

## Steps of Experimentation

- I. **Observation & Question** (ask “what would happen if ....”) Informal testing is part of this step.
- II. **Research** – Find out what is known about the problem
- III. **Hypothesis**- a possible explanation for an event or set of observations. Must be specific enough to be tested in your experiment. (“If..... then.....”) Predict what will happen in your experiment.
- IV. **Design & Conduct Experiment** –
  - a. “Variable” = any changeable factor that can influence the outcome of an experiment.
  - b. “Independent Variable” = the single variable that is selected to be changed for the experiment.
  - c. “Levels of Independent Variable” = variations in degree of the Independent Variable (e.g. if “Light” is the Ind Var, then “sunlight”, “red light”, “blue light”, “green light” would be levels of this Independent Variable)
  - d. “Constants” = any factor that **if allowed to change** would influence the outcome of an experiment. These factors are held unchanged for the duration of the experiment.
  - e. “Control” = the conditions in which none of the potential variables are allowed to change (The “Independent Variable” is absent or held at a normal or standard level)
  - f. “Dependent Variable” = the measured outcome (recorded Data) of the experiment. Must specify the units used for measurements. Identify data as “qualitative” (non-standard scale) or “quantitative” (standard scale)
  - g. “# Trials” = How many tests will be run for each level of IV
  - h. “Safety Measures” = identify any potential risks associated with the experiment, and tell how dangers will be avoided.
- V. **Results – Gather Data**-Prepare data tables before experiment begins. Carefully record observations and measurements using data tables and charts in a project data book (log book).

**Analyze Data**-Examine results using modes for qualitative data or mathematical analysis (e.g. average, mode, range, maximum, minimum, total, etc.) for quantitative data. Display your analysis using graphs. Describe any trends seen in graphs.
- VI. **Discussion**- Explain scientific principles supported or contradicted by your experiment. Explore any significance of your findings.
- VII. **Conclusion**- While referencing your hypothesis (restate), explain what information has been definitively discovered. Do not speculate here. Your hypothesis can be supported or disproven.
- VIII. **Communication of Conclusion**-(lab report, research paper, science fair)