



Name _____

Scientific Cents Asking Questions & Hypotheses

Background Information: Scientists ask questions and then try to answer them using a scientific method. Different kinds of questions need different kinds of scientific investigations. Some 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. When a scientific investigation is used to try to answer a question, the question is called a **RESEARCH QUESTION**.

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?

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.

Given this information:

You have been given a penny and three different liquids: plain water, a mixture of three parts water to one part liquid soap, and a mixture of one part water to one part soap. If you use an eyedropper you can drop each liquid on the penny, one drop at a time, and the liquid will stay on the penny.

Write a research question: Use the above information to write a question using the word effect or affect.

More Background Information: Sometimes scientists use a **HYPOTHESIS** to help guide an experimental investigation. A hypothesis is a special kind of **PREDICTION**. It is an educated guess about the relationship between the independent and dependent variable. A hypothesis is testable; an experimental investigation can be done based on the hypothesis.

One way to write a hypothesis is to use an “If..., Then....” statement. An If, Then statement shows cause and effect.

In other words, what **effect** does the independent variable have on the dependent variable? Or what does the independent variable **cause** the dependent variable to do?

Write an If, ...Then... hypothesis using this format:

IF the independent variable changes, ***THEN*** the dependent variable will change.

Of course, in a real hypothesis, you will state the actual variables and describe the type of changes you expect.

Write a hypothesis for this research question: “Does *the amount of soap mixed with water affect how well the water will stay on a penny?*” Use an If, Then statement.

If _____

then _____