UNIT 6 CHEMICAL KINETICS

Textbook References: *Chemistry* Zumdahl 5th Edition Chapters 12 Kinetics:

1. state collision theory and use to explain the factors that effect reaction rate
2. use stoichiometry to determine relative reaction rates of products and reactants
3. determine the rate expression from experimental data
4. determine the order of reaction from the rate expression
5. determine the unit of k knowing the reaction order
6. know the integrated rate law and half-life equation for zero, first and second order reactions
7. use integrated rate law to calculate concentrations and time
8. use graphical methods to determine the order of reaction
9. interpret potential energy diagrams
10. determine energy of activation using Arrhenius equation
11. describe the relationship between reaction mechanism and the rate determining step
12. evaluate reaction mechanisms

Vocabulary

reaction rate	reaction order	rate determining step
threshold energy	half-life	reaction mechanism
proper orientation	activation energy	catalyst
rate constant	elementary step	

AP Course Guide correlation:

III. Reactions
D. Kinetics
1. Concept of rate of reaction
2. Use of experimental data and graphical analysis to determine reactant order, rate constants, and reaction rate laws
3. Effect of temperature change on rates
4. Energy of activation; the role of catalysts
5. The relationship between the rate-determining step and a mechanism
III. Reactions
C. Equilibrium
1. Concept of dynamic equilibrium, physical and chemical; Le Chatelier's principle; equilibrium constants
2. Quantitative treatment
a. Equilibrium constants for gaseous reactions: *Kp*, *Kc*

IB course Outline correlation

6.1.1 Define the term *rate of reaction*. 1
6.1.2 Describe suitable experimental procedures for measuring rates of reactions.
6.1.3 Analyse data from rate experiments. 3 Students should be familiar with graphs of changes in concentration, volume and mass against time.
6.2.1 Describe the kinetic theory in terms of the movement of particles whose average energy is proportional to temperature in kelvins.
6.2.2 Define the term *activation energy*, *E*a. 1
6.2.3 Describe the collision theory. 2 Students should know that reaction rate depends on:
• collision frequency
• number of particles with $E \geq E$a
• appropriate collision geometry or orientation.
6.2.4 Predict and explain, using the collision theory, the qualitative effects of particle size, temperature, concentration and pressure on the rate of a reaction.

6.2.5 Sketch and explain qualitatively the Maxwell–Boltzmann energy distribution curve for a fixed amount of gas at different temperatures and its consequences for changes in reaction rate.
6.2.6 Describe the effect of a catalyst on a chemical reaction.
6.2.7 Sketch and explain Maxwell– Boltzmann curves for reactions with and without catalysts.
16.1.1 Distinguish between the terms *rate constant*, *overall order of reaction* and *order of reaction* with respect to a particular reactant.
16.1.2 Deduce the rate expression for a reaction from experimental data.
16.1.3 Solve problems involving the rate expression.
16.1.4 Sketch, identify and analyse graphical representations for zero-, first- and second-order reactions.
16.2.1 Explain that reactions can occur by more than one step and that the slowest step determines the rate of reaction (rate-determining step).
16.2.2 Describe the relationship between reaction mechanism, order of reaction and rate-determining step.