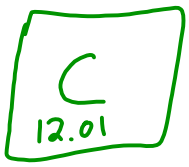
Molar Mass:

✓ **Molar mass** is the mass of one mole of a substance. 6.02 x 10^23

✓ The molar mass for an atom can be found on the periodic table under the title **atomic molar mass**

✓ The units for molar mass are grams per mole or **g/mol**



✓ To calculate the molar mass of a compound you have to add up the atomic molar mass of all atoms in that compound.

Ex. What is the molar mass of $CH_{4(g)}$?

C = 1 x 12.01g/mol = 12.01 g/mol

H = 4 x 1.01g/mol = 4.04 g/mol

CH_4 = 16.05g/mol

1 mole of methane molecules have a mass of 16.05 grams.

Ex. What is the molar mass of silver chloride? AgCl

M = 107.87 g/mol + 35.45 g/mol

M = 143.32 g/mol

Ex. What is the molar mass of sodium carbonate? Na_2CO_3

2 x 22.99 g/mol
1 x 12.01 g/mol
3 x 16.00 g/mol
105.99 g/mol

$(NH_4)_2SO_4$

2 x N = 28.02 g/mol
8 x H = 8.08 g/mol
1 x S = 32.07 g/mol
4 x O = 64.00 g/mol
132.17 g/mol

Cu^{2+} OH^-

copper (II) hydroxide

$Cu(OH)_2$

1 x Cu = 63.55 g/mol
2 x O = 32.00 g/mol
2 x H = 2.02 g/mol
97.57 g/mol

Relating Moles, Molar Mass and Mass of a substance:

✓ A mathematical formula is used to link Moles, molar mass and mass of a substance

$m = n \times M$

m = mass (g)
n = number of moles (mol)
M = molar mass (g/mol)

Example: How many moles of silicon are in a 56.18g of silicon?

Step 1: Find out the molar mass of silicon

Molar mass of silicon (Si) = 28.09 g/mol

Step 2: Rearrange the formula to solve for the unknown

$m = n \times M$

$n = \frac{m}{M}$

$\frac{56.18\,g}{28.09\,g\,mol^{-1}} = \frac{(n) \times (28.09\,g\,mol^{-1})}{28.09\,g\,mol^{-1}}$

Step 3: Calculate the answer

n = 56.18 g / 28.09 g/mol = 2.000 mol

Example: What is the mass of 10.0 mol of water?

$n = 10.0\,mol$
$M = 18.02\,g\,mol^{-1}$
$m = ?$

$m = nM$
$m = (10.0\,mol)(18.02\,g\,mol^{-1})$
$= 180.2\,g = 180\,g$

Example: How many moles are in 15.5 g of iron?

$m = 15.5\,g$
$M = 55.85\,g\,mol^{-1}$
$n = ?$

$m = nM$
$15.5\,g = n\,(55.85\,g\,mol^{-1})$
$n = \frac{15.5\,g}{55.85\,g\,mol^{-1}}$
$= 0.2775\ldots\,mol$
$= 0.278\,mol$

1 mol of Fe = 6.02×10^{23} atoms (avogadros number) #

# of atoms/molecules = (moles) $\times$ (avogadros # / 6.02×10^{23})