

The Vomit Lab

Introduction

The fundamental chemical components of cells can be grouped into four basic categories:

carbohydrates, proteins, lipids, and nucleic acids.

Several tests have been developed by biologists to determine the presence of different major chemical compounds found in cells. You will learn how to use these tests to test for the presence of the major chemicals of life in various unknown samples.

Key Vocabulary

Carbohydrate	Protein	Lipid	Nucleic acid	Organic
Monosaccharide	Amino acid	Fatty acid	Nucleotide	Monomer
Energy	Starch	Cellulose	Glucose	Sucrose
Polysaccharide	Polymer	Benedict's soln.	Iodine test	Amino Acid
Enzymes	Biuret test	Macromolecule	Fatty acid	Sudan III test
DNA	RNA	Nucleotide	Diphenylamine	Qualitative
Observation	Inference			

Background

Patients "John Doe" and "Jane Doe" arrived at the VCU Medical Center Emergency Room at 10:00pm on Tuesday, September 13, 2016, complaining of stomach cramps, nausea, and diarrhea. Both their stomachs were pumped and the contents were saved for testing. Doctors believe food poisoning was to blame because both patients claimed to have eat at Taco Bell earlier that day, but neither has been able to remember specifically what he/she ate. Doctors would like to test for whether they ate the same or different menu items from the restaurant.

General Purpose – Did John and Jane eat the same type of food that caused their illnesses, or did they eat different foods?

Specific Purpose – Each group will test for the presence of a specific organic macromolecule in each sample.

Your group will be responsible for testing for _____

Possible Tests

Simple Carbohydrates (monosaccharides) – Benedict's Solution

- Carbohydrates act as an immediate **energy** source for cells. Simple sugars are called called **monosaccharides (glucose, sucrose)**.
- **Benedict's solution** changes from blue to green to yellow-orange-red in the presence of simple sugars.

Complex Carbohydrates (polysaccharides) – Iodine

- Carbohydrates such as **starch** and **cellulose** are abundant in plants and commonly found in potatoes, beans, and grains. These are **polysaccharides** - long chains of simple sugars.
- **Iodine** turns dark blue in the presence of starch and cellulose.

Proteins – Biuret Test

- Proteins are long chains (**polymers**) of **amino acids** that have folded into 3D shapes. They act as **enzymes**, structural fibers, or transport proteins in all living things.
- Good sources of food protein include eggs, milk, and meat.
- **The biuret test** solution will turn from a light blue to purple if proteins are present.

Lipids – Sudan III Test

- Lipids, which include fats and oils contain more energy per molecule than other **macromolecules** because they have so many chemical bonds in their **fatty acid** monomers. Unlike the other organic macromolecules, they do not dissolve in water easily.
- When **Sudan III** is mixed vigorously with a substance, two layers will form in the presence of lipids. The top layer containing the lipid will be a pale pink-orange color.

Nucleic Acid – Diphenylamine

- All living things contain nucleic acids – **DNA** and/or **RNA**. The **nucleotides** from nucleic acids digested from fresh food are reused in the body to form new molecules or repair old ones.
- **Diphenylamine** will turn purple in color if DNA is present and green if RNA is present.

Summary Chart – Complete using the information above.

Test Name	Macromolecule	Positive Color/Appearance

Name _____ Period _____ Date _____

Vomit Lab Experiment

FORMING A QUESTION AND A HYPOTHESIS

You will begin the inquiry process by writing a question to be tested and a hypothesis that answers your question.

Question:

Hypothesis:

Why do you believe your hypothesis is true? What scientific evidence can you give to support your hypothesis? Make sure you include information about both the independent and dependent variable.

- **Personal Experiences: (life experiences that tell why you think your hypothesis is true)**

- **Scientific Concepts:**

DESIGNING AN INVESTIGATION

Materials:

- Indicator being used: _____
- Other possible materials:

General Plan:

Make a general plan for collecting the data you need. (hint: Think about the activities you simulated in the Gizmo)

- What will you do, and what change will you be looking for in a “positive” result?

- How will you *know* that a slight color change is a “positive” result and shouldn’t be ignored?

Vomit Lab Experiment

- Identifying **Constants**

What factors will be kept the same in both the control and experimental group?

- Identifying **Variables**

List the independent and dependent variables

- Independent variable:
- Dependent variable:

PROCEDURE

Make a detailed list of steps you expect to follow to test the sample for your assigned macromolecule.

COLLECTING AND PRESENTING DATA

Make a data table for your investigation in the space below. Be sure to:

- Make sure your table is **labeled correctly**, and
- Give your table a **title that includes both your independent and dependent variables.**

Data Table:

Observations:

As you collect data, write down observations (qualitative and/or quantitative) in the space below. Note anything unusual, especially any possible errors.