CHEM 105: Chemistry and Disease
Dr. Jakubowski

Lab 1: Hypothesis Building 1 - The Blue Bottle

Introduction

The world must seem a mysterious place to someone without the benefit of our modern explanations for it. Changes in matter that appear before our very eyes can now be explained through the power of science instead of magic or mysticism. The scientific methods used to arrive at our scientific understandings are themselves triumphs of our human intellect. Today you will observe an almost magical transformation of the contents of a bottle, and through thoughtful experimentation develop a hypothesis that could account for the observed changes.

Safety Notes: Eye protection (safety goggles) is required at all times during this experiment. If the solution comes into contact with your skin wash the exposed area thoroughly

Observations and Hypothesis Building

1. Each pair have received a capped bottle. Don't open it at this point. Record your observations.

2. While firmly holding the bottle, shake it vigorously. Record your observations.

3. In your group, propose several hypotheses to explain your observations in 1 and 2.

4. Devise some actions (i.e. perform experiments) to test your hypotheses. Optimally, your experiments should differentiate among the hypotheses, so that after the experiment, you can reject some and save others. Continue with this process until you have developed the simplest hypothesis to explain your observations and eliminated others. Record all your observations and explain how they either support or reject your hypothesis.

Experiment	Hypothesis Tested	Observation	Status of tested Hypothesis

5. A clever student developed the following hypothesis. Indestructible biological nanites, invisible to the naked eye, are present in the liquid and can sense the state of the liquid. Under appropriate conditions, they alter the color of the liquid. Any attempt to locate them causes them to suddenly, but temporarily, move to a different dimension, where they can not be detected. Is this a valid scientific hypothesis? How does it differ from the hypotheses you developed above?

In an experiment, we often try to find the relationship between one factor (or variable) and another. For example, we might ask how the volume of a gas change as the temperature is changed. We wish to see how one variable, volume, depend on the other variable, temperature. In this example, the measured volume is the **dependent** variable since it depends on temperature, which in this case is the **independent** variable. There are other independent variables (like pressure) that can affect the volume, but to keep the interpretation of the experiment simple, these are usually held **constant** so that only one independent variable is changing at a time.

6. List as many independent variables as you can for the blue bottle experiment.

7. Which of them are constant in your experiment?

8. Which (if any) of the independent variables is(are) changed in the experiment?

9. Which is(are) the dependent variables?

10. Using the scientific method, can you prove that a hypothesis is absolutely true? Explain.