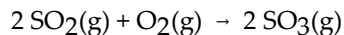


Name _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Given the following balanced equation, determine the rate of reaction with respect to [SO₂].



A) Rate = + $\frac{2 \Delta[\text{SO}_2]}{\Delta t}$

B) Rate = - $\frac{1}{2} \frac{\Delta[\text{SO}_2]}{\Delta t}$

C) Rate = - $\frac{\Delta[\text{SO}_2]}{\Delta t}$

D) Rate = + $\frac{1}{2} \frac{\Delta[\text{SO}_2]}{\Delta t}$

E) It is not possible to determine without more information.

2) Given the following rate law, how does the rate of reaction change if the concentration of Y is doubled?

$$\text{Rate} = k [\text{X}][\text{Y}]^2$$

A) The rate of reaction will decrease by a factor of 2.

B) The rate of reaction will increase by a factor of 2.

C) The rate of reaction will increase by a factor of 5.

D) The rate of reaction will increase by a factor of 4.

E) The rate of reaction will remain unchanged.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

3) Write a balanced reaction for which the following rate relationships are true.

$$\text{Rate} = -\frac{1}{2} \frac{\Delta[\text{N}_2\text{O}_5]}{\Delta t} = \frac{1}{4} \frac{\Delta[\text{NO}_2]}{\Delta t} = \frac{\Delta[\text{O}_2]}{\Delta t}$$

4) Determine the rate law **and** the value of k for the following reaction using the data provided.

$2 \text{N}_2\text{O}_5(\text{g}) \rightarrow 4 \text{NO}_2(\text{g}) + \text{O}_2(\text{g})$	$[\text{N}_2\text{O}_5]_i$ (M)	Initial Rate (M/s)
	0.093	4.84×10^{-4}
	0.084	4.37×10^{-4}
	0.224	1.16×10^{-3}

5) Determine the rate law **and** the value of k for the following reaction using the data provided.

$2 \text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2 \text{NO}_2(\text{g})$	$[\text{NO}]_i$ (M)	$[\text{O}_2]_i$ (M)	Initial Rate (M/s)
	0.030	0.0055	8.55×10^{-3}
	0.030	0.0110	1.71×10^{-2}
	0.060	0.0055	3.42×10^{-2}

6) What are the units of k in a zero order reaction?

7) What are the units of k in a second order reaction?

8) What is the **overall order** of the following reaction, given the rate law?



9) The decomposition of dinitrogen pentoxide is described by the chemical equation



If the rate of appearance of NO_2 is equal to 0.560 mol/min at a particular moment, what is the rate of appearance of O_2 at that moment? (Conceptualize this)

10) What happens in the concentration of reactants and products during a chemical reaction?

11) What is the difference between average reaction rate and instantaneous reaction rate?

12) Explain how the order of a reaction can be determined.

Answer Key

Testname: QUIZ 13.1-13.3 KINETICS RATE LAWS

- 1) B
- 2) D
- 3) $2 \text{N}_2\text{O}_5 \rightarrow 4 \text{NO}_2 + \text{O}_2$
- 4) $\text{Rate} = 5.2 \times 10^{-3} \text{ s}^{-1}[\text{N}_2\text{O}_5]$
- 5) $\text{Rate} = 1.7 \times 10^3 \text{ M}^{-2}\text{s}^{-1}[\text{NO}]^2[\text{O}_2]$
- 6) $\frac{\text{M}}{\text{s}}$
- 7) $\text{M}^{-1}\text{s}^{-1}$
- 8) 3rd order
- 9) 0.140 mol/min
- 10) The concentration of reactants decrease and the concentration of products increase during a chemical reaction.
- 11) An average reaction rate is determined using long periods of time during the reaction. An instantaneous rate is found at a particular moment during reaction. Instantaneous rates usually decrease during the course of a reaction.
- 12) The order of a reaction can only be determined experimentally.