**Scientific Method Definitions**

**Analysis** – The breakdown of something that is complex into smaller parts in such a way that leads to a better understanding of the whole.

**Classify** – Grouping things together based on specific characteristics.

**Compare** – To examine the different and/or similar characteristics of things or events.

**Control** – The group or subject that is used as a standard for comparison in an experiment.

**Critical thinking** – Thinking that uses specific sets of skills to carefully analyze problems step-by-step; scientific methods are one type of critical thinking.

**Data** – Information, measurements and materials gathered from observations that are used to help answer questions.

**Experimental error** – Incorrect data in an experiment that may result from a variety of causes.

**Experiment** – A test using observations and controlled variables to discover answers to questions, and/or to check a hypothesis.

**Hypothesis** – A testable explanation for observations and questions about the physical universe. (Note: “hypothesis” is very similar to “prediction,” and the two words are often used interchangeably.)

**Inference** – A logical explanation or conclusion based on observations and/or facts.

**Measure** – To compare the characteristics of something (such as mass, length, volume) with a standard (such as grams, meters, liters).

**Methods** – An ordered series of steps followed to help answer a question.

**Nature** – The entire physical universe.

**Observation** – (1) Noticing objects or events using the five senses. (2) The data collected by using the five senses to learn about objects and events.

**Prediction** – A statement made about the future outcome of an experiment based on past experiences or observations.

**Procedure** – An ordered series of steps followed to help answer a question.

**Qualitative data** – Data that is based on observable characteristics of things or events that can be collected using the five senses. Example: “The juice tastes *sweet* to me.”

**Quantitative data** – Data that is based on measurable characteristics of things or events such as mass, volume, length, and quantity. Example: “There is *one liter* of juice in the carton.”

Accuracy in Experiments: Notes

**Qualitative (quality):** based on a subjective quality or categorization, like yes/no or opinion (ex. asking about feelings)

**Quantitative** **(quantity):** based on objective numbers or measurements (ex. syrup lap is 14.9 seconds)

**Empirical Evidence:** evidence that comes from experiment or observation. (i.e. central idea of scientific inquiry)

**Anecdotal Evidence:** evidence that is based on a belief or hearsay; not based on experiment (ex. Kidnapping 35 out of 40 million)

**Generalizing:** saying research is true of the entire population; need large enough sample size

The sample size:

1. It is the number of repetitions or subjects in the study.(Example: 12 subjects/people in the study or 3 laps completed in the pool = 3 repetitions of the test)
2. Typically the larger the sample size the more precision there will be in the findings. However, in large samples, small errors in calculations can be amplified and decrease the amount of accuracy.

**Repeated trials** – Experimental tests done more than once.

**Replication** – Repeated trials on more than one subject, as well as controls, in experimental tests.

**Science** – The study of nature and the physical world using the methods of science, or a “special method of finding things out.”

**Scientist** – A person who “does” science and uses the methods of science.

**Scientific law** – A generalized *pattern* in nature.

**Scientific method(s)** – A process of critical thinking that uses observations and experiments to investigate testable predictions about the physical universe.

**Scientific theory** – An *explanation* for generalized patterns in nature that is supported by much scientific evidence based on data collected using scientific methods.

**Variation** – Slight differences among objects, organisms or events that are all of the same basic type.

**Variable** – Something that can affect a system being examined, and is therefore a factor that may change in an experiment.

**Variable**, **independent/manipulated** – A factor that can be changed or manipulated in an experiment by the scientist; “you change it” variables.

**Variable**, **dependent/responding** – A factor that responds to changes in other variables in an experiment; “it changed” variables.