

CHM 111**Chapter 12 study guide / learning objectives**

Chapter 12 in the OpenStax textbook deals with kinetics - the study of the rate of chemical reactions. You will be introduced to the concept of the rate law - an equation which describes how the speed of a chemical reaction depends on temperature and the amount of reactants (or other substances) present. You will also look at one of the methods chemists use to get information about the rate of reaction. In lecture, we will focus more on the qualitative aspects of kinetics, but you should be able to perform basic calculations for the initial rates method. In the text, you will be responsible for materia; from sections 12.1, 12.2, 12.3, 12.5, and 12.7. You are not responsible for sections 12.4 and 12.6.

At the end of this chapter, you should be able to:

[Definitions / Terminology]

- Define terms associated with the reaction rate: **kinetics, rate of reaction, rate law, rate constant, reaction order, catalyst**
- Define terms associated with theories on how reactions occur: **collision theory, transition state, activation energy, Arrhenius equation**

[Rate laws]

- Describe the terms in the rate law.
- Explain how the rates of disappearance of a reactant **relate** to the rates of appearance of product.
- Explain what **factors** influence the rate constant.
- Explain what effect the **reaction order** has on the rate of reaction.
- Calculate the rate constant and reaction orders for a reaction from a simple **initial rates experiment**.

[Influencing the reaction rate]

- List and describe the **four factors** (other than the chemical nature of the reactants) that influence the reaction rate.

[Collision theory]

- Describe the **conditions** necessary for a reaction between two species to occur in collision theory.
- Explain how **collision theory** supports the notion that nearly all reactions proceed faster at higher temperatures.

[Transition state theory]

- Draw and/or label an **energy diagram** showing the transition state, reactants and products, the activation energy, and the enthalpy change of reaction.
- Using transition state theory, explain why both endothermic and exothermic reactions proceed faster at higher temperatures.
- Explain how reaction rate depends on temperature using the **Arrhenius equation**.

[Catalysis]

- Explain (using an energy diagram and transition state theory) **how catalysts work**. You are not required to provide details about the mechanism for a particular catalyst works. Instead, focus on how the effect of a catalyst shows up on an energy diagram.
- Describe the **difference** between a homogeneous catalyst and a heterogeneous catalyst and give examples of each.

[Practice exercises from the OpenStax text]

- 1, 3, 7, 13, 23, 51, 53, 79, 81