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Biomolecules in My Food

Food is fuel:

All living things need to obtain fuel from something. Whether it is from yourself through the process of photosynthesis, or by ingesting something and breaking it apart into its components.

What makes food?

All organic (naturally occurring) molecules are classified into 4 general categories: carbohydrate, lipid, protein, and nucleic acid. Foods you consume consist of these 4 molecules. Let's take a look into the unique characteristics of these 4 categories (not to be confused with food groups), and **sketch or write a few notes in the boxes on the right** to help remember what we learn.

1.Carbohydrates – sugars, starches (flour), grains. Carbohydrates can be found in almost all food sources. Rice, cereal, potatoes, fruits, pasta, vegetables, etc., have some kind of carbohydrate in them. Carbohydrates can be compounds that are as simple as a single glucose ring, to strings of these rings. How these rings are arranged determines what kind of carbohydrate we have. Carbohydrates are the main energy source for the body. Your brain needs it to think, muscles need it to make ATP for muscle contractions. As well, every cell in your body needs carbohydrates to function. There are some carbohydrates that cannot be digested, so it just passes right through us. Cows, goats, sheep and horses have figured out how to use this non-digestible material and turn it into energy with the help of bacteria that live in their digestive tracts.

2.Lipids – fat, oil, lard, butter. Depending on the state of the lipid it is classified as a saturated fat or a non-saturated fat. Saturated fats are solid at room temperature. Examples: butter, animal fat. Non-saturated fats are liquids at room temperature such as your various cooking oils. Fat is necessary in a diet to maintain the membranes of your cells, and they are used to make certain hormones. Fat is a huge energy source. However, it takes a lot of effort to break this molecule up to release the energy. That's why carbohydrates are used first. Our bodies more easily break them apart.

3.Proteins – beans, meat, green leafy vegetables. Most people think of meat when protein is discussed. True as that may be, there are other means of obtaining your protein. There's an array of beans, all of which have protein. Everything from kidney beans to peanuts. We need proteins to maintain our muscles and the components of proteins help us put together almost everything in our bodies – from something as small as markers on our cells and antibodies, to steroid hormones, muscle tissue, hair and nails.

4.Nucleic acids – the genetic material. We consume the cells of an organism. Therefore we are also eating its DNA. We actually digest it. No, it does not become part of our DNA, but eating other organisms breaks down the DNA found in them into its components so they can be 'recycled'.

How do you know what your food is made of? The 'Biomolecules in My Food' lab will show you! This lab will test various food sources for various types of compounds: fats, proteins, simple sugars, and starch. This lab will take about 90 min. to finish. Allow time for a lengthy clean up.

Biomolecules in My Food Lab Sheet

Vocabulary Review:

- **Calcium** is a mineral that is necessary for bone growth and strength.
- **Carbohydrates** are nutrients in food that provide energy.
- **Fats** are nutrients that provide a source of energy that carry vitamins to body cells.
- The **food guide pyramid** is a triangle of colored, vertical stripes representing the five food groups, as well as fats and oils.
- **Minerals** are compounds needed for growth and to help the body work.
- **Nutrients** are any substances in food that the body can use to get energy or make the body work.
- **Protein** is a nutrient in food that helps build muscle.
- **Vitamins** are organic compounds that the body needs to stay healthy.

Problem: What is your food made of? Let's discover which nutrients - fats, proteins, carbohydrates (starch or simple sugars) are found in different foods.

Materials

Test Tube	Spot Plate	Biuret
Test Tube Rack	Boiling Water Bath	Benedict's Solution
Toothpicks	Brown Paper	
Plastic Knife	Iodine	
Food items: crackers, cheese, potato chips, grapes, apples, meat, butter		

Preview of Lab Procedures & Purposes

- Fats are nutrients that provide a source of energy that carry vitamins to body cells. **To test for fat:** Spread food within circles on a brown bag. Wait for foods to evaporate and check for grease spots by holding up to the light. The size of the grease spot indicates the amount of fat.
- Protein is a nutrient in food that helps build muscle. **To test for protein:** Place foods in a spot plate. Add Biuret solution to each food – a color change from blue to purple indicates protein is present.
- Carbohydrates are nutrients in food that provide energy. Simple starches and sugars are produced in plants during photosynthesis and broken down by animals during respiration. **To test for Starch:** Place foods in a spot plate. Add Iodine solution – a color change from brown to a blue-black indicates starch is present. **To test for Simple Sugar:** Place foods into test tubes. Add Benedict's solution – any immediate color change from blue to green or orange indicates that simple sugars are present.

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Day 1 - Goal: Today you will need to LEARN and PRACTICE conducting these tests by experimenting with known substances: water, egg whites, oil, starch and sugar.

Step 1: Get into your lab groups and review your data sheet. Take a few minutes to fill in the different foods to be tested and write a hypothesis regarding the presence of each nutrient sample within that particular food. You can use short-hand notes such as + and – signs to reflect the presence or absence of a nutrient within each sample.

Step 2: Fat Test

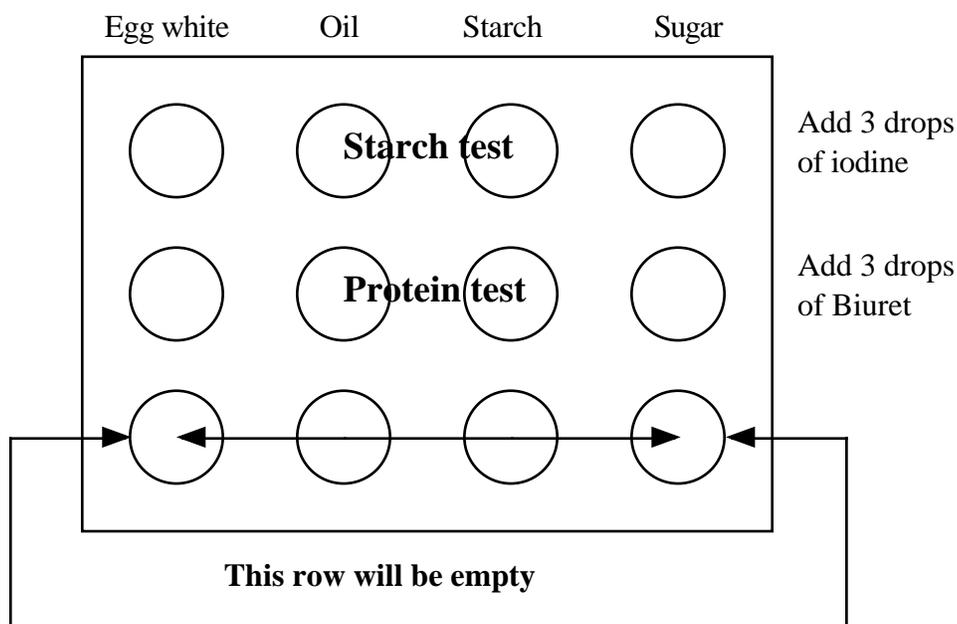
- a) Draw 5 circles on your brown paper and label each circle; water, egg whites, oil, starch, and sugar.
- b) Take your brown paper to the lab buffet table and put 2 drops of water in the water circle, 2 drops of egg in the egg white circle, continue with oil, starch, and sugar.
- c) Leave the brown paper on the side to dry. Once dry, record you results.

Step 3: Conduct protein test and starch test on water

- a) Take your spot plate to the buffet table. Add 5 drops of water into 2 spaces on the spot plate.
- b) Add 3 drops of **Biuret** solution to one spot of water.
- c) Add 3 drops of **Iodine** to the second spot of water.

Step 4: Rinse and drying your spot plate with water and a paper towel

Step 5: Conduct a protein and starch test on the remaining 4 samples. Your spot plate will look something like this:



Step 6: Conduct sugar tests for all samples.

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- a) Label each test tube with the food sample being tested and add 10 drops of each food sample into the appropriate test tube.
- b) Add 15 drops of Benedict's solution into each test tube.
- c) Note any immediate color changes then heat all 5 test tubes in a hot water bath for 5 minutes.
- d) A color change from blue to green or orange indicates that simple sugars are present. A positive result!

Step 7: CLEAN UP!!!!!! Return trays and wipe down the lab table.

Day 2 - Goal: You are testing your own foods. You will be testing 5 different foods, one of which will be an unknown. Be sure to mash your food into a paste before testing.

Step 1: Test for starch, protein, and fat.

- a) Get a spot plate and go the buffet table to get 3 samples of each food.
- b) Test each sample for starch, protein, and fat.
- c) Record results.

Step 2: While waiting for the fat test to dry, conduct the sugar tests on all samples and record results.

Step 3: CLEAN UP!!!!!! Return trays and wipe down lab table.