**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Biological Indicators and Macromolecules**

**Purpose**

In this exercise you will investigate biological indicators used to detect the presence of organic macromolecules: simple carbohydrates (sugar); complex carbohydrates (starch); proteins or lipids. The objectives of the lab are to determine:

**1. Which organic macromolecule is detected by which biological indicator listed below**:

a. Benedict’s reagent

b. Biuret reagent

c. Iodine/Lugol’s solution (I2KI)

d. Brown paper bag

**2. What constitutes a positive reaction for each indicator** (i.e. what do you visibly see when the indicator is added to the organic)

**3. What organic macromolecule(s) is(are) in some common household foods**

Figure 1. Test substances and its biomolecules

|  |  |
| --- | --- |
| **Test Substance** | **Biomolecule Present** |
| Albumin | Protein |
| Dextrose | Simple carbohydrates |
| Corn starch | Complex carbohydrates |
| Coconut oil | Lipid |
| Distilled water | None |

**Question**

**What is the purpose of the distilled water as a test substance?**

**Explain.**

**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Table I: Indicator Lab: Results/Observations**

Record the initial color of the substances (i.e., water, albumin, starch, dextrose, oil), followed by the final color AFTER you add the bioindicator. You do not need to use complete sentences. Be succinct.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Benedict’s** | **Biuret** | **Iodine** | **Paper bag** |
| **Distilled water**  **(control)** | *Example:*  *Initial color of water = clear*  *Final color after heat (with indicator)= blue* |  |  |  |
| **Albumin**  **(protein)** |  |  |  |  |
| **Dextrose**  **(simple carb)** |  |  |  |  |
| **Soluble Starch**  **(complex carb)** |  |  |  |  |
| **Coconut Oil**  **(lipid)** |  |  |  |  |

**Table II: Indicator Lab - Indicator test Summary**

Use your results/observations to determine which molecules are detected by each indicator. For the positive test description, write the physical change that occurred.

|  |  |  |
| --- | --- | --- |
| **Indicator** | **Molecule Detected** | **Positive Test Description** |
| **Benedict’s Reagent** |  |  |
| **Biuret’s Reagent** |  |  |
| **Iodine** |  |  |
| **Paper Bag** |  |  |

**Table 3: Testing For Biomolecules In Our Food**

In this portion of the lab, you will hypothesize and test for biomolecules present in your food. Begin by hypothesizing what macromolecules (carbohydrates, lipids, and/ or proteins) may be found in the food sample assigned to you. If you think there may be more than one biomolecule in your sample, explain which is present in a greater quantity. Consider what you may see for each bioindicator if your hypothesized biomolecule is present. When you’re done, follow your teacher’s instructions to complete the latter part of the chart.

**My Food Sample:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Simple Carbs**  **(Benedict’s)** | **Complex Carbs**  **(Iodine)** | **Protein**  **(Biuret’s)** | **Lipids**  **(Bag)** |
| **Hypothesis** |  |  |  |  |
| **Observation** |  |  |  |  |

**Summary Questions for Detecting Macromolecules in Foods**

1.) Based on your observations, which foods are good sources of

a.) complex sugars?

b.) protein?

c.) simple sugar?

2.) Name another food you would hypothesize to be a good source of

a.) complex sugars?

b.) protein?

c.) simple sugar?

3.) Why is it important that milk has a complete complement of macromolecules?

4.) Why do you need to eat a varied diet?

5.) For what other substances might you test to get a more complete picture of the nutrient content of foods?

6.)In a test similar to today’s experiment the following data were collected

Food Tested Results of Benedict’s Results of Iodine

Onion bright orange yellow/amber

Potato blue/green black/deep purple

What do these results tell us about the food storage molecules of these two plant structures?