

Definitions

- Chemistry: Study of matter
- Organic Chemistry: Compounds of carbon
- Atom: Is the smallest possible particle of a chemical element
- Molecules: Atoms connected in a particular arrangement
 - o Changing the arrangement or connections changes the molecule.
- Compound: Collection of molecules of one type
 - o Water (H₂O), Cholesterol (27 carbons, white crystalline powder, average male contains 80g)
- Atomic Number: number of protons in nucleus
- Atomic Weight: mass of protons and neutrons
- Molecular Weight (MW): units g/mol

Mole Concept

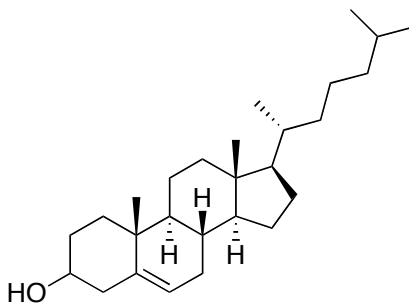
- 1 mole = 6.02×10^{23} molecules
- H₂O: MW = [(2 x 1 g/mol)H + (1 x 16 g/mol)O] = 18 g/mol
- 18g of H₂O is 6.02×10^{23} molecules = 1 mole of H₂O

Know: 1st two rows of periodic table, element symbols, atomic number, and atomic weight (i.e. Elements from hydrogen through neon).

Typical Molecule

- A few Angstroms (Å) in length
- $1 \text{ Å} = 10^{-8} \text{ cm}$

example: cholesterol is ca. 18 Å in length. If you lined all of the cholesterol molecules in a 20g bottle end to end it would wrap around the earth roughly 5 million times. (structure not given in class yet – will be explained later)



cholesterol

Purity of Compounds

- 1 mole of H₂O (6.02×10^{23} molecules) = 18g then add 1×10^6 other molecules (e.g. sugar) the purity of the water would be 99.999 999 999 999 999% pure.

- Purity: Pure compound shows no change in physical properties upon attempts to further purify. (purity is a relative term)

Physical Properties

- Defined by chemical structure – some physical properties include:
- State: solid, liquid, or gas.
- Melting point (mp) and Boiling point (bp): Each compounds has a characteristic mp and bp.
- Taste, odour, and biological properties (how it interacts with other molecules).
- Density (g/cm^3).
- Absorption of radiation.

Qualitative Test for Inorganic or Organic Compound

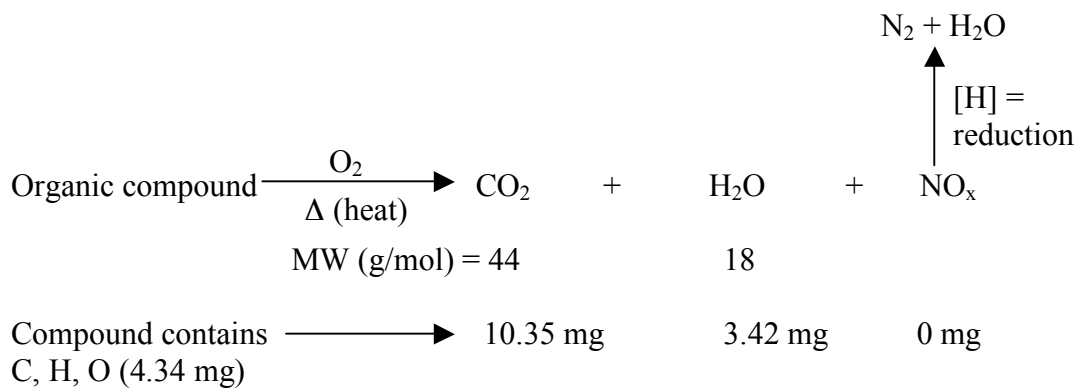
- Qualitative: Determine if you have the compound of interest.

Organic	Inorganic
<ul style="list-style-type: none"> - Contains carbon - Low mp - Burn - Soluble in non-polar solvents 	<ul style="list-style-type: none"> - High mp - “Does not burn” - Soluble in H_2O

THERE ARE MANY EXCEPTIONS !!!

Quantitative Analysis

- Quantitative: How much of the compound of interest (quantity).



$$\text{Weight of carbon (in sample)} = \frac{12 \text{ g/mol of C}}{44 \text{ g/mol CO}_2} \times 10.35 \text{ mg of CO}_2 = 2.82 \text{ mg of C}$$

$$\text{Weight of hydrogen} = \frac{2(1 \text{ g/mol of H})}{18 \text{ g/mol of H}_2\text{O}} \times 3.42 \text{ mg of H}_2\text{O} = 0.383 \text{ mg of H}$$

$$\text{Weight of oxygen} = 4.34 \text{ mg} - (2.82 \text{ mg of C} + 0.383 \text{ mg of H}) = 1.14 \text{ mg of O}$$