Definitions: Chapter 1

I. Some Basic Terminology

chemistry: the study of the composition, structure, properties and behavior of matter.

matter: the physical material of the universe; atoms and molecules make up all matter. (Anything that has mass and takes up space). (This is a "for now" definition. We will refine this definition in future discussions).

atoms: the smallest distinct units in a sample of matter; "building blocks" of matter. (This is a "for now" definition. We will refine this definition in future discussions).

molecules: larger units of matter that consist of two or more atoms.

II. Matter Can Be Divided into Two Categories

A. Substances

substance: matter that has a fixed composition and distinct properties.

element: substances composed of only one type of atom.

compound: substance made of two or more elements in a fixed ratio.

B. Mixtures

mixtures: a combination of two or more substances where each substance retains its own chemical identity.

homogeneous: a mixture that has the same composition through out.

heterogeneous: varies in composition (and/or properties) from one part of the mixture to another.

physical property: a characteristic displayed by a sample of matter without changing composition.

physical change: when a sample of matter undergoes a change in property, but the identity of matter does not change.

III. Metric System

THESE ARE ONLY SOME COMMON EXAMPLES. YOU NEED TO KNOW THE OTHER UNITS LISTED IN YOUR TEXT AS WELL

Mass

Many small units make up a large unit

Large Unit	Small Unit
1 kilogram (kg)	=1000 grams (g) = 1 x 10^3g
1 gram	= 1000 milligrams (mg) = 1 x 10^3 mg
1 gram	= 1x 10^6 μg
1 gram	= 1x10^9 ng, etc.

or one small unit is equal to a portion of a large unit

Small Unit	Large Unit
1 gram	= 1 x 10^{-3}kg = 0.001kg
1 milligram	= 1 x 10^{-3}g = 0.001g
1 μg	= 1 x 10^{-6} g = 0.000001 g
1 ng	= 1x 10^{-9} g = 0.000000001 g, etc

Length

Many small units make up a large unit

Large Unit	Small Unit
1 kilometer (m)	=1000 meters (m) = 1 x 10^3meters
1 meter	= 100 centimeters (cm) = 1 x 10^2 cm
1 meter	= 1x 10^3 mm
1 meter	= 1x10^9 nm
1cm	= 10 mm = 1 x 10^1 mm, etc.

or one small unit is equal to a portion of a large unit

Small Unit	Large Unit
1 meter	= 1 x 10^{-3}km = 0.001km
1 mm	= 1 x 10^{-3}m = 0.001m
1 μm	= 1 x 10^{-6} m = 0.000001 m
1 nm	= 1x 10^{-9} m = 0.000000001 m, etc
1mm	= 1 x10^{-1} cm = 0.1cm, etc.

Volume

Many small units make up a large unit

Large Unit	Small Unit
1 liter (L)	=1000 milliliters (mL) = 1 x 10^3mL

or one small unit is equal to a portion of a large unit

Small Unit	Large Unit
1 milliliter	= 1 x 10^{-3}L = 0.001L, etc.

Temperature

temperature: a property that indicates heat flow (hot to cold). The average kinetic energy of the molecules or atoms in a sample of matter.

We will use the Celsius scale or the Kelvin Scale.

IV. Precision vs. Accuracy

precision: how close a set of measurements agree with each other (reproducibilty of a measurement).

accuracy: how close the average of a set of measurements comes to the "correct" (or most probable) value.

V. Density

density: mass per unit volume.