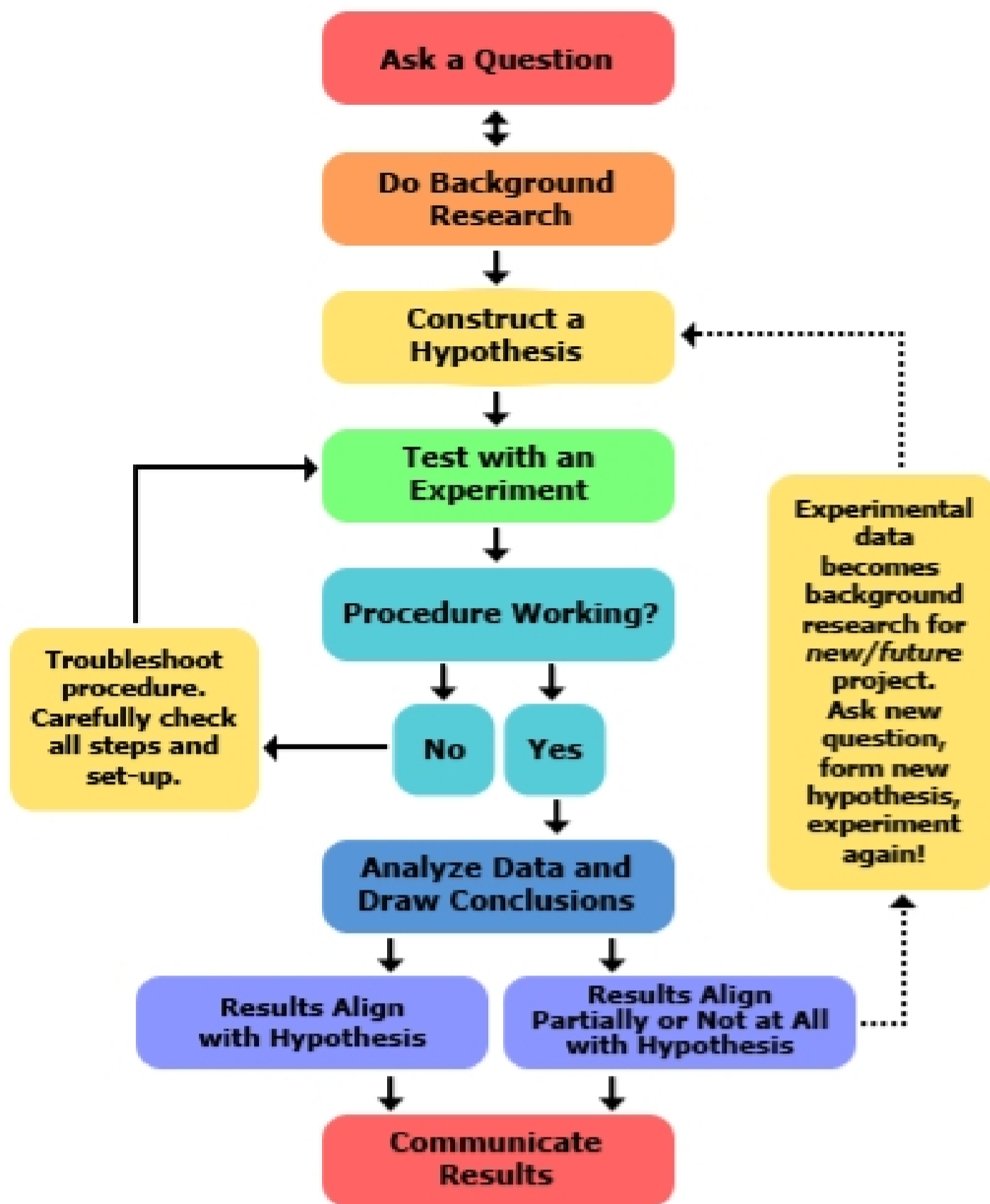

Chapter 1: Matter its Properties and Measurement

Vocabulary

- **Natural Laws** - concise statements, often mathematical form, about natural phenomena
- **Induction** - form of reasoning in which a general statement or natural law is inferred from a set of observations
- **Hypothesis** - tentative explanation of a natural law
- **Theory** - a model or way of looking at nature that can be used to explain natural laws and make further predictions about natural phenomena
- **Scientific Method** - the combination of observation, experimentation, and the formulation of laws, hypotheses, and theories
- **Matter** - anything that occupies space and displays the properties of mass and inertia
- **Composition** - refers to the parts or components of a sample of matter and their relative proportions
- **Properties** - those qualities or attributes that we can use to distinguish one sample of matter from others; the properties of matter are generally grouped into two broad categories: physical and chemical
- **Physical Property** - one that a sample of matter displays without changing its composition
- **Physical Change** - some of the physical properties of the sample may change, but its composition remains unchanged
- **Chemical Change/Chemical Reaction** - one or more kinds of matter are converted to new kinds of matter with different compositions
- **Chemical Property** - the ability of a sample of matter to undergo a change in composition under stated conditions
- **Atoms** - tiny units that makes up matter
- **Element** - pure matter that cannot be separated
- **Compounds** - substances comprising atoms of two or more elements joined together
- **Molecule** - the smallest entity having the same proportions of the constituent atoms as does the compound as a whole
- **Substances** - elements and compounds
- **Homogeneous Mixture** - uniform in composition and properties throughout aka *solution*
- **Heterogeneous Mixture** - the composition and physical properties vary from one part of the mixture to another
- **Solid** - atoms or molecules are in close contact, sometimes in a highly organized arrangement called a crystal, and has a definite shape
- **Liquid** - the atoms or molecules are usually separated by somewhat greater distances than in a solid, movement of these atoms or molecules

gives a liquid its most distinctive property - the ability to flow, covering the bottom and assuming the shape of its container

- **Gas** - distances between atoms or molecules are much greater
- **SI** - the scientific system of measurement is called the International System of Units, a modern version of the metric system, a system based on the unit of length, meter
- **Mass** - describes the quantity of matter in an object
- **Celsius** - the melting point of ice is 0° C, the boiling point of water is 100°C, and the interval between is divided into 100 equal parts
- **Fahrenheit** - the melting point of ice is 32°F, the boiling point of water is 212°F, and the interval between is divided into 180 equal parts
- **Kelvin** - assigns a value of zero to the lowest possible temperature
- **Density** - the ratio of mass to volume
- **Extensive Property** - *dependent* on the quantity of matter observed
- **Intensive Property** - *independent* of the amount of matter observed
- **Systematic Errors** - measuring instruments have built-in, or inherent, errors
- **Random Errors** - limitations in an experimenter's skill or ability to read a scientific instrument also lead to errors and give results that may be either too high or too low
- **Precision** - the closeness of agreement when the same quantity is measured several times
- **Accuracy** - refers to how close a measured value is to the accepted, or actual, value
- **Significant Figures** -
 - All nonzero digits are significant
 - Zeros are also significant, but with two important exceptions for quantities less than one. Any zeros preceding the decimal point or following the decimal point and preceding the first nonzero digit, are not significant
 - The case of terminal zeros that precede the decimal point in quantities greater than one is ambiguous



Section 2: Properties of Matter

Matter is everything; all of the objects that we see around us consist of matter. Gas is made of matter, sunlight, however, is *not* matter, but rather, a form of energy.

- **Composition** refers to the parts or components of a sample of matter and their relative proportions.
- **Properties** are those qualities or attributes that we can use to distinguish one sample of matter from others; and, as we consider next, the properties of matter are generally grouped into two broad categories: physical and chemical
- Physical Properties and Physical Changes
 - o A **physical property** is one that a sample of matter displays without changing its composition
 - o Another **physical property** of copper is that it can be hammered into a thin sheet of foil
 - o Ex: malleable, brittle, lustrous, etc.