# bs00590_Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_ Block \_\_\_\_\_\_

# Drops on a Penny

***Experimental*** investigations involve the manipulation of variables. Variables are the parts of the experiment that can change. **Independent variables** arethe 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 things that are observed or measured. **Controlled variables** are those things that are kept the same. They could be changed, but the scientist keeps them the same so that they will not interfere with the investigation.

**Problem:** “Does *the amount of soap mixed with water affect how well the water will stay on a penny*?”

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 “When… Then….” Statement.. A When, Then statement shows cause and effect. Alternatively, what does the independent variable **cause** the dependent variable to do? Write a When, Then… hypothesis using this format: ***When*** *I change**the independent variable* ***THEN*** *the dependent variable will change.*

In this experiment, what will you change? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

That is your **independent** **variable**.

In this experiment, what will you measure? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

This is your **dependent variable**.

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

When\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,then\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part A: Perform a CONTROL test for comparison with later results.**

**Perform tests with the TESTING LIQUID A**

**Liquid A is our control group. It is 100% Water.**

1. Rinse a penny in tap water and dry completely.
2. Place the penny on paper towel.
3. Use an eyedropper to place drops of WATER on the penny (one at a time) until ANY amount of water runs over the edge of the penny.
4. Record the number of drops for that trial in the table.
5. Repeat Steps 1-4 four more times, and then calculate the mean (average).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** | **Trial 5** | **Average (Mean)** |
|  |  |  |  |  |  |

**Part B: Perform tests with the TESTING LIQUID B.**

**Testing Liquid B is 75% Water & 25% Soap**

1. Rinse a penny in tap water and dry completely.
2. Place the penny on paper towel.
3. Use an eyedropper to place drops of TESTING LIQUID B on the penny (one at a time) until ANY amount of water runs over the edge of the penny.
4. Record the number of drops for that trial in the table.
5. Repeat Steps 1-4 four more times, and then calculate the mean (average).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** | **Trial 5** | **Average (Mean)** |
|  |  |  |  |  |  |

**Part C: Perform tests with the TESTING LIQUID C.**

**Testing Liquid C is 50% Water & 50% Soap**

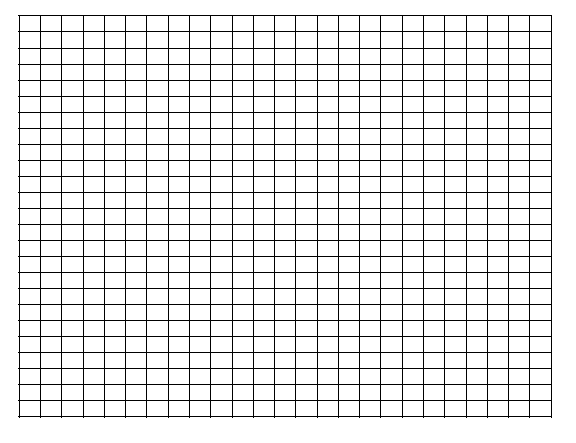
1. Rinse a penny in tap water and dry completely.
2. Place the penny on paper towel.
3. Use an eyedropper to place drops of TESTING LIQUID C on the penny (one at a time) until ANY amount of water runs over the edge of the penny.
4. Record the number of drops for that trial in the table.
5. Repeat Steps 1-4 four more times, and then calculate the mean (average).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** | **Trial 5** | **Average (Mean)** |
|  |  |  |  |  |  |

# Data

Using the average of the three liquids, create a bar graph.

Title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



Look for **RELATIONSHIPS** - two variables are related if one of them changes whenever

the other one changes. There are two kinds of relationships:

**DIRECT RELATIONSHIP**: When one variable increases the other variable increases.

**INDIRECT RELATIONSHIP**: When one variable decreases the other variable increases.

What relationship(s) do you see?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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After the data has been analyzed, a **CONCLUSION** is written. A conclusion is a written answer to the question. Whatever conclusion is drawn it is **always, always** supported by actual data from the experiment. An answer without evidence is meaningless.

Write a conclusion for your experiment below. (Answer the questions in COMPLETE sentences.)

1. Write your question & hypothesis below.

2. Was your hypothesis (prediction) supported by the data or was it rejected by the data? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Use the data to explain why you said your hypothesis was supported or rejected.

My hypothesis was \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because the data showed that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. What happened during the lab that could have made your results unreliable (not dependable) and if you had to do the lab again, what would you do differently? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_