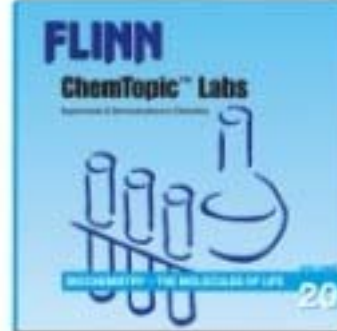


# Biochemistry—The Molecules of Life— Experiment Summaries and Concepts



## *Introduction to Carbohydrates—Structure and Properties*

What is a carbohydrate? How are monosaccharides related to di- and polysaccharides? What is the difference between a reducing and nonreducing sugar? The purpose of this experiment is to explore the structures and properties of different types of carbohydrates and learn how they can be identified. The identities of five carbohydrates—starch, glucose, fructose, lactose, and sucrose—have been scrambled. Students perform a set of classification tests in sequence to unscramble the carbohydrate code and reveal the identities of the unknowns.

## *Identifying Proteins and Amino Acids*

Starting with only about 20 different amino acids, a single cell may synthesize more than 3,000 different types of proteins. How do amino acids link together to build a protein? The purpose of this experiment is to identify proteins and amino acids using a series of classification tests. Students study the behavior of albumin, casein, and gelatin using the biuret test to identify the general nature of the peptide linkage and its central role in protein structure. A series of chemical tests are then performed to investigate the composition of these proteins with respect to three specific amino acids.

## *Physical Properties of Proteins*

The relationship between structure and function is a universal theme in biochemistry. In this experiment, students examine the effects of acids and bases, inorganic salts, organic solvents, and heat on the physical properties of proteins. The results demonstrate how sensitive proteins are to physiological conditions and to the addition of external agents. Many factors are shown to affect the physical properties of proteins that relate, in turn, to their structure and function. Students learn about the interactions among amino acid side chains that allow proteins to fulfill their vital biological functions.

## *Properties of Lipids*

Fats and oils, waxes and cholesterol, steroid hormones and Vitamin A—all of these natural products belong to the diverse class of biological compounds called lipids. The purpose of this experiment is to identify and classify lipids and examine their properties. Students study the solubility of lipids, stain them using a special “fat stain,” and perform a chemical test to classify oils as saturated versus unsaturated. Finally, students extract peanut oil from peanuts to determine the amount of fat in peanuts. This activity mimics the real-life processes used to characterize lipids and allows students to compare their results with information provided on the nutritional labels of a variety of food items.

## Concepts

- Carbohydrates
- Monosaccharide
- Disaccharide
- Polysaccharide
- Reducing sugars
  
- Proteins
- Amino acids
- Peptide linkage
- Biuret test
- Xanthoproteic test
  
- Protein folding
- Native structure
- Denaturation
- Salting-out
  
- Lipids
- Polar vs. nonpolar
- Triglycerides
- Fats and oils
- Saturated vs. unsaturated