**Macromolecule Madness!!!**

**What are organic compounds?**

Almost all of the food we eat comes from plants and animals. Plants and animals contain mainly water and organic compounds, like CARBON! The table below lists the most common types of organic compounds found in living organisms. For each **type** of organic compound, give one or two **examples** and describe one **characteristic**, e.g. whether it is greasy, whether it contains genetic material, whether this type of organic compound is found in meat or in pretzels and potatoes.

|  |  |  |
| --- | --- | --- |
| **Type of Organic Compound** | **Examples** | **Characteristics of food that contain this type of Organic Compound** |
| Carbohydrates |  |  |
| Lipids |  |  |
| Proteins |  |  |
| Nucleic Acids |  |  |

Over the next few days, you will be testing different foods to determine what macromolecules are present in the foods you eat. For testing proteins and carbohydrates, you will use chemical indicators. For lipids, a smear test will be done to test for the presence of fats and/or oils.

**What are indicators?**

An indicator is a substance that changes color in the presence of a particular type of molecule. Over the next three days, you will learn how to use several indicators to test for the presence of proteins and carbohydrates. You will use a different type of test for lipids, which does not require a color-changing indicator. You will use these tests to analyze several types of food.

**Day 1:** **Lipid Testing**

In your group, choose six of the ten available samples. Try to choose some samples that you think will test positive for lipids, but you can choose some that you think will test negative. Place your six samples in the small cups labeled 1 through 6. On the table below, write the name of the sample next to the appropriate number. Then, make your predictions for what will test positive for lipids.

Cut open your brown bag and divide up the paper into six equal sections. Label the sections 1 through 6 and label with the appropriate food sample.

With six different cotton swabs, smear/smash your sample in the correct numbered section on your piece of brown paper. Let your brown paper dry for at least 10 minutes. On the table below, write the name of the sample next to the appropriate number.

Directions for Lipid Testing are located at the testing station!

**YOU MUST WEAR GOGGLES FOR THIS LAB!**

|  |  |  |
| --- | --- | --- |
| **Sample**  Write in the food samples that your group chose. | **Prediction**  Do you think it contains lipids? Write yes or no. | **Result**  Does it actually contain lipids? Use a ✔ for yes and an ✗ for no |
| 1. |  |  |
| 2. |  |  |
| 3. |  |  |
| 4. |  |  |
| 5. |  |  |
| 6. Our Control: |  |  |

**Results:**

1. Compare your predictions to the results you found for lipid sample. Were your predictions correct? Justify your reasoning for your prediction and explain why it differed from the result.
2. Of the items your group tested, which contained lipids? Which items did not contain lipids?
3. What is the monomer of a lipid? Explain and draw the monomer.
4. Compare saturated and unsaturated fats.
5. Explain the role of cholesterol in your cells.
6. Is cholesterol inherited or caused by diet? Explain why.
7. What two atoms are present in fatty acid chains?

**Day 2: Carbohydrate Testing**

**Part 1:** Observe and test for the presence of **STARCH**

Directions for Carbohydrate Testing are located at the testing station!

**YOU MUST WEAR GOGGLES FOR THIS LAB!**

|  |  |  |
| --- | --- | --- |
| **Sample**  Write in the food samples that your group chose. | **Prediction**  Do you think it contains starch? Write yes or no. | **Result**  Does it actually contain Starch? Use a ✔ for yes and an ✗ for no |
| 1. |  |  |
| 2. |  |  |
| 3. |  |  |
| 4. |  |  |
| 5. |  |  |
| 6. Our Control: |  |  |

**Part Two:** To observe and test for the presence of **GLUCOSE**

|  |  |  |
| --- | --- | --- |
| **Sample**  Write in the food samples that your group chose. | **Prediction**  Do you think it contains glucose? Write yes or no. | **Result**  Does it actually contain Glucose? Use a ✔ for yes and an ✗ for no |
| 1. |  |  |
| 2. |  |  |
| 3. |  |  |
| 4. |  |  |
| 5. |  |  |
| 6. Our Control: |  |  |

**Results:**

1. Of the items tested, which contained starch? Which contained glucose?
2. Were your predictions correct? Why or why not?
3. What is the monomer of carbohydrates?
4. Starch is which kind of carbohydrate?
5. Glucose is which kind of carbohydrate?
6. What kinds of organisms produce starch?
7. What complex carbohydrate do animals produce?
8. What are the similarities and differences between glucose and starch?
9. What effect did chewing the saltine cracker have on the results of the lab? Why did chewing up the cracker make a difference?

**Day 3: Protein Testing**

In your group, choose six of the ten available samples. Be sure to choose an appropriate control (water!). Try to choose some samples that you think will test positive for protein, but you can choose some that you think will test negative. Place your six samples in the small cups labeled 1 through 6. On the table below, write the name of the sample next to the appropriate number.

With your groups, predict what you think will happen. Mark your predictions in the table below. When you are ready, start the test and record your results.

Directions for Protein Testing are located at the testing station!

**YOU MUST WEAR GOGGLES FOR THIS LAB!**

**THE LAB MEMBER HANDLING THE BIURET SOLUTION SHOULD** *ALSO* **WEAR GLOVES!!!**

*CAUTION: Biuret reagent contains sodium hydroxide, a strong base. Be very careful not to splash or spill any. If you splash any reagent on yourself, wash it off immediately with water. Call Ms. Monroe for assistance.*

|  |  |  |
| --- | --- | --- |
| **Sample**  Write in the food samples that your group chose. | **Prediction**  Do you think it contains protein? Write yes or no. | **Result**  Does it actually contain protein? Use a ✔ for yes and an ✗ for no |
| 1. |  |  |
| 2. |  |  |
| 3. |  |  |
| 4. |  |  |
| 5. |  |  |
| 6. Our Control: |  |  |

**Results:**

1. Of the items tested, which contained protein? Which did not?
2. Were your predictions correct? Why or why not?
3. What is the chemical element that makes proteins *unique*?
4. What is the monomer of a protein? What makes each monomer unique? DRAW a protein monomer.
5. How are protein monomers attached to each other? What type of bond connects the monomers—ionic or covalent?
6. If you change a protein’s structure, you change its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
7. Explain the role of enzymes in the body. What is another name for an enzyme?
8. List 4 foods (other than those tested) that contain protein.

**Who took Carrie’s iPod?—*A Macromolecule Mystery***

Carrie is a 10th grade student at DSA who works at McDonald’s on the weekends. While on break, Carrie was studying for her biology test and listening to her new iPod. There were four other workers taking a break at the same time, each having something *different* for lunch.

Carrie’s boyfriend stopped by near the end of her break, and she rushed out to see him and forgot her iPod and biology book in the break room. When she realized, she hurried back and found only her biology book and some food crumbs. Her iPod was gone!

First Carrie FREAKED out, but she calmed down when she realized she could use her knowledge of organic compounds to figure out which of her coworkers left the crumbs on her textbook and who took her iPod.

**Procedure:**

Using the methods that you have been practicing in the past few days, you will test the UNKNOWN crumb sample collected at the crime scene. Each group will test for a different organic compound: carbohydrates (starch and glucose), protein, or lipid. Using the data that the class collects, we will compare our data for the unknown crumb sample to the samples of employees’ lunches collected at the crime scene.

The employee whose lunch ingredients match the data for the unknown crumbs is the culprit!

✔ = Substance is present

✗= Substance is *not* present

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Suspects** | **Starch** | **Glucose** | **Protein** | **Lipid** |
| UNKNOWN |  |  |  |  |
| Scott |  |  |  |  |
| Lydian |  |  |  |  |
| Thomas |  |  |  |  |
| Christine |  |  |  |  |