

SHOW ALL WORK TO RECEIVE CREDIT.

1. (4 Pts) Which of the statements concerning relative rates of reaction is correct for the decomposition of dinitrogen pentaoxide?



- a. The rate of disappearance of N_2O_5 is 1/2 the rate of appearance of O_2 .
- b. The rate of appearance of NO_2 is 1/4 the rate of appearance of O_2 .
- c.** The rate of disappearance of N_2O_5 is 1/2 the rate of appearance of NO_2 .
- d. The rate of appearance of NO_2 equals the rate of appearance of O_2 .
- e. The rate of disappearance of N_2O_5 equals the rate of appearance of NO_2 .

2. (10 Pts) Given the initial rate data for the reaction $\text{A} + \text{B} \rightarrow \text{C}$, determine the rate expression for the reaction and the value of the rate constant along with its units.

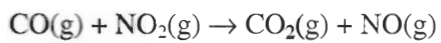
	[A], M	[B], M	$\Delta[\text{C}]/\Delta t$ (initial) M/s
Exp 1	0.10	0.20	4.20×10^{-4}
Exp 2	0.10	0.40	1.68×10^{-3}
Exp 3	0.20	0.40	3.36×10^{-3}

General Rate law:
 $\text{rate} = k[\text{A}]^x [\text{B}]^y$

For A: use $\frac{\text{exp 3}}{\text{exp 2}}$: $\frac{\text{rate}_3}{\text{rate}_2} = \frac{[\text{A}]_3^x [\text{B}]_3^y}{[\text{A}]_2^x [\text{B}]_2^y}$
 $\frac{3.36 \times 10^{-3}}{1.68 \times 10^{-3}} = \left(\frac{0.20}{0.10}\right)^x \Rightarrow 2 = 2^x \Rightarrow x = 1$

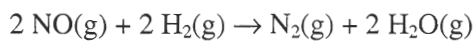
For B: $\frac{\text{Exp 2}}{\text{Exp 1}}$: $\frac{1.68 \times 10^{-3}}{4.20 \times 10^{-4}} = \left(\frac{0.40}{0.20}\right)^y \Rightarrow 4 = 2^y \Rightarrow y = 2$
 rate law: $\text{rate} = k[\text{A}]^1 [\text{B}]^2$ $k = \frac{\text{rate}}{[\text{A}][\text{B}]^2}$ $k = 0.105 \text{ M}^{-2} \text{ s}^{-1}$

3. (3 Pts) What is the overall order of the reaction



if it proceeds via the following rate expression? $\text{rate} = k[\text{CO}][\text{NO}_2]$ ans 2

4. (3 Pts) Nitric oxide reacts with hydrogen at a measurable rate at 1000 K according to the equation below.



What is overall order of the reaction?

- a. first-order
- b. second-order
- c. third-order
- d. fourth-order
- e.** not enough information given to solve

5. (4) For the reaction $\text{A} + \text{B} \rightarrow \text{C}$, the rate law is

$$\frac{\Delta[\text{C}]}{\Delta t} = k[\text{A}][\text{B}]$$

What are the units of the rate constant where time is measured in seconds?

$$\text{M}^{-1} \text{ s}^{-1}$$