What is an Anomaly?

Today’s Objective:
• Be able to determine the anomaly, list possible explanations, and discuss how the explanation could be tested
Anomaly Demos

• Pick one of the anomalies that were just demonstrated

• On your whiteboard, list the following:
  – What is the problem? How is it an anomaly?
  – Why you think it happened (your reasoning/explanation).
  – A test you could do/perform to see if your explanation is correct.
Hose/Flask Experiment

• While doing the lab, you need to...
  – Write down the problem/anomaly
  – Come up with 2-3 hypotheses to test
  – List the materials used
  – Explain how you tested each hypothesis
  – Record any observation/results from each test
Lab Report Format
Warm-Up Questions

• Why is it important for scientists to record and communicate the results of their experiments in something such as a lab report?

• Think of and list in order the steps you went through when doing the introductory-hose/flask lab.
Group Activity...

• The pictures are not arranged in the proper sequence...

• Arrange the following numbered pictures in the order that you think that they occurred.

• Once you have put the pictures in order, list the numbers in order of occurrence on a whiteboard

• Explain to the class your explanation of what has happened!
What’s the catch...?

• What steps did you take in determining which picture went where?

• Are these steps similar to those that you used in the Intro Lab Activity?
Warm-Up Question

- How have you used the Scientific Method already today? List at least 2 examples.
What is the Scientific Method?

• A guide used to solve problems
• Involves asking questions, making observations, and trying things out in an orderly way
• Does **NOT** have to follow an exact order
Scientific Method -- Steps

1. Identify the Problem
2. Gather Information
3. Form Hypothesis
4. Test Hypothesis with an Experiment
5. Make Observations
6. Analyze the Data/Results
7. Draw Conclusion
   **If you conclude that your hypothesis is incorrect, form new hypothesis and follow the same steps!**
8. Communicate Results
What is a Hypothesis?

- Possible explanation to a problem or question
What makes up a “good” Hypothesis?

• It is a statement
  – Can be an “If, then” statement
  – Ex: If the flask is heated, then the fluid will move down the tube.

• It is specific
  – Ex: The fluid will move down the tube faster if the flask is heated by a flame than it would if the flask was heated by body heat.

• It is testable!
Which of the following hypotheses are testable?

• If the polar ice caps begin to melt, the amount of salt in the ocean water will change.
• If Mr. Johns listens to loud music, then he will not be able to hear well.
• A propeller with large blades can propel an airplane faster than a propeller with smaller blades.
• Mr. Howard uses mind control on his students to help them do better on tests and quizzes.
Warm-Up Questions

• What were some of the different variables that you used/changed in the 1st lab?

• Did you use a control in the 1st lab? If so, what was it?
Variables & Controls

• **Variable**
  – Factors that can be changed in an experiment

• **Control**
  – Used as the base measurement
  – Can also be used as a factor for comparison

• **Control Groups vs. Experimental Groups**
Control Group vs. Experimental Group

• Control Group
  – Group that stays the same throughout the experiment
  – Is **NOT** exposed to testing

• Experimental Group
  – Group that experiment is performed on
  – Group that is observed for results and data
Independent vs. Dependent Variables

• IV
  – The variable that is changed/controlled by the scientist during the experiment

• DV
  – The variable that’s resulting change is observed

• The DV is dependent upon the IV

IV = cause ........ DV = effect
Hypothesis vs. Theory vs. Law

• What is the difference between the 3?
• Hypothesis
  – Possible explanation to a problem or question
• Theory
  – An accepted hypothesis that is supported from repeated testing
  – Explains *why* laws occur
• Law
  – Generalizations about what has happened
  – Does not address *why* something happened, just that we know it does happen
  – Ex: Law of Gravity; Newton’s Laws
Experimental Design
Experimental Design (1)

• With the person sitting next to you, design an experiment to investigate the following question:
  – Does eating breakfast increase performance in school?

• Make sure you include in your experiment:
  – Hypothesis
  – Control
  – Variables
  - Experimental Group
  - Control Group
  - Test/Procedures
Experimental Design (2)

• With the person sitting next to you, design an experiment to investigate the following question:
  – What color light do plants grow best in?

• Make sure you include in your experiment:
  – Hypothesis  - Experimental Group
  – Control   - Control Group
  – Variables - Test/Procedures
Experimental Design (3)

• With the person sitting next to you, design an experiment to investigate the following question:
  – Does airplane design affect the distance a plane can fly?

• Make sure you include in your experiment:
  – Hypothesis
  – Control
  – Variables
  – Experimental Group
  – Control Group
  – Test/Procedures
Experimental Design

- You are given 3 types of bubble gum:

- Problem: We do not know which type you can blow the biggest bubbles with.
- Question: Which type of bubble gum allows you to blow the biggest bubbles?
- Design your experiment....