Name_____ Period_____ Date_____

Ms. Randall A & P
Lab activity: Murder and a Meal (*Adapted from a lesson developed by Camron J. Stanley 2008*)

Background: A murder has occurred in Mastic Beach, NY. As top-notch students at William Floyd High School you have been asked to assist in the investigation of this most unfortunate incident. Central to identifying the individual who committed this crime is establishing where the victim was the day of the crime so that detectives can question the individuals with whom the victim came into contact. An autopsy performed on the victim has revealed that the victim ate just prior to the time of death. Upon questioning the victim's friends and family, detectives working the case have learned that the victim enjoyed eating at the following places:

Domino's Pizza
- The victim would never eat thin crust pizza from anywhere else! The victim would typically order a Meat lovers pizza with extra sausage and pepperoni.

RG Wings
- The victim would hang out here to watch sporting events while feasting on Blazing Wings and celery.

Mama Lisa's Restaurant
- The victim loved to go here for a night of bread, olive oil, and pasta.

Objectives

- Categorize food items from a menu as protein, lipid, or carbohydrate (sugar, starch)
- Perform lab tests to test for presence of macromolecules
- Utilize lab results to deduce macromolecules present in stomach contents, therefore, determine which restaurant a murder victim ate their last meal.

CLAIM-EVIDENCE-REASONING (RUBRIC)

	Accomplished (3)	Proficient (2)	Developing (1)
CLAIM	Makes an accurate and complete claim, uses complete and grammatically correct sentences	Makes an accurate, but incomplete claim, or grammatically incorrect	Claim is not accurate, incomplete, or unintelligible
EVIDENCE	Provides appropriate and sufficient evidence to support claim by referencing specific data, observations, or text evidence (for readings)	Provides appropriate data but insufficient data, too general or lacking in details	Provides evidence but it is insufficient, inaccurate, no details
REASONING	Provides thorough reasoning that links evidence to the claim, references scientific principles that are relevant to claim	Provides reasoning that links evidence to the claim, lacks scientific principles	Does not provide reasoining, or reasoning does not link evidence.

Procedure:

The forensic pathologist has removed the contents of the victim's stomach for you to analyze in order to determine where the victim had his last meal.

1. Before chemically analyzing the stomach contents of the deceased, you must review the procedure to be used to test for each organic macromolecule (proteins, carbohydrates, lipids).
2. Make a prediction of which meal you believe was eaten prior to the victim's death based on visual examination of the stomach contents.
3. Using the information given determine the contents of the victim's stomach.

I predict that:

_____

_____

Use the following table to record your results.

Table 1. Controls

Macromolecule	Chemical Test	Positive Test Result	Negative Test Result
Lipids			
Proteins			
Carbohydrates— Glucose			
Carbohydrates— Starch			

Table 2. Stomach contents

Test for Lipids	Test for Proteins	Test for Glucose	Test for Starch
Observations:	Observations:	Observations:	Observations:
Present? _____	Present? _____	Present? _____	Present? _____
Not Present? _____	Not Present? _____	Not Present? _____	Not Present? _____

Analysis: What was the victim's last meal?

CLAIM:

EVIDENCE:

REASONING:

Claim (accurate, complete, grammar) __3__2__1
Evidence (appropriate, sufficient, data) __3__2__1
Reasoning (links to claim and sci. principles) 3__2__1

Lipid Test-Sudan III stain

Sudan III is used to identify the presence of lipids in liquids. It will stain fat cells red.

1. Place three test tubes in a test tube rack and label them control (distilled water), lipid (distilled water + oil), unknown (stomach contents).
2. To the first test tube, add 2 ml of distilled water.
3. To the second test tube, add 1 ml of distilled water and 1 ml of vegetable oil.
4. To the third test tube, add 1 ml of stomach contents and 1 ml of distilled water.
5. Add 3 drops of Sudan III stain to each test tube. Shake gently to mix.
6. A red-stained oil layer will separate out and float on the water surface if fat is present.

Protein Test-Biuret solution

Biuret solution is used to identify the presence of protein. Biuret reagent is a blue solution that, when it reacts with protein, will change color to pink-purple.

1. Place three test tubes in a test tube rack and label them control (distilled water), protein (albumin), unknown (stomach contents).
2. To the first test tube, add 2 ml of distilled water.
3. To the second test tube, add 2 ml of albumin.
4. To the third test tube, add 2 ml of stomach contents.
5. Add 3 drops of Biuret reagent solution to the test tube. Shake gently to mix.
6. Note any color change. Proteins will turn solution pink or purple.

Sugar test-Benedict's solution

Benedict's solution is used to test for simple sugars, such as glucose. It is a clear blue solution of sodium and copper salts. In the presence of simple sugars, the blue solution changes color to green, yellow, and brick-red, depending on the amount of sugar.

1. Place four test tubes in a test tube rack and label them control (distilled water), sugar (glucose), unknown (stomach contents).

2. To the first test tube, add 2 ml of distilled water.

3. To the second test tube, add 2 ml of glucose solution.

4. To the third test tube, add 2 ml of stomach contents.

5. Add 10 drops of Benedict's solution to the test tube. Carefully heat the test tubes by suspending in a hot water bath at about 75-80 degrees Celsius for five minutes.

6. Note any color change. If sugar is present, the solution will turn green, yellow, or brick-red, depending on sugar concentration.

Starch test - Lugol's iodine

Lugol's iodine is used to identify the presence of starch. The solution is yellow-brown, but when it reacts chemically with starch, a blue-black substance called iodide starch is produced. If the stomach contents test tube sample has a blue-black substance coloring the stomach contents will contain starch.

1. Place three test tubes in a test tube rack and label them control (distilled water), starch (starch), unknown (stomach contents).

2. To the first test tube, add 2 ml of distilled water.

3. To the second test tube, add 2 ml of starch solution.

4. To the third test tube, add 2 ml of stomach contents.

5. Add three (3) drops of Lugol's Iodine to each test tube sample. Agitate sample and mix thoroughly.

6. Observe any color change. If starch is present, a blue-black precipitate will form. Compare color of each sample. Darker blue-black represents more starch present. If the stomach contents test tube sample has a blue-black substance coloring the stomach contents will contain starch.