The Mole and Its Applications   Name_____

Atomic Mass and Atom Counting

Read from **Lesson 1: Atomic Mass and Atom Counting** in the **Chemistry Tutorial Section, Chapter 7** of **The Physics Classroom**:

Part a: Atomic Mass   Part b: Measuring Atomic Mass
Part c: The Mole   Part d: Grams-Moles-Atoms Relationship

Part 1: Massive Calculations

1. Mass spectrometer analysis by NASA scientists revealed the following types of isotopes of an element were found on a meteor from outer space. 92.5% of the isotopes found had a mass number of 7. The remaining isotopes had a mass number of 6. What is the average atomic mass, atomic number, and identity of the element found on the meteor?

2. If NASA scientists extracted 3470 amu of this element from the meteor, how many atoms of this element were in the sample? If scientists extracted this many atoms of copper, what would the mass of the sample of copper be?

3. Two isotopes, copper-63 (mass of 62.939598 amu) and copper-65 (mass of 64.927793 amu) make up the naturally occurring copper on Earth. What is the percent abundance of each isotope?

Part 2: Whole-y Mole-y Calculations

When chemistry students are beginning to solve mole problems, it is helpful to use a "mole statement." A mole statement is: **1 mole (of substance) = Avogadro's number of particles = molar mass (grams)**
Write out the mole statement before setting up the conversion factors in the calculations.

Examples   1 mole of hydrogen = 6.022 x 10^{23} atoms of H = 1.01 grams H
of mole   1 mole of carbon = 6.022 x 10^{23} atoms = 12.01 grams C
statements: 1 mole of uranium = 6.022 x 10^{23} atoms = 238.03 grams U

Example of a mole conversion problem: How many atoms of copper are in 3.14 moles of copper?
  a. Write out the mole statement:
              1 mole of copper = 6.022 x 10^{23} atoms of Cu = 63.55 grams Cu
  b. Write out the conversion factor(s) and solve the problem.
              3.14 mol Cu * 6.022 x 10^{23} atoms Cu = 1.89 x 10^{24} atoms Cu

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1 mol Cu

Show all work for the following mole conversion problems. Use the periodic table for molar masses and use 6.022×10^{23} for Avogadro's number.

1. Sally Kon's doctor tells her that selenium is important for thyroid gland function. The doctor advises her to take 0.0550 milligrams of selenium each day. How many moles of selenium per day will she be taking?

2. Adam Splidda visits a nuclear power plant near his school. On the tour of the facility, he learns that a typical uranium fuel pellet contains around 8.8 grams of uranium. How many atoms of uranium are contained in a fuel pellet?

3. During a chemistry experiment, Ellie Ektron cuts a copper wire that has a mass of 7.28 grams. How many moles and how many atoms of copper is this?

4. Tesla claims that the batteries in their electric vehicles are designed to last around 300,000 to 500,000 miles. A Tesla battery contains around 50 kilograms (50,000 grams) of nickel. How many moles and how many atoms of nickel is in a Tesla battery?

5. Professor BrINClHOF (remember diatomic molecules) breathes in 2.1×10^{21} oxygen *molecules* per breath. How many oxygen atoms is this? How many grams of oxygen does each breath contain?