$$

4. For the overall chemical reaction shown below, which one of the following statements can you rightly assume?



- A. The reaction is third-order overall. B. The reaction is second-order overall.
 C. The rate law is, rate = $k[\text{H}_2\text{S}]^2 [\text{O}_2]$. D. The rate law is, rate = $k[\text{H}_2\text{S}] [\text{O}_2]$.
 E. The rate law cannot be determined from the information given.

5. The units for a first-order rate constant are

- A. M/s B. 1/M•s C. 1/s D. M²•s E. None of these

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

$$\frac{\text{M}}{\text{s}} = \text{M}$$

$$\uparrow$$

$$\frac{1}{\text{s}}$$

6. The reaction $\text{A} + 2\text{B} \rightarrow \text{products}$ was found to follow the rate law: rate = $k[\text{A}]^2[\text{B}]$. Predict by what factor the rate of reaction will increase when the concentration of A is doubled and the concentration of B is tripled, and the temperature remains constant.

- A. 5 B. 6 C. 12 D. 18 E. None of the above.

$$\text{rate} = k[2]^2[3]$$

$$4 \times 3 =$$

$$\text{12}$$