CHAPTER 14 LEARNING OBJECTIVES

To satisfy the minimum requirements for this course, you should master the following learning objectives.

Understand the concept of reaction rates and be able to
- use the coefficients of a balanced reaction to express the rate of reaction in terms of the change in concentration of a reactant or product over time.
- distinguish between instantaneous rates and average rates from a graph.

Determine the rate law from initial rate data and be able to determine
- the order of reaction with respect to each reactant.
- the overall order of reaction.
- the rate constant with units.

Recognize the integrated rate laws and be able to
- use integrated first-order and second-order rate laws to find the value of one variable, given values of the other variables.
- explain the concept of reaction half-life and describe the relationship between half-life and rate constant for first-order and second-order reactions.
- determine the order of the reaction from plots of concentration versus time, ln(concentration) versus time, and 1/(concentration) versus time.

Use the Collision Theory of Chemical Kinetics to explain how reactions occur at the molecular level, and
- explain the concept of activation energy and how it relates to the variation of reaction rate with temperature.
- be able to interpret potential energy profiles and use them to determine the activation energy and potential energy changes for a reaction.

Define a catalyst and be able to
- given a reaction mechanism, identify the reaction intermediates and catalysts, write the overall reaction, and determine the molecularity of each step.
- describe the effect of a catalyst on the energy requirements for a reaction.
- sketch a potential energy profile showing the activation energies for the forward and reverse reactions and show how they are affected by the addition of a catalyst.
- explain how enzymes act as biological catalysts and how they interact with specific substrate molecules.
- explain why enzymatic reactions respond differently to temperature changes than non-enzymatic processes.

Naval Applications

Chemical Warfare:
- Explain the mechanism by which sarin inhibits acetylcholinesterase