



Understanding the Significance of Proteins, Lipids and Carbohydrates in Our Food

Annotation: Students will use their own creative way to construct lipid, proteins and carbohydrates and compare their differences and similarities in a report (oral and/or written). This assignment will emphasize the differences in the chemical structure of the molecules, how they are classified and why each of them is significant to living organisms. Students will also conduct a lab that will help identify the presence or absence of proteins, lipids, and carbohydrates in different food items. They will identify these molecules by using reagents that will serve as indicators by causing distinct color changes in the food items where these molecules are present.

Primary Learning outcome:

Students will be able to compare the molecular structures of fats, proteins and carbohydrates, understand how they are classified and why they are important to living organisms. They will also be able to identify the presence of lipids, proteins, and carbohydrates in different food items.

Additional Learning outcome:

Students will gain an understanding of the chemical makeup of lipids, proteins, and carbohydrates and the reasons that these compounds react with certain chemical indicators.

Georgia Performance Standards:

ScSh2: Students will use standard safety practices for all classroom laboratory and field investigations.

b. Demonstrate appropriate technique in all laboratory situations

ScSh3: Students will identify and investigate problems scientifically.

c. Collect, organize and record data

SCSh6. Students will communicate scientific investigations and information clearly.

a. Write clear coherent laboratory reports related to scientific investigations

Total Duration

Part A: Students will work independently outside of class

Part B: 90 minutes in class

Materials and Equipment

Posterboard

Yarn

Scissors

Construction paper

Glue

Models of molecular structures (chemical sequence)

Note: Any other materials needed to form molecular structures creatively.

Food items

Eggs (whites)

Bread

Grapes

Butter

Equipment

Test tubes

Test tube racks

Paper bags

Utensils

Paper towels

Water bath

Reagents

10% sodium hydroxide

1 % copper sulfate

Benedicts solution

Iodine

Procedures

Part A: Constructing Molecules

Students will construct actual models of a fat, short chain protein or amino acid, or glucose (carbohydrate) in a creative way. Students should not draw the model on poster board only. They must at least construct one out of the three molecules in a unique way while also comparing it with the two other molecules. For example, if a group of 2 students construct a protein or amino acid, they must discuss the differences between fats and carbohydrates in their report with pictures of their structures also. Students should highlight how the molecules are classified and what are the determining factors for these classifications.

Examples: Cutting out letters that represent elements (i.e: C for carbon and H for hydrogen) and use yarn or straws as the chemical bonds.

Part B: Testing for the presence of Molecules in foods

This lab has been modified. The original source is documented below.

Wesslemann, D. M. *Passing The Science Graduation Test in Georgia 2nd ed.* 2000. American Book Company.

After the students have presented the report, they can hypothesize the presence or absence of fat, carbohydrates, and protein in each of the foods tested. They should make educated guesses before the experiment and then report their results after (worksheet).

Understanding the Significance of Proteins, Lipids and Carbohydrates in our Food Lab Procedures

Each group or student should take each of the four food items (listed above) and place small pieces in the bottom of 2 separate test tubes (totaling 8 test tubes). Each item will be tested with 3 different reagents in test tubes.

Testing for Carbohydrates

All four items will be tested for sugar by using the Benedicts solution. Add 10 drops of the Benedicts solution to each tube. Heat the content of the tube for 3 minutes in a water bath. Observe the color change.

Testing for Starch

All four items will be tested for starch using iodine. Place small pieces of each food item on a paper towel. Place one drop of iodine on each bit of food and wait to observe color change.

Testing for Protein

All items will be tested for protein using a combination of 10% sodium hydroxide and 1% copper sulfate. In each tube place 4 cm of 10% sodium Hydroxide and 3 drops of 1% copper sulfate. Observe color change.

Testing for Lipids

All four of the food items will be tested for the presence of fat by using a piece of brown paper bag. Rub the brown paper bag with each small piece of food. Wait for ten minutes and hold the paper up to the light to see the effect on the bag.