

ANSWERS AT END

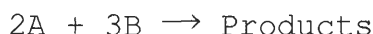
1. The gas phase reaction $A + B \rightarrow C$ has a reaction rate which is experimentally observed to follow the relationship $\text{Rate} = k[A]^2[B]$. The overall order of the reaction is? _____

2. The units of the rate constant for a second order reaction can be? (use t for time)

_____.

3. A reaction is first order in X and second order in Y. Tripling the initial concentration of X and cutting the initial concentration of Y to three-fourths of its previous concentration at constant temperature causes the initial rate to (increase or decrease) _____ by a factor of _____.

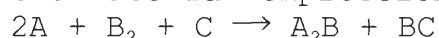
4. Consider the following rate data for the reaction below at a particular temperature.



Experiment	Initial [A]	Initial [B]	Initial Rate of Loss of A
1	0.10 M	0.30 M	$7.20 \times 10^{-5} \text{ M}\cdot\text{s}^{-1}$
2	0.10 M	0.60 M	$1.44 \times 10^{-4} \text{ M}\cdot\text{s}^{-1}$
3	0.20 M	0.90 M	$8.64 \times 10^{-4} \text{ M}\cdot\text{s}^{-1}$

The reaction is _____ order in A and _____ order in B.

5. Determine the rate-law expression for the reaction below.



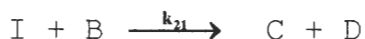
Trial	Initial [A]	Initial [B ₂]	Initial [C]	Initial Rate of Formation of BC
1	0.20 M	0.20 M	0.20 M	$2.4 \times 10^{-6} \text{ M}\cdot\text{min}^{-1}$
2	0.40 M	0.30 M	0.20 M	$9.6 \times 10^{-6} \text{ M}\cdot\text{min}^{-1}$
3	0.20 M	0.30 M	0.20 M	$2.4 \times 10^{-6} \text{ M}\cdot\text{min}^{-1}$
4	0.20 M	0.40 M	0.40 M	$4.8 \times 10^{-6} \text{ M}\cdot\text{min}^{-1}$

6. The decomposition of dimethylether at 504°C is first order with a half-life of 1570 seconds. What fraction of an initial amount of dimethylether remains after 4710 seconds?

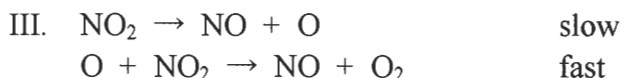
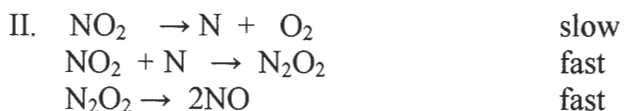
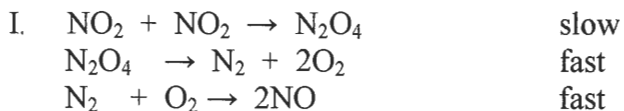
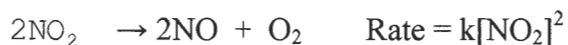
7. The gas phase reaction $3C + 2D \rightarrow E + F$ obeys the rate-law expression $\text{Rate} = k[D]$ and has a half-life of 0.860 s^{-1} . If 2.00 mole of D is injected into a 1.00-L container with excess C, what concentration of D remains after 1.50 seconds?

8. The decomposition of dinitrogen pentoxide obeys the rate-law expression $\text{Rate} = 0.080 \text{ min}^{-1} [\text{N}_2\text{O}_5]$. If the initial concentration of N_2O_5 is 0.30 M , what is the concentration after 2.6 minutes?

9. Consider the following proposed mechanism. If this mechanism for the overall reaction were correct, and if k_1 were much less than k_2 , then what would the observed rate law be?



10. Consider the reaction below and its observed rate law expression. Which proposed mechanisms are consistent with the rate law expression?



11. Calculate the activation energy of a reaction if the rate constant is 0.75 s^{-1} at 25°C and 11.5 s^{-1} at 75°C .

12. The specific rate constant, k , for a reaction is $2.64 \times 10^{-2} \text{ s}^{-1}$ at 25°C , and the activation energy is 74.0 kJ/mol . Calculate k at 50°C .

ANSWERS:

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|--|------------------------------------|
| 1. is third | 2. $\text{M}^{-1}\text{s}^{-1}$ |
| 3. increase, 1.69 | 4. second, first |
| 5. $\text{rate} = k[\text{A}]^2[\text{C}]$ | 6. $1/8$ |
| 7. 0.60 M | 8. 0.24 M |
| 9. $\text{rate} = k_1[\text{A}]^2$ | 10. I |
| 11. <u>d) 47.1 kJ</u> | 12. <u>c) 0.266 s⁻¹</u> |