

Study Guide

Chapter 14

Name: _____

Date: _____ Per: _____

- Define:
 - Homogeneous reaction: _____
 - Heterogeneous reaction: _____
 - Activated complex: _____
 - Activation energy: _____
- How is average rate of reaction calculated? _____

- What is the relationship between $\Delta[\text{product}]$ and $\Delta[\text{reactant}]$ for a chemical reaction? _____

- Describe an effective collision: _____

- What are three factors that affect reaction rate? _____

- Why is gas pressure directly related to gas concentration? _____

- Describe the method of initial rates? _____

- What are two methods of determining the order of a reactant using experimental data? _____

- What is an integrated rate law used for? _____

- Complete the following table for integrated rate law calculations:

	Zero Order Reaction	First Order Reaction	Second Order Reaction
Rate Law Constant Unit:			
Integrated Rate Law:			
$\frac{1}{2}$ -life Formula:			
y-value for Straight-Line Plot:			
How does the $\frac{1}{2}$ -life change over time?			

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11. What is the relationship between reaction rate and activation energy? _____

12. What is the Arrhenius equation? How do the variables affect the value? _____

13. Describe a reaction mechanism: _____

14. Define:

a. Molecularity: _____

b. Rate-determining Step: _____

c. Initial Step: _____

15. Complete the following table for elementary reactions:

Molecularity	Sample Equation	Rate Law

16. How is the rate-law determined for a multi-step reaction mechanism with a slow-initial step? _____

17. How is determining the rate-law for a multi-step reaction mechanism with a fast-initial step different than for one with a slow-initial step? _____

18. How do catalysts affect reaction rate (& how do they change variables in the Arrhenius equation)? _____

19. Define:

a. Homogeneous catalyst: _____

b. Heterogeneous catalyst: _____

c. Adsorption: _____

d. Absorption: _____

20. Compare & contrast acid catalysis & base catalysis: _____

21. Describe surface catalysis: _____

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22. Describe enzymatic catalysis: _____

Calculations

23. The data in the table below were obtained for the reaction:



- a. What is the order of the reaction with respect to ClO_2 ?

- b. What is the order of the reaction with respect to OH^- ?

Experiment Number	$[\text{ClO}_2]$ (M)	$[\text{OH}^-]$ (M)	Initial Rate (M/s)
1	0.060	0.030	0.0248
2	0.020	0.030	0.00276
3	0.020	0.090	0.00828

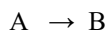
- c. What is the overall order of the reaction?

- d. What is the magnitude of the rate constant for the reaction?

24. The rate law for a reaction is $\text{rate} = k [\text{A}][\text{B}]^2$:

- a. What is the overall reaction order? _____
 b. How would the rate change if the $[\text{A}]$ was tripled? _____
 c. How would the rate change if the $[\text{B}]$ was halved? _____
 d. How would the rate change if the $[\text{A}]$ was doubled and $[\text{B}]$ was quartered? _____

25. The following reaction is second order in $[\text{A}]$ and the rate constant is $0.025 \text{ M}^{-1}\text{s}^{-1}$:



The concentration of A was 0.65 M at 33 s. Find the initial concentration of A.

26. A compound decomposes by a first-order process. If 25.0% of the compound decomposes in 60.0 minutes, the half-life of the compound is

27. For the elementary reaction; $\text{NO}_3 + \text{CO} \rightarrow \text{NO}_2 + \text{CO}_2$, the molecularity of the reaction is _____, and the rate law is $\text{rate} = \text{_____}$.

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28. A second-order reaction has a half-life of 18 s when the initial concentration of reactant is 0.71 M. The rate constant for this reaction is _____ $M^{-1}s^{-1}$.

29. The decomposition of N_2O_5 in solution in carbon tetrachloride proceeds via the reaction

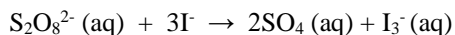


The reaction is first order and has a rate constant of $4.82 \times 10^{-3}s^{-1}$ at 64°C . If the reaction is initiated with 0.058 mol in a 1.00-L vessel, how many moles remain after 151 s?

30. The reaction; $2NOBr (g) \rightarrow 2NO (g) + Br_2 (g)$; is a second-order reaction with a rate constant of $0.80 M^{-1}s^{-1}$ at 11°C . If the initial concentration of NOBr is 0.0440 M, what is the concentration of NOBr after 7.0 seconds?

31. What is the rate of appearance of Br_2 when the rate of disappearance of HBr in the gas phase reaction; $2HBr (g) \rightarrow H_2 (g) + Br_2 (g)$; is $0.301 Ms^{-1}$ at 150°C .

32. The peroxydisulfate ion ($S_2O_8^{2-}$) reacts with the iodide ion in aqueous solution via the reaction:



An aqueous solution containing 0.050 M of $S_2O_8^{2-}$ ion and 0.072 M of I^- is prepared, and the progress of the reaction followed by measuring $[I^-]$. The data obtained is given in the table below.

Time (s)	0.000	400.0	800.0	1200.0	1600.0
$[I^-]$ (M)	0.072	0.057	0.046	0.037	0.029

- The average rate of disappearance of I^- in the initial 400.0 s is _____ M/s.
- The average rate of disappearance of I^- between 400.0 s and 800.0 s is _____ M/s.
- The concentration of $S_2O_8^{2-}$ remaining at 400 s is _____ M.