

8/22/05

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CHM 123 - Lecture 1 (Monday 10:30am)

- Lecturer: Dr. Cindy Harwood
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- Lecture notes will be posted on website.

Chapter 2 - Atoms and Elements

- Read chapter 1: general introduction to calculations etc.

Atomic structure: Modern view

- (i) Electrons: negatively charged particles, determine how elements combine to form compounds.
- (ii) Protons: positively charged particles. Protons give an element its identity.
- (iii) Neutrons: contribute to the mass of an atom. Neutral particles.
 $\# \text{ of neutrons} + \# \text{ of protons} = \text{Mass number (A) of an atom.}$

$\# \text{ of protons} = \text{Atomic number (Z)}$

$\# \text{ of neutrons} = N$

$\# \text{ of neutrons} + \# \text{ of protons} = \text{Mass number (A) of an atom}$

Isotopes:

- Atoms of the same element that have identical atomic numbers but different mass numbers.

Atomic representation



X: element

A: mass number

Z: atomic number.

Isotopes and Atomic weight

- Natural isotopes are of interest to us.

$$\text{Atomic weight} = \left(\begin{array}{c} \text{Relative abundance} \\ \text{of isotope 1} \end{array} \times \begin{array}{c} \text{isotopic} \\ \text{mass number} \\ \text{of 1} \end{array} \right) + \left(\begin{array}{c} \text{Abundance} \\ \text{of isotope 2} \end{array} \times \begin{array}{c} \text{mass} \\ \text{of 2} \end{array} \right) + \dots + \left(\begin{array}{c} \text{Abundance} \\ \text{of isotope N} \end{array} \times \begin{array}{c} \text{mass} \\ \text{of N} \end{array} \right)$$

The Mole

- Chemical counting unit.
- Defined as amount of substance that contains as many atoms, molecules etc as there are atoms in exactly 12g of carbon-12.
- 1 mole = $6.02214199 \times 10^{23}$ particles.

$$1 \text{ mol of Cu} = 63.546 \text{ g}$$

$$1 \text{ mol H}_2 = 2.01058 \text{ g}$$

Molar mass and problem solving

- Use mole to convert ~~to~~ between mass and molar mass.

Example:

(Q) How many grams of Cu are there in 5.67 mol Cu?

$$\begin{aligned} \text{(Sol.) } \# \text{ g Cu} &= 5.67 \cancel{\text{mol Cu}} \times \left(\frac{63.546 \text{ g}}{1 \cancel{\text{mol Cu}}} \right) \rightarrow \text{atomic mass of Cu} \\ &= \underline{\underline{360 \text{ g}}} \end{aligned}$$

Periodic Table

① ~~Atoms~~ Elements are arranged in order of increasing atomic numbers from left to right.

② group 1A: alkali metals.
group 2A: alkaline earth metals.
group 7: halogens
group 8: noble gases.

going down.

③ going across - each row is called a period.