

Name _____



Experimental Design with Bubble Tubes

Part 1 – Observations, Inferences, & Predictions

Purpose: To practice making observations, inferences, and predictions

Materials:

Meter stick	Stop watch	Set of three bubble tubes
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Procedure:

1. Work with your partner. Make sure you both understand what to do.
2. Make a data table/chart to record your observations
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. Record your qualitative and quantitative observations in your table.
8. Repeat with the other tubes.

Data:

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Examine the observations you made about the tubes. Classify each observation as a fact, an opinion, or an inference.

Facts	Opinions	Inferences

Make three predictions about the movement of the bubbles in the tubes.

1. _____

2. _____

3. _____

Part 2 – Developing Testable Questions

Purpose: To practice writing a testable, scientific question

Based on your observations, write three (3) testable, experimental questions you can ask about the movement of the bubbles in the tube.

Use effect or affect in the questions.

Identify the independent, dependent, and at least two (2) controlled variables for each question.

Question 1: _____

Independent variable: _____

Dependent variable: _____

Controlled variable 1: _____

Controlled variable 2: _____

Question 2: _____

Independent variable: _____

Dependent variable: _____

Controlled variable 1: _____

Controlled variable 2: _____

Question 3: _____

Independent variable: _____

Dependent variable: _____

Controlled variable 1: _____

Controlled variable 2: _____

Part 3 – Writing a Hypothesis

Purpose: To practice writing a hypothesis using an If, Then statement

Procedure:

1. Work with your partner. Make sure you both understand what to do.
2. Pick one (1) of the testable questions and write a hypothesis using an If,...Then... statement.
3. Be sure that the independent and dependent variables are identifiable in the statement.
4. Specify the types of changes you expect.

Question: _____
 _____?

Hypothesis: If _____
 Then _____.

Part 4 – Designing an Experiment

Purpose: To practice designing and writing a detailed, step-by-step procedure for testing a hypothesis

Materials:

Meter stick	Stop watch	Set of three bubble tubes
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Procedure:

1. Work with your partner. Make sure you both understand what to do.
2. Use the graphic organizer to plan your experiment.
3. Make sure to include:
 - a. exactly what you will change
 - b. exactly what you will observe and measure
 - c. exactly what you will control
 - d. how you will change the IV
 - e. how you will measure the DV
 - f. how you will control other variables
 - g. how you will measure
 - h. tools you will use
 - i. how many times you will repeat the procedure (# of trials)
 - j. what data you will collect
 - k. how long you will do something
 - l. any safety precautions you will take
4. You do not have to include:
 - a. “gather materials”
 - b. “make a chart”
 - c. “graph the data”
 - d. “write a conclusion”
5. Use the left side of the organizer to write IN ORDER the steps you will follow.
6. Use the right side of the organizer to note amounts, number of times, materials and supplies you will use.
7. You may have more or less than 10 steps

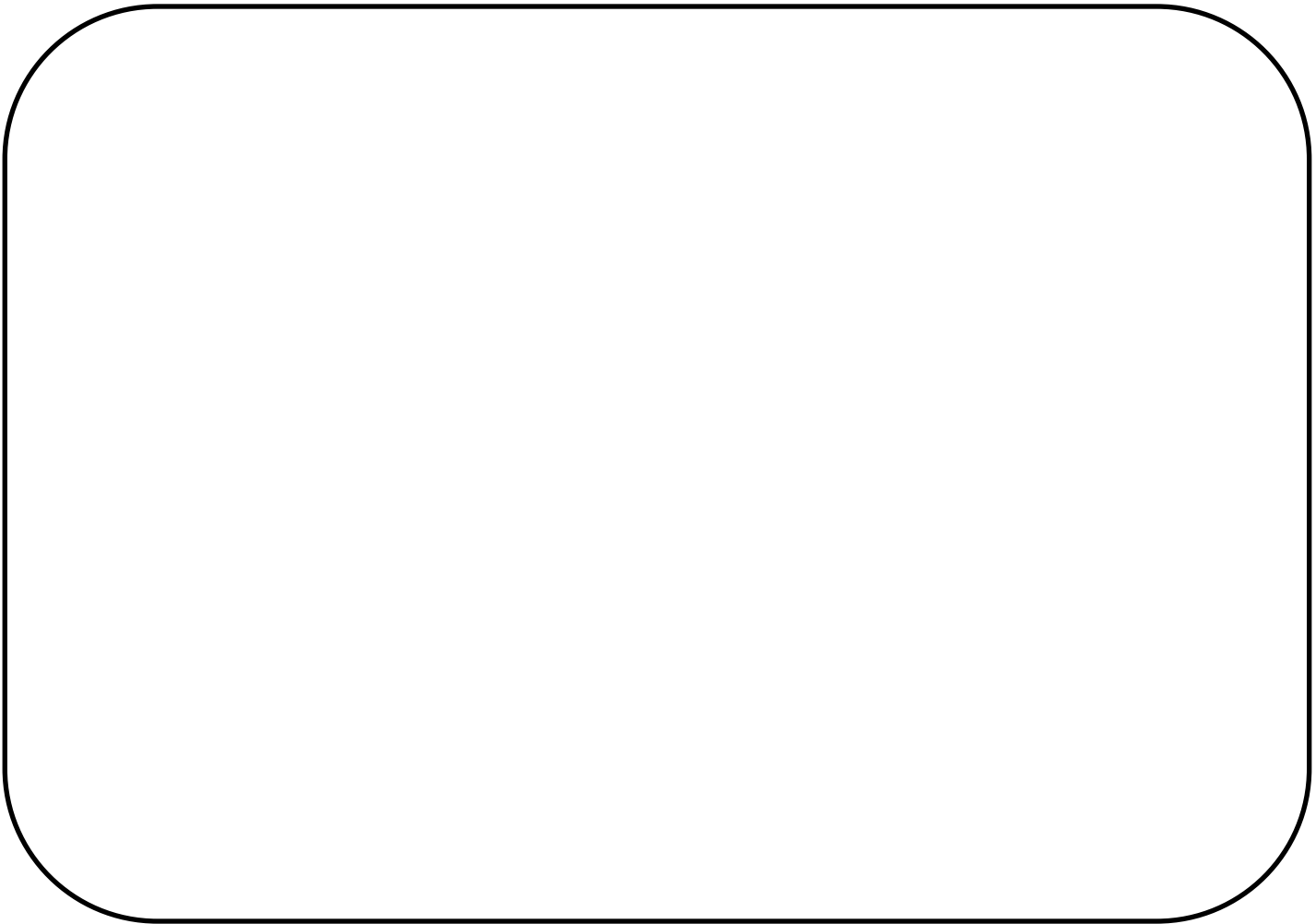
Steps	Why this included
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Part 5 – Collecting and Recording Data

Purpose: To practice creating tables and charts to collect observations and data in a systematic, organized fashion

Procedure:

1. Work with your partner. Make sure you both understand what to do.
2. Look back over your question, hypothesis & procedure.
3. Create a table or chart to collect and record your data.
4. Make sure you have a way to:
 - a. show the independent variable
 - b. show repeated trials
 - c. show measures of central tendency



Part 6 – Conducting an Investigation to Test a Hypothesis

Purpose: To practice implementing an experimental design to collect data

Materials:

Meter stick	Stop watch	Set of three bubble tubes
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Procedure:

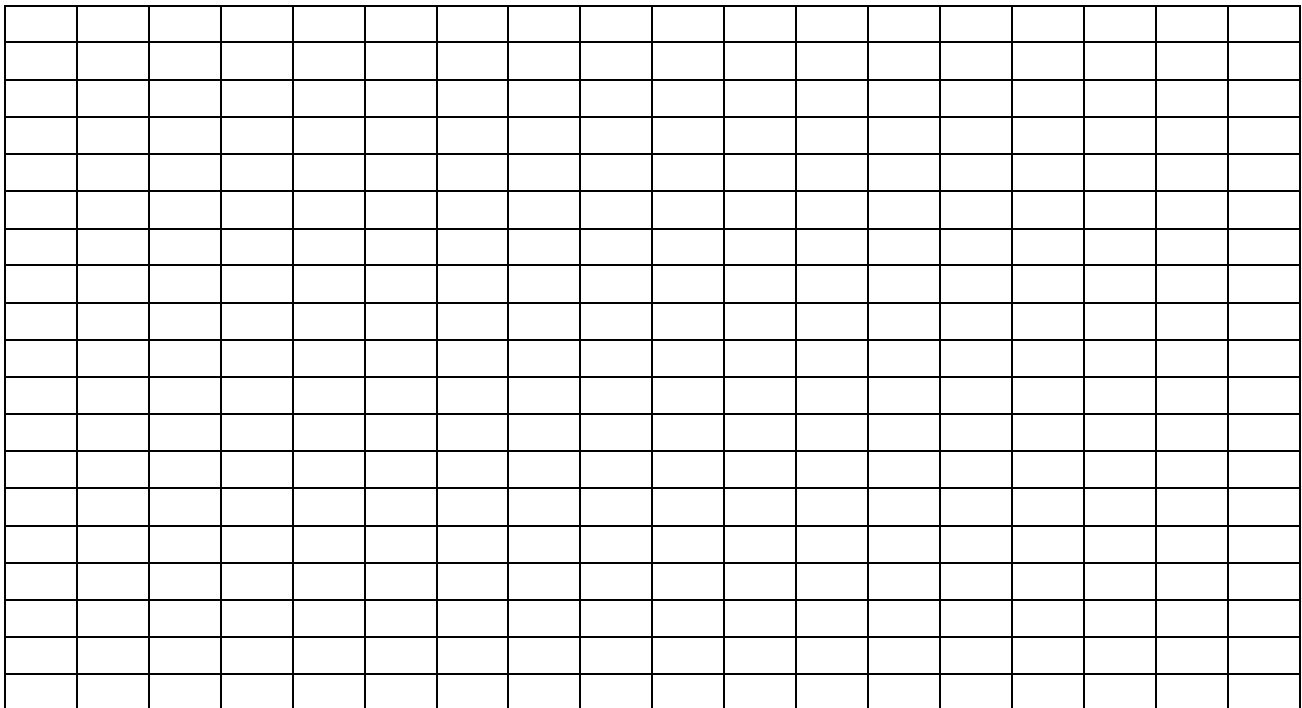
1. Work with your partner. Make sure you both understand what to do.
2. Follow your procedure to collect data to test your hypothesis.
3. Record your data in the chart you created in part 5.

Part 7 – Displaying Data

Purpose: To practice creating graphs to display data in a way that is easy to understand

Procedure:

1. Work with your partner. Make sure you both understand what to do.
2. Make a graph to communicate your data.
3. Decide which type of graph is best for the data.
4. Make sure to:
 - a. Title the graph
 - b. Label the axes
 - c. Use an appropriate scale and interval



Part 8 – Analyzing Data

Purpose: To practice looking for relationships, trends, and patterns in data

Procedure:

1. Work with your partner. Make sure you both understand what to do.
 2. Examine your graph. What information does it show? What relationship can you see?
 3. Write a statement explaining the relationship communicated in your graph.
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Part 9 – Drawing Conclusions

Purpose: To practice communicating the results of an investigation

Materials:

Meter stick	Stop watch	Set of three bubble tubes
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Procedure:

1. Work with your partner. Make sure you both understand what to do.
2. Review your question, hypothesis, and data.
3. Write a conclusion to summarize the investigation and communicate your findings.
4. Be sure to:
 - a. answer your original question
 - b. restate the question and your hypothesis
 - c. explain whether or not the data supported your hypothesis
 - d. provide evidence – actual data – from the investigation to support what you say
 - e. describe any relationships, patterns, or trends
 - f. identify possible sources of error
 - g. discuss possible extensions or elaborations to the investigation; what further research can be done?