



Nature of Science

Name \_\_\_\_\_



## Bubble Tube Experimental Design

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

**Background Information:** One way to investigate an answer to a question is by doing an **EXPERIMENT**. A true experiment involves **VARIABLES**.

In an experiment, scientists ask a question [called a **RESEARCH QUESTION**] about how one variable [called the **INDEPENDENT VARIABLE**] will affect another variable [called the **DEPENDENT VARIABLE**.]

Some variables are held **CONSTANT** - they do not change during the experiment because the scientist controls them. These are called **CONTROLLED VARIABLES**.

Usually a **HYPOTHESIS** is made; this is an educated guess about how the independent variable will affect the dependent variable.

Then a **PROCEDURE** is developed to test the hypothesis.

The experiment must be **REPEATED SEVERAL TIMES** to be confident in the accuracy of the results.

The results [called **DATA**] of the experiment are recorded. A **TABLE** or **CHART** is used to collect the data.

Data is the **ANALYZED**, often with **GRAPHS** and **STATISTICS** to find possible relationships or patterns.

After the data is analyzed **CONCLUSIONS** can be drawn about the variables. The original question may be answered, although sometimes more research is needed to be certain of the answer.

A hypothesis is **NEVER** right or wrong; it is supported by the data or not supported by the data.

Given this **RESEARCH QUESTION**:

*Does the angle of the tube affect the time it takes the bubble to move from one end to another?*

Design an experimental investigation to help you answer the question. Use the graphic organizer to help plan what to do.

Remember to:

☺ Identify all variables - independent, dependent, controlled - and explain exactly HOW the variables will be changed and measured.

- Independent \_\_\_\_\_
- Dependent \_\_\_\_\_
- Controlled \_\_\_\_\_

☺ Put the steps of your experiment in the correct order.

Write each step of your experiment in order.

<b>Steps</b> (What needs to be done)	<b>Details</b> (Materials, how much, how often, when, time, temperature)
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

### Collecting Data:

Data gathered during an experimental investigation must be collected in some organized manner. A **DATA TABLE** or **DATA CHART** is usually used. The data table is frequently designed as part of the experimental design. **Charts** are lists of information; they may also be diagrams or pictures. **Tables** are numerical displays in columns and rows.

Quality tables and charts have a title. The title describes exactly what the data in the table or chart refers to.

Tables and charts include the variables and units of measurement. The units of measurement are put in parenthesis. They are always metric units.

The data table includes the **REDUCED DATA** - averages, percents, frequencies, range or other **MEASURES OF CENTRAL TENDENCY**.

The reduced is data is frequently **GRAPHED** so that **PATTERNS**, **TRENDS**, and **RELATIONSHIPS** can be seen.

Design a data table to record your observations: