Average Atomic Mass

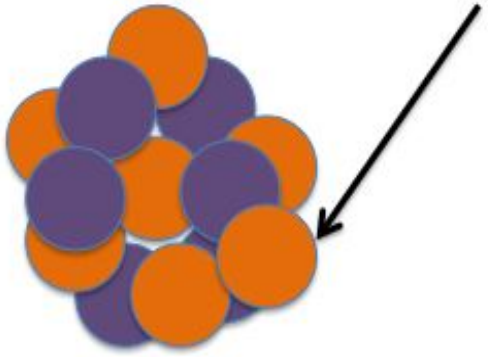
Background

- The Carbon-12 atom is used as the reference for all other atomic masses.
- One C-12 atom has a mass of 12 atomic mass units (12 amu or 12*u*)
- 1*u* = 1/12 of the mass of a C-12 atom

The Nuclei of ^{12}C and ^{13}C

Protons: 6
Neutrons: +6
Atomic mass: 12

This extra neutron gives ^{13}C its heavier mass!



Protons: 6
Neutrons: +7
Atomic mass: 13

Average Atomic Mass

- The weighted average of the atomic masses of the naturally occurring isotopes of an element

- Most elements occur naturally as mixtures of isotopes

Average Atomic Mass

- Dependent upon both mass and the relative abundance of each of the elements isotopes

- $m_{average} = (m_{isotope\ 1})(\%\ abundance) + (m_{isotope2})(\%\ abundance)$

Repeat to add up the (m x %) for ALL isotopes

Example

- Naturally occurring copper exists with the following abundances:

Isotope	Actual Mass (amu)	% Abundance
Cu-63	62.93	69.17%
Cu-65	64.93	30.83%

- Let's use our whiteboards to try! *Click for Answer*
- m = (62.93 amu)(0.6917)+ (64.93 amu)(0.3083)= 63.55 amu

Problem 1

- 3 Isotopes of Argon occur in nature
- Whiteboards at the ready!!

- 0.337% as Ar-36, 35.97 amu
- 0.063% Ar-38, 37.96 amu
- 99.6% Ar-40, 39.96 amu

- Calculate the Average Atomic Mass
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Answer Check

- m = (35.97 amu)(0.00337) + (37.96 amu)(0.00063) + (39.96 amu)x(0.996)= 39.95 amu

Problem 2

- 2 Naturally occurring Isotopes of Boron occur with the following abundances:
- In your notes, check with your neighbour:

- 80.20% B-11, 11.01 amu
- 19.80% B-10, 10.81 amu

- What is the Average Atomic Mass

Answer Check

- (11.01 amu)(0.8020) + (10.81 amu)(0.1980) = 10.97 amu