The Mole

- A counting unit

- 6.02×10^{23} (in scientific notation)

- This number is named in honor of Amedeo Avogadro (1776 – 1856)

1 dozen cookies = 12 cookies
100 cookies = 10^2 cookies
A million of cookies = 10^6 cookies
1 mole of cookies = 6.02×10^{23} cookies

A Mole of Particles
Contain 6.02 x 10^{23} particles

1 mole C = 6.02 x 10^{23} C atoms

1 mole H_2O = 6.02 x 10^{23} H_2O molecules

1 mole NaCl = 6.02 x 10^{23} NaCl molecules

(6.02 x 10^{23} Na$^+$ ions and

6.02 x 10^{23} Cl$^-$ ions)

1 mole = 6.02 x 10^{23} particles
A particle could be an atom, a molecule, OR an ion!

Note that the NUMBER is always the same, but the MASS is very different!

Molar Mass

- The Mass of 1 mole (in grams)

Atoms

- Equal to the numerical value of the average atomic mass (get from periodic table)
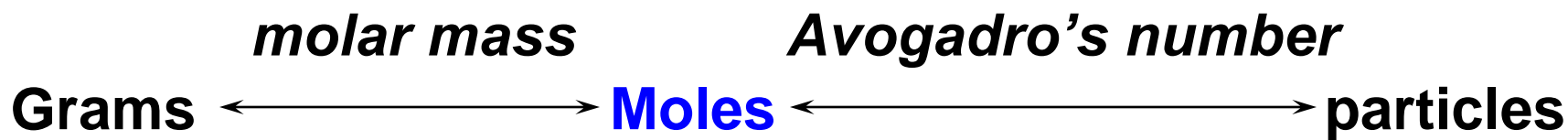
  1 mole of C atoms = 12.0 g

Molecules

- Mass in grams of 1 mole equal numerically to the sum of the atomic masses.

1 mole of H_2O = ? g

2 moles H x 1 g + 1 mole O x 16 g = 18 g H_2O

Calculations

Grams ←——— *molar mass* ———→ **Moles** ←——— *Avogadro's number* ———→ **particles**

Everything must go through Moles!!!

Atoms/Molecules and Grams

Ex: How many atoms of Cu are present in 35.4 g of Cu?

63.5g Cu = 1mol Cu

35.4g Cu = 0.56mol Cu

1mol Cu = 6.02X 10^{23} mol Cu atoms

0.56 mol Cu = 3.4 X 10^{23} Cu atoms

Test your skills

- How many atoms are in 36 grams of C?