# Ap Chem Summer Assignment #3

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## 1 Key:

- **Bold**: Important Notes
- underline: definition
- *Italic*: emphasis

## 2 1.1 Daily 1 - Moles and Molar Mass

### 2.1 What is a mole?

According to the SI definition, The mole, symbol mol, is the SI unit of amount of substance of a specified elementary entity, which may be an atom, molecule, ion, electron, any other particle or a specified group of such particles; its magnitude is set by fixing the numerical value of the Avogadro constant to be exactly $6.02214129{\times}10^{23}$ when it is expressed in the SI unit mol−1.

In plain english, we can say a mole is a standard scientific unit for measuring large quantities of very small entities such as atoms, molecules, or other specified particles. 1 mole is equal to $6.02214129{\times}10^{23}$ particles, or Avogadro's constant

### 2.2 Why do chemists use moles?

All 4 samples in figure 1 contain 1 mol. That means each sample has $6.02214129{\times}10^{23}$ particles. If we were to write that number every time we do a calculation, it would be needlessly tedious.

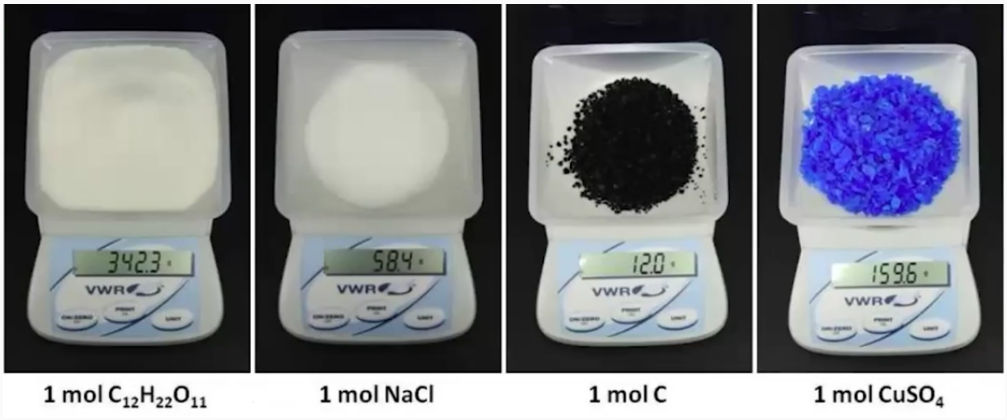


Figure 1: Compounds ($C_{12}H_{22}O_{11}$, NaCl, C, $CuSO_4$)

Moles help link between the micro world of atoms and molecules to the macro world of grams and kilograms.

## 2.3 How do we find the mass of sucrose ($C_{12}H_{22}O_{11}$)?

1. Count atoms in chemical formula
    - We have 12 carbon atoms, 22 hydrogen atoms, and 11 oxygen atoms
2. Find the atomic mass of each element
    - Carbon $= 12.01u$, Hydrogen $= 1.01u$, Oxygen $= 16.00u$
3. Multiply atoms by atomic mass of each element, to find total mass
    (a) $C = 12 * 12.01 = 144.12u$
    (b) $H = 22 * 1.01 = 22.22u$
    (c) $O = 11 * 16.00u = 176.00u$
4. Find the total
    - $Total = 144.14 + 22.22 + 176.00 = 342.3u$

However, we still don't have the correct answer. Thats because $1\ molecule \neq 1\ mol$. The mass of each sample is equal to the formula mass of one particle in the units of grams. This is the

molar mass

(Above, u = g/mol)

## 2.4 Example 1

What is the molar mass of $H_2SO_4$?

1. Count the atoms (2 hydrogen, 1 Sulfur, 4 Oxygen)
2. Find the atomic mass of each element
   (a) $H = 1.01u$
   (b) $S = 32.06u$
   (c) $O = 16.00u$
3. Multiply it out
   (a) $H = 2 * 1.01 = 2.02u$
   (b) $S = 1 * 32.06 = 32.06u$
   (c) $O = 4 * 16.00 = 64.00u$
4. Add the results
   - $2.02u + 32.06u + 64.00y = 98.08u$
5. Use the correct units for molar mass
   - $= 98.08g/mol$

## 2.5 Example 2

What is the molar mass of $Al(NO_3)_3$?

1. Count the atoms (1 Aluminium, 3 Nitrogen, 9 Oxygen)

2. Find the atomic mass of each element
    (a) $Al = 26.98u$
    (b) $N = 14.01u$
    (c) $O = 16.00u$
3. Multiply it out
    (a) $Al = 26.98u * 1 = 26.98u$
    (b) $N = 14.01u * 3 = 42.03u$
    (c) $O = 16.00u * 9 = 144.0u$
4. Add the results
    - $26.98 + 42.03 + 144.0u = 213.01u$
5. Use the correct units for molar mass
    - $= 213.01g/mol$

# 3 1.1 Daily 2 - Moles and Molar Mass