



### Cycle 7 Chemistry 1 Lesson 2

**AGENDA – Define and Use the “Mole”**  
**Lab day is WEDNESDAY (TOMORROW)**



**Vocab:** “mole”, “molar mass”,  
“Avogadro’s Number”

#### **Classwork:**

- Write the mass in grams and the number of atoms in 1 mole of C, S, Cu, He, Zn
- Divide the grams of mass by # atoms to get the mass, in grams, of each atom (C, S, Cu, He, Zn)
- Estimate the # of Cu atoms in a penny. Write out in Scientific and Standard notation.





## Introduction to the Mole

- Most samples of elements have great numbers of atoms.
- A **mole** is defined as the number of atoms in exactly 12 grams of carbon-12. The mole is the SI unit for the amount of a substance.
- The **molar mass** of an element is the mass in grams of one mole of the element. Molar mass has the unit grams per mol (g/mol).
- The mass in grams of 1 mol of an element is numerically equal to the element's atomic mass from the periodic table in atomic mass units.

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### Introduction to the Mole, *continued*

- Scientists have also determined the number of particles present in 1 mol of a substance, called **Avogadro's number**.
  - One mole of pure substance contains  $6.022\ 1367 \times 10^{23}$  particles.
  - Avogadro's number may be used to count any kind of particle, including atoms and molecules.



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## Moles are a Counting Unit for Atoms

- Suppose you want to make NaCl out of Na and Cl
- You can't just use equal masses
- Na atoms weigh less than Cl atoms!
- So one mole of Na has less mass than one mole of Cl – but they both have equal numbers of atoms.



- A dozen bowling balls have more mass than a dozen ping-pong balls, but both are a dozen
- A mole is like a dozen, except it's  $6.022 \times 10^{23}$ !





### Molar Mass

$6.02 \times 10^{23}$  iron atoms = 1 mol iron = 55.78 g of iron



55.78 g/mol = molar mass of iron



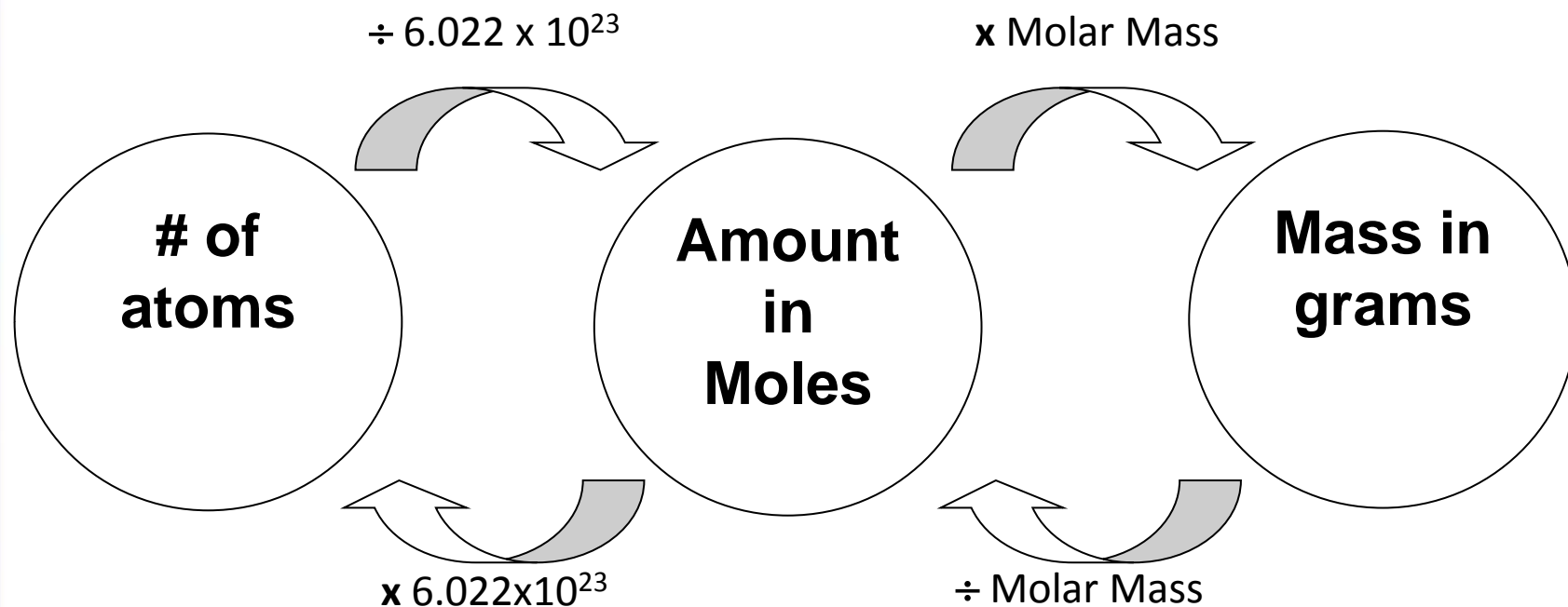
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Moles provide “Bridge” between #atoms and Mass





### Converting from Amount in Moles to Mass

#### Sample Problem D

Determine the mass in grams of 3.50 mol of copper.



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## Sample Problem D Solution

- First, make a set-up that shows what is given and what is desired.

$$3.50 \text{ mol Cu} \times ? = ? \text{ g Cu}$$

- Use a conversion factor that has g Cu in the numerator and mol Cu in the denominator.

$$3.50 \text{ mol Cu} \times \frac{? \text{ g Cu}}{1 \text{ mol}} = ? \text{ g Cu}$$

- The correct conversion factor is the molar mass of Cu, 63.55 g/mol.

$$3.50 \text{ mol Cu} \times \frac{63.55 \text{ g Cu}}{1 \text{ mol}} = 222 \text{ g Cu}$$

