Science Processes

Outcomes

As a result of today's laboratory you will have:

Safely lit a Bunsen Burner and used a nichrome wire to evaluate the flame.
Described the following processes: observing, classifying, inferring, communicating, and modeling.
Differentiated between observations and inferences.
Listed characteristics of solids, liquids, and gases.
Classified a substance as solid, liquid, or gas.
Used models to represent solids, liquids, and gases.
Observed that energy is involved in physical changes.

Purpose

To introduce lab safety concepts, to use a Bunsen burner, and to describe various scientific processes.

Background Information

Science is a way of describing natural phenomenon that follows a specific process known as the scientific method. Some of the processes used in science are:

Observing: collecting data or information using one's senses (alone or with an instruments).
Classifying: sorting objects or ideas into groups according to similarities and differences.
Measuring: comparing measured quantities with standard units.
Inferring: forming an explanation or drawing a conclusion from observations.
Predicting: declaring observable outcomes in advance.
Communicating: conveying knowledge or information for others to evaluate.
Experimenting: controlled observations of predicted observations
Interpreting Data: determining the meaning of experimental observations.

Explanations derived by inference from scientific data maybe in the format of a:

Hypothesis: a testable, tentative explanation that can be demonstrated to be either true or false.
Theory: an explanation that has withstood the test of time … a workable explanation and predictive tool.
Law: Usually mathematical prediction tool.

The scientific method involves:

1. Observing characteristic properties and recognizing patterns in behaviors.
2. Developing a tentative model called a hypothesis to explain the noted observations
3. Testing the hypothesis by making a prediction about what is being investigated
4 Determining if the prediction is correct.

Important things when designing or evaluating an experiment:

1. Only one variable is changed at a time.
   The results can be more easily interpreted.
   This is often difficult or impossible to do when studying complex systems.
2. Experiments must be repeatable.
3. Evaluate how well the hypothesis correctly predicted experimental results.
   The tentative model may have to be refined and re-tested.
   This process continues until the model is well
4. Peer review
   Experimental work needs to be communicated to the scientific community.
   It must be evaluated by others having expertise in the same field.
   Different people looking at the same data and results may reach different conclusions.

Good science shows a cause and effect relationship, not just a correlation, between two occurrences.

Procedure

Part I. Making Observations and Inferences using a Bunsen Burner Flame

Safety Precautions: Wear Safety Goggles
Keep flammable materials (papers, hair, clothing, etc.) away from the burner flame.

These optional videos will offer more explanations … watch outside of class

1. Watch the video on lighting a Bunsen Burner (4:10)
2. Watch the Video on lighting a Bunsen Burner with a match (2:47)
3. Watch the video on measuring Temperature (1:13)

4. Complete the data, results, conclusion and question sections for part I of the Hand-In.

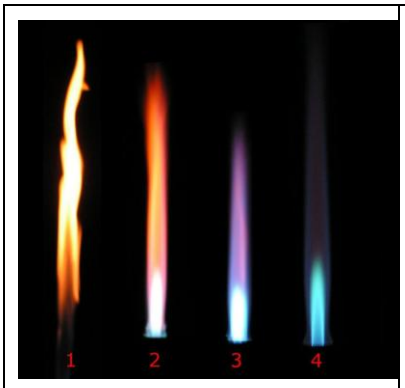		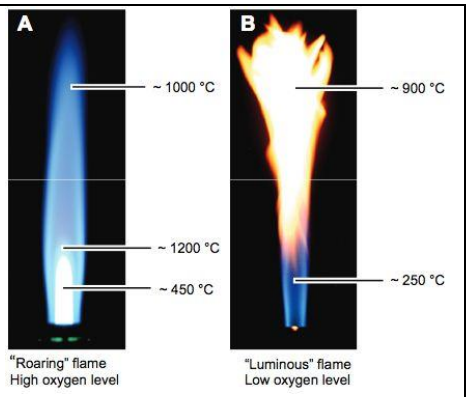
Left to Right: **Air valve closed to open**	**Wire at tip of inner cone**	**Temperature Comparisons**

Table 1. Color and Corresponding Celsius Temperature

Color	No light	Almost Red	Dark Red	Bright Red	Yellow-Red	Almost White	White
Temp.(°C)	< 500	500–550	650–750	850–950	1050–1150	1250–1350	>1450

Part II. States of Matter

1. Use your experiences with everyday substances to fill in the "Observing States of Matter" and "Changing States of Matter" tables. The examples that you list for the different states can be common everyday examples.

3. Complete the results, conclusion and question sections for part II of the Hand-In.