Definitions: Chapter 1

Note: This information is meant to enhance your own class notes and to be used as a quick reference when studying. This is not a complete lecture outline. You must still take notes in class to understand all of the material presented.

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

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 10^6 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.

Chapter 2 Terminology
Chem 1A
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Again, this information is meant to supplement your notes. This is not a complete guide to the chapter.

I. History of Chemistry
Law of Conservation of Mass: The total mass remains constant during a chemical reaction.

Law of Definite Proportions: A given compound always contains the exact proportion of elements by mass.

Law of Multiple Proportions: When 2 or more different compounds of the same two elements are compared, the masses of one element that combine with a fixed mass of the second element are in the ratio of small whole numbers.

Dalton's Atomic Theory
- All matter is composed of small indivisible particles.
- All atoms of a given element are alike, but atoms of one element differ from atoms of another element.
- Compounds are formed when atoms of different elements combine in fixed ratios.
- A chemical reaction involves a rearrangements of atoms (THAT IS IT!)

II. The Atom
Atomic Number (Z): The number of protons in the atoms of a given element. (This is what makes the element what it is!)

Mass Number: The number of protons plus the number of neutrons (this is **not** the same as the atomic mass).

Isotopes: Atoms with the same number of protons, but a different number of neutrons.

Atomic Mass: The weighted average of the masses of the naturally occurring isotopes of the elements.

III. Molecular Compounds
Molecular compounds contain covalent bond. The atoms are held together by shared pairs of electrons. Molecular compounds are made up of non-metals (this is a "for now" definition!)

Chemical Formula: A representation of the molecule using chemical symbols from the periodic table to indicate the number and type of atoms in the molecule. There are several types of chemical formulas.

Empirical Formula: The simplest chemical formula that represents the type and **ratio** of elements (atoms) present in a molecule.

Molecular Formula: A chemical formula that represents that **actual number** of atoms present in a molecule. (These formulas do not necessarily show connectivity.)

Structural Formula: A chemical formula that shows the connectivity of the atoms as well as the number and type of atoms in the molecule. (A **Condensed Structural Formula** also shows the connectivity of the atoms in the molecule, but without the dashes representing the covalent bonds.)

Isomers: Molecules that have the same empirical and molecular formula, but not the same structural formula. The connectivity of the atoms is different in each molecule.

III. Ionic Compounds

Ionic compounds contain ionic bonds. The ions are held together by electrostatic attraction. Ionic compounds consist of a metal plus a non-metal (again this is a "for now" definition.)

Ions: An electrically charged atom or group of atoms. (An atom that has gained or lost electrons.)

Polyatomic Ion: Charged group of bonded atoms (these are those icky things you have to memorize on table 2.4).

Salt: An ionic solid consisting of oppositely charged ions.

Formula Unit: The simplest collection of cations and anions that represent an electrically neutral compound (This is a theoretical unit. It does not actually exist.)

Anions: Negatively charged ions.

Cations: Positively charged ions.

IV. Acids and Basesu

Acid: Compounds that ionize in water to form the hydronium ion or H^+ (this is a "for now" definition.)

Bases: Compounds that ionize in water to form the hydroxide ion (this too is a "for now" definition.)