



Nature of Science

Name _____



Bubble Tube Questions

SAFETY: Use care handling the tubes; they will break!

Background Information: Frequently making observations about our world leads to **QUESTIONS**. The questions that scientists try to answer are called **RESEARCH QUESTIONS**. Research questions can be answered by doing some type of **INVESTIGATION**.

Investigations use different types of scientific methods or processes. Different kinds of questions need different kinds of scientific methods.

Some scientific investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve researching more information; some involve doing a fair test or experimenting; some involve discovery of new objects and phenomena; and some involve making models.

We can divide investigations into two general categories: *descriptive* or *qualitative* and *experimental* or *quantitative*.

- **Descriptive or qualitative** investigations include building models, inventing, dissecting, making observations and describing them, interviewing, collecting specimens among others. Although these are sometimes called experiments, they are not really experimental.
- **Experimental or quantitative** investigations involve the control or manipulation of **variables**. Variables are the parts of the experiment that can change, or vary.
 - **Independent variables** are those that can cause changes in other variables. This means it is the ONE thing that has been chosen to be changed or manipulated by the scientist. It is what the investigator is testing; the difference between groups.

- **Dependent variables** are those that change in response to the manipulation of another variable. It is the response that can be observed and measured.
- **Controlled variables** or **constants** are those that are kept the same or constant. They could be changed, but the scientist keeps them constant so that they will not interfere with the investigation.

Effect and **affect** are good words to use when writing a research question.

Effect is a noun; it refers to the outcome or result of an investigation.

Affect is a verb; it means to influence or act upon something.

Examples: What is the effect of different types of fertilizer on the growth of plants?

How do different types of fertilizer affect the growth of plants?

Materials:

Set of 3 tubes	Meter stick	Stopwatch
----------------	-------------	-----------

Procedure:

1. Work with your partner
2. Read the procedure carefully.
3. Pick one tube (it does not matter which one).
4. Move the tube so that the bubble inside tube moves up and down the tube.
5. Observe what happens.
6. Move the tube in different ways, at different speeds, or any other way you can to move the bubble.
7. Repeat with the other tubes.

A good descriptive research question identifies exactly what will be observed during the investigation.

A good experimental research question identifies exactly what will be tested and observed & measured during the investigation.

List at least three (3) questions you can ask about the movement of the bubble.

Classify each question as descriptive or experimental.

1. _____

2. _____

3. _____

Pick one of the experimental questions you asked, and identify the independent, dependent, and controlled variables.

Question:

Independent variable:

Dependent variable:

Controlled variables:
