Food Explorations Lab I:
Sweet Saccharide

STUDENT LAB INVESTIGATIONS

Name: _____

Lab Overview

In this investigation, your group will test sugar solutions to determine their glucose content and to determine the solutions' identities. You will also calculate the calories contained in the sugar solutions and consider how a person's sugar intake can be reduced.

Lab Objectives

In this lab, you will learn how to…

1. Determine the glucose concentration of unknown sugar solutions.
2. Determine the identity of three unknown liquid substances based on their glucose concentration.
3. Identify foods containing glucose, fructose, and sucrose.
4. Calculate calories in food due to simple sugars.
5. Describe how a diet can be modified to reduce sugar intake.

Lab Safety: Before beginning ANY investigation you should put on your safety goggles and apron. It is important to avoid getting chemicals on your hands. Always wash your hands following completion of an investigation. When handling food, you should also wash your hands prior to beginning an investigation.

Lab Question

Which of the following substances do you think will have the greatest concentration of glucose? (Circle your answer.)

Apple Juice Grape Juice Table Sugar/Water Solution

Predictions: I predict _____ will have the greatest concentration of glucose because…

Will the glucose concentration be high or low in each liquid solution? Provide an explanation for your response. (Circle your answer.)

APPLE JUICE:

HIGH **LOW**

There is glucose present in the juice.

GRAPE JUICE:

HIGH **LOW**

There is glucose present in the juice.

SUGAR CANE (SUGAR WATER):

HIGH **LOW**

Glucose is not present in sucrose, which is the sugar used in this solution.

Observation of Unknown Samples

MATERIALS

4-8 Glucose Test Strips
Unknown Sample A
Unknown Sample B
Unknown Sample C
Control (water)
Stopwatch or kitchen timer
Glucose Color Chart
Paper towels or napkins
safety goggles
aprons (optional)

PROCEDURE

1. Obtain your 3 unknown samples from your teacher and the control (water).

2. Observe each sample. Record observations in Table A under the column labeled "Liquid Appearance."

3. Start with the control. Measure the glucose concentration of the control by dipping 1 glucose strip into the cup. After dipping, blot each side of the strip on a paper towel or napkin to remove the excess fluid. Not removing the extra fluid from your strip through blotting can result in an incorrect measurement.

4. Wait 30 seconds for the color of the strip to develop; then compare the color of the strip to the *Glucose Reference Color Chart*. Be sure to read your test strip at **exactly** 30 seconds. Record your answer in Table A under the column labeled "Test Strip Color at 30 Seconds."

5. One at a time, repeat steps 3-4 with all three unknown samples. Be sure to use a new strip each time, wait exactly 30 seconds, and record your data in Table A under the column labeled "Test Strip Color at 30 Seconds."

Table A: Unknown Sample Observations and Glucose Testing

	Liquid Appearance	Test Strip Color at 30 Seconds
Control (Water)	Clear, no color	Negative (Teal)
Sample A	Yellow, clear	Positive (Light brown)
Sample B	Yellow, clear	Positive (Dark brown)
Sample C	Yellow, clear	Negative (Teal)

Conclusion:

1. Using the *Glucose Reference Color Chart* provided, record the glucose concentration for each of your samples in Table B.

TABLE B: Glucose Concentrations and Substance Identification

	Glucose Concentration (At 30 seconds)	Identity of Substance	Explanation
Control	0mmoL/L	Water	Water does not contain glucose.
Sample A	30mmoL/L	Apple	Apple has a lower glucose concentration compared to grape juice.
Sample B	60mmoL/L	Grape	Grape juice has a higher glucose concentration.
Sample C	0mmoL/L	Sugar Water	Sugar is composed of sucrose. Sucrase would be needed to breakdown sucrose before glucose could be detected.

2. Using the data presented in Table C, calculate the % glucose for each food item.

Food Item	Total Sugar	Free Fructose	Free Glucose	Sucrose	% Glucose
Example Juice	18g	7g	3g	1g	16.7%

$$\frac{\text{3g Free Glucose}}{\text{18g Total Sugar}} = 0.167$$

0.167 x 100 = 16.7% glucose

Table C: Calculating % Glucose in Food Items

Food Item	Total Sugar	Free Fructose	Free Glucose	Sucrose	% Glucose
Apple Juice	10g	6g	2g	2g	20%
Grape Juice	15g	8g	7g	0g	46.7%
Sugar Water	16g	1g	1g	14g	6.25%

Apple:

$$\frac{\text{2g Free Glucose}}{\text{10g Total Sugar}} = 0.20$$

$$0.20 \times 100 = 20\%$$

Grape:

$$\frac{\text{7g Free Glucose}}{\text{15g Total Sugar}} = 0.4667$$

$$0.4667 \times 100 = 46.7\%$$

Table Sugar Water:

$$\frac{\text{1g Free Glucose}}{\text{16g Total Sugar}} = 0.0625$$

$$0.0625 \times 100 = 6.25\%$$

3. Compare and contrast your results in Tables A and B to your original responses to the lab question. Describe similarities and differences.

Answers will vary based on responses in Table A and B.

4. Complete Table B on page 210. The sugar solutions used in this investigation were grape juice, apple juice, and sugar water. Match the sugar solution to each unknown and provide an explanation to support your answer.

5. The table sugar water and grape juice solutions have similar sugar concentrations, but the glucose concentrations were different. Explain why this is possible.

The sugar water solution only contained sucrose, which is composed of linked glucose and fructose. Grape juice contained fructose and glucose separated, so the glucose indicator strip could detect the glucose.

6. What types of foods are naturally high in fructose? Glucose? Sucrose?

Fructose: Honey and most fruit

Glucose: Whole grain products, legumes, potatoes, dairy, vegetables, and grapes

Sucrose: Dates, sugar beets, sweet peas, and dried fruit

7. Fructose, glucose, and sucrose are types of carbohydrates in the diet that can provide energy for the body in the form of calories. Calculate how many calories from total sugar each beverage contains. (HINT: To find total calories multiply Total Sugar in Table C by 4 grams/calorie.)

   Apple: 10g Total Sugar x 4cal = 40 calories

   Grape: 15g Total Sugar x 4cal = 60 calories

   Table Sugar Water: 16g Total Sugar x 4cal = 64 calories

8. Based on the reading "Sugar Solutions", what does the body do with sugar that is consumed but not needed for the body's current energy needs?

   The sugar is converted to fat for storage.

9. Identify two sources of added sugar you regularly eat or drink. Name one way you can decrease your intake of extra sugar.

   Sports drink – zero calorie option

   Regular soda – water or diet soda