**Using Properties of Water to Introduce Students to Statistics**

**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Period: \_\_\_\_\_\_\_**

The **purpose** of this **lab** is to investigate the **property** of water such as cohesion and adhesion of **water**.

**Null Hypothesis:** \_\_\_\_*There will be no statistically significant difference between the number of drops of water, alcohol, or salt water that can be placed on a penny before it overflows.*\_\_\_\_

**Experimental Hypothesis**

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

**Method:**

1. Obtain a dry penny
2. Using a dropper, drop distilled or DI water onto a penny one drop at a time.
3. Count the drops
4. Record how many drops you were able to place on the penny before it overflowed. Record this number in the data table provided on the next page.
5. Dry the penny and repeat for a total of five trials.
6. **Predict** the number of drops of rubbing alcohol a penny will hold and **Justify** your prediction.

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7) Repeats steps 1-4 with the same penny (remember to dry it) but with rubbing alcohol.

8) **Predict** the number of drops of salt water a penny will hold and **Justify** your prediction.

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9) Repeats steps 1-4 with the same penny (remember to dry it) but with salt water.

10) **Predict** the number of drops of distilled water a penny will hold if dish soap has been spread on its surface and **Justify** your prediction.

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11) Using your finger, spread one small drop of soap on the surface of a penny.

12) Repeats steps 1-4 with the same penny (remember to apply the soapy water drop) and use distilled water for the drops.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | |  | | |  | | Table 1: Drops of a Fluid Contained on a Penny |
| **Trial** | **Distilled Water** | | **Alcohol** | | **Salt Water** | **Soapy Penny** | |
| **1** |  | |  | |  |  | |
| **2** |  | |  | |  |  | |
| **3** |  | |  | |  |  | |
| **4** |  | |  | |  |  | |
| **5** |  | |  | |  |  | |

**Question:** Does adding substances to distilled water change its properties and ability to stay on a penny?

**Claim:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Data Analysis (Use your Formula Sheet)**

Table 2: Quantitative Analysis of the Drop of Fluid Contained on a Penny

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Calculations** | **Distilled Water** | **Alcohol** | **Salt Water** | **Soapy Penny** |
| **Mean** |  |  |  |  |
| **Standard Deviation** |  |  |  |  |
| **Standard Error** |  |  |  |  |
| **Mean + 2 SEM** |  |  |  |  |
| **Mean – 2 SEM** |  |  |  |  |

**Data Analysis:** Decide on the type of graph to use and draw a graph for results of the lab with the means for each and with error bars (95% confidence intervals).

Create a graph (use lab notebook) and label the axes. Provide a title and write a proper description of the results.

**Reasoning** (aka “Why did you get the results you did?”): Include a discussion of the properties of water that apply here and make a MODEL (draw the molecules). Be sure to use your evidence in your discussion.