**DESIGN YOUR OWN LAB: Nutrients and their Indicators**

**Purpose:** To design a lab that to identify the presence of major nutrients such as simple carbohydrates (glucose), complex carbohydrates (starch), protein and fat in common foods.

**Background Information:**

*Indicators* are chemical compounds used to detect the presence of other compounds, usually by a color change. Below is a chart of indicators that can be used to indicate presence of specific nutrients.

|  |  |  |  |
| --- | --- | --- | --- |
| **Indicator** | **Nutrient** | **Negative** | **Positive** |
| Benedict’s solution | Simple carbohydrates (sugars) | Blue | Yellow, orange, red |
| Iodine solution | Complex carbohydrates  (starch) | Yellow | Blue, black |
| Biuret solution | protein | Light Blue | Pink, purple |
| Sudan IV solution | Fat | Translucent red | Opaque red |

**Scenario: Who stole your airpods?**

You took a break from your studies to go shoot some hoops. When you came back your airpods were gone! Left behind on your desk were some bits of the thief’s lunch. You remember there were only four people in the room when you left and this is what they were eating:

|  |  |
| --- | --- |
| **Student** | **Lunch/Snack** |
| Jose | Bean burrito with cheese |
| Ashley | Fat-Free Yogurt |
| Bruce | Peanut butter and jelly sandwich |
| Kiara | Pretzel |

**DESIGN A LAB** outlining how you would discover who the culprit is by using your knowledge of nutrient content in various foods and the indicators used to detect them to analyze the leftover lunch bits on your desk.

**What to do:**

1. Write a VERY **BRIEF** procedure to guide me through how you will test the food items. Assume each food item can be made into a solution and only a drop of each indicator is needed for easy testing.
2. **CREATE A CHART** of each food item to be tested with each indicator.
3. Using your knowledge of nutrient content in various foods, **PREDICT** what nutrient(s) you would expect to find in each food sample by **COMPLETING** your chart. How will you indicate positive results? How will you know what a negative result looks like? Be aware that most foods contain more than one type of nutrient.
4. Indicate that the results of the mystery lunch showed red with the Benedict’s solution, yellow for Iodine, purple with the Biuret solution, and translucent red for Sudan IV.
5. Your lab should be in the **correct format**, with a **title**, **proper headings**, completed (predicted) table of **results**, **answers** to the Analysis questions, and a **conclusion** indicating who the culprit was using CER.

**Analysis Questions**

1. Explain why you think some tests would show very weak responses whereas some were very strong reactions.
2. Some foods taste sweet, but have very little glucose. What is one possible explanation?
3. Suggest a legitimate snack that would show positive results for all tests.

Extra:

1. Our bodies are made up of the same types of organic compounds as all other living organisms. Complete the following sentences by filling in each blank to indicate the function of each type of molecule in different parts of our body.
2. Our muscles contain lots of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ This enables the muscles to contract.
3. Glucose is carried by our blood to all the cells in our body. Our cells use the glucose for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. Lipids are found in fat cells in our bodies. The fat cells store fat molecules to be used for \_\_\_\_\_\_\_\_\_\_\_\_\_\_ if a person cannot get enough food.
5. Lipids are also a main component of our cell \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
6. Our bodies do not make starch, but we often eat plant foods which contain starch which we digest into \_\_\_\_\_\_\_\_\_\_\_\_\_, the building block that is used to make starch.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Food** | **Do you expect this food to contain** | | | |
| **Glucose?** | **Starch?** | **Protein?** | **Lipid?** |
| Pretzel |  |  |  |  |
| Potato chips |  |  |  |  |
| Peanut Butter |  |  |  |  |
| Jelly |  |  |  |  |
| Fat-free yogurt |  |  |  |  |
| Cheese |  |  |  |  |
| Beans |  |  |  |  |
| Bread |  |  |  |  |
| Tortilla |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Benedict’s solution Sugar | Iodine | Biuret solution | Sudan IV |
| Sugar |  |  |  |  |
| Starch |  |  |  |  |
| Protein |  |  |  |  |
| Fat |  |  |  |  |
| Mystery lunch |  |  |  |  |

Results:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Student** | **Lunch/Snack** | **Benedict** | **Iodine** | **Biuret** | **Sudan IV** |
| Thief | Food evidence | Blue | Blue | Purple | Opaque red |

In this activity results were given simply as either positive or negative. In real life, different foods contain different amounts of nutrients and may show a range of colours making it difficult to discern a positive result. For example, cream cheese and cottage cheese both have fat and protein, but cream cheese has much more fat than protein, whereas cottage cheese has much more protein than fat.