High	MOL.2	Define one mole of a substance as 6.02 X 10^{23} particles.	10.1
High	MOL.3	Define atomic mass, formula mass and molecular mass.	10.2
High	MOL.4	Calculate the molar mass of a compound.	10.2
High	MOL.5	Use dimensional analysis to convert between the mass, number of moles and number of particles of a substance.	10.2-3

Directions: **Show ALL of your work. Make sure to include units!!!!**

Mole-Particle Conversions (use Avogadro's number for your conversions)

grams ⟷ **Molar Mass** ⟶ moles ⟷ **Avogadro's #** ⟶ particles

$$\text{Avogadro's \#} = \frac{6.02\times10^{23}\,\text{particles}}{1\;\text{mole}} \quad \text{or} \quad \frac{1\;\text{mole}}{6.02\times10^{23}\,\text{particles}}$$

atoms (element)
molecules (covalent)
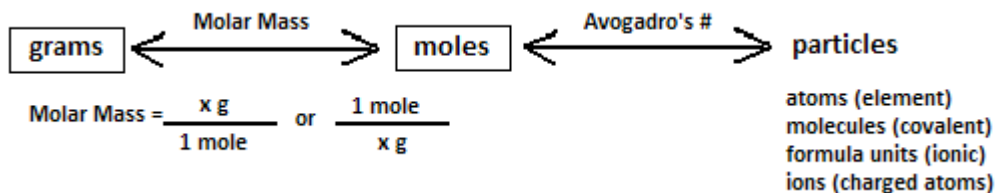formula units (ionic)
ions (charged atoms)
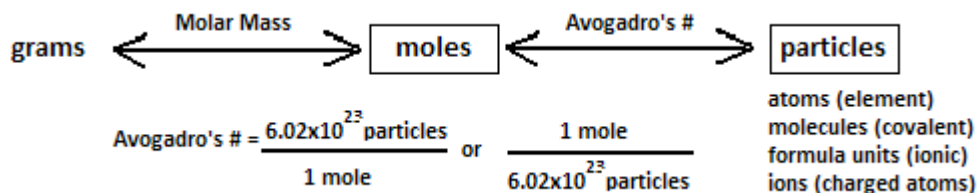
1. How many moles of magnesium are in 3.01 x 10^{22} atoms of magnesium?

2. How many molecules are there in 4.00 moles of glucose, $C_6H_{12}O_6$?

3. How many moles are 1.20 x 10^{25} formula units of calcium iodide?

4. How many formula units are in 12.5 moles of calcium phosphate?

Mole-Mass Conversions (use the molar mass from the periodic table for your conversions)
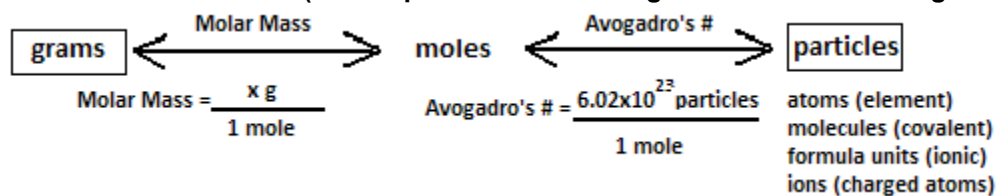
grams ⟷ **Molar Mass** ⟶ moles ⟷ **Avogadro's #** ⟶ particles

$$\text{Molar Mass} = \frac{x\;\text{g}}{1\;\text{mole}} \quad \text{or} \quad \frac{1\;\text{mole}}{x\;\text{g}}$$

atoms (element)
molecules (covalent)
formula units (ionic)
ions (charged atoms)

1. How many moles are in 28 grams of CO_2 ?

2. What is the mass of 5 moles of Fe_2O_3 ?

3. Find the number of moles of argon in 452 g of argon.

4. How many grams are in 3.45 moles of CO_2?

Gram to Particle Conversions (two step conversions using molar mass and Avogadro's number)

Molar Mass

| grams | ⟷ | moles | ⟷ | particles |

Avogadro's #

Molar Mass = $\dfrac{x\ g}{1\ mole}$

Avogadro's # = $\dfrac{6.02\times10^{23}\ particles}{1\ mole}$

atoms (element)
molecules (covalent)
formula units (ionic)
ions (charged atoms)

1. How many oxygen molecules are in 3.36 g of oxygen (O_2) [2 x mass of O]?

2. Find the mass in grams of 2.00 x 10^{23} molecules of F_2.

3. Determine the number of molecules of 14 g of nitrogen dioxide (NO_2).

4. Find the mass, in grams, of 1.00 x 10^{23} molecules of N_2.

5. Aspartame is an artificial sweetener that is 160 times sweeter than sucrose (table sugar) when dissolved in water. It is marketed by G.D. Searle as *Nutra Sweet*. The molecular formula of aspartame is $C_{14}H_{18}N_2O_5$.

   a) Calculate the molar mass of aspartame.

   b) How many moles are in 10.5 g of aspartame?

   c) How many molecules are in 10.5 g of aspartame?

   e) How many atoms of nitrogen are in 1.2 grams of aspartame?