Chapter 1 Part 2

1. Average Atomic Mass

   A. **Atomic Mass**:

- 1 Atomic mass unit – a mass exactly equal to _____ the mass of a

  _____ atom.

isotope	**Carbon-12**	**Carbon-13**	**Carbon-14**
Protons	6	6	6
Neutrons	6	7	8
Atomic Mass (amu)	12.00000	13.003355	14.003241
natural abundance	98.93%	1.07%	<0.0001%

- 1 amu is about equal to ….
- 1 amu = _____ grams

B. Average Atomic Mass:

Example of something more readily visualized: Marbles!

If we have the followings set of marbles, what is the average mass of a marble in this set?

_____ marbles with a mass of 517.2 g (marble A)

_____ marbles with a mass of 518.2 g (marble B)

_____marbles with a mass of 519.2 g (marble C)

Option 1:

Option 2: Using Percentages

Marble A makes up _____ of the marbles.

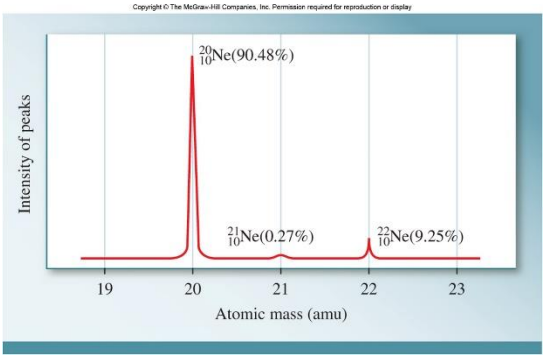
Marble B makes up _____of the marbles.

Marble C makes up _____of the marbles.

Example with atoms: Carbon – data seen on slide is shown in the table on the first page of these notes.

Calculate the average atomic mass for Carbon (just use carbon-12 and carbon -13):

- Mass spectrometer: instrument used to measure percent abundance for different isotopes of a particular atom.
- Example of a mass spectra for Neon:



Isotope	Neon-20	Neon-21	Neon-22
Amu	19.9924356	20.9938428	21.9913831

On your own: Calculate the average atomic mass for Neon

C. Additional Example problem related to Average Atomic Mass

Example: The average atomic mass of nitrogen is **14.0067 amu.** The atomic masses of the two stable isotopes of nitrogen are shown in the table. Use this information to determine the <u>percent abundance</u> of each nitrogen isotope. Before doing calculations, **can you predict which isotope is more abundant?**

Isotope	Nitrogen-14 (^{14}N)	Nitrogen-15 (^{15}N)
Atomic mass (amu)		
Percent abundance		

2. The Mole Concept!
   A. The MOLE : "A chemist's dozen"

   - Definition of **a mol:**

   - Other examples of a similar concept:

   B. Why 6.022×10^{23} ??????

   - This number is known as _____, because it was determined experimentally by Amedo Avagadro.

   - How is this number relate derived?

Recall:

1 amu = 1/12 the mass of a carbon-12 atom
1 amu = 1.66×10^{-24} g (based upon mass of protons and neutrons)

How many amu are in 1 g? Solve using Dimensional analysis.

C. Let's see how a mole can help us thing about atoms of sulfur.

The mass of 1 sulfur atom in amu (on average) is …..

The mass of 1 mole of sulfur atoms (in amu) is ……

Use dimensional analysis to convert this mass to grams.

Conclusion: 1 mol of sulfur atoms weighs _____ grams.

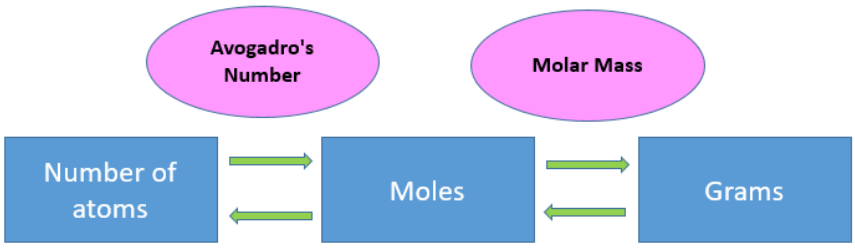
D. **Molar mass**:

Comparing Molar mass and atomic Mass:

Atomic Mass	Molar Mass

E. The concept of moles and Avogadro's number helps us convert between number of atoms, moles and grams for any particular element.

Figure: Represents conversions related to the MOLE



Dimensional Analysis with Moles

Example 1a: Calculate the amount of copper (in mol) of a _____ pure copper sheet.

Ex 1b: How many atoms of copper are in this sheet?

Example 2 (Poll Everywhere): Take notes below.