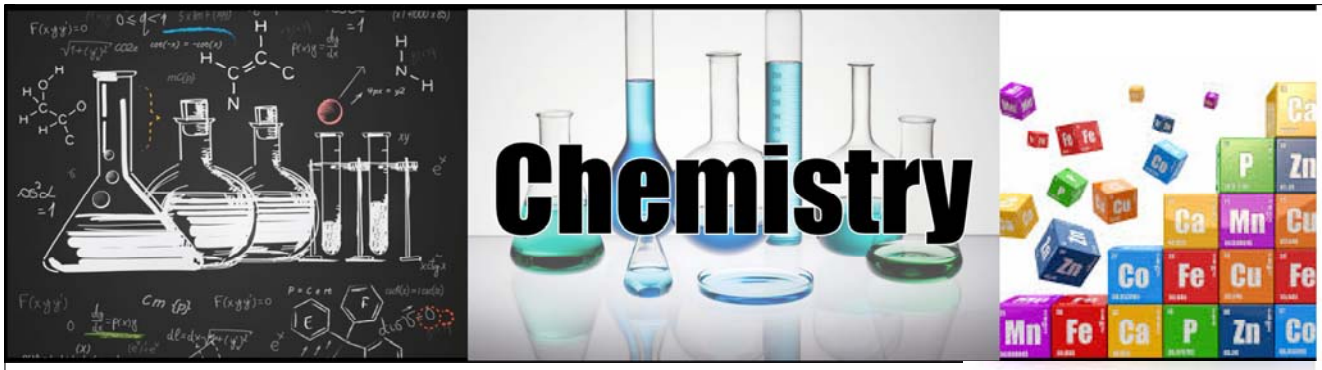

Lesson 16: The Mole

- Scientists cannot count individual atoms and molecules, so they place large numbers of them into groups.
- This group is called a mole, 1 mol is **Avagadro's number**
- 1 mol = 6.0 $\times$ 10^{23} (atoms, particles, molecules)

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Molar Mass

- Mass of one mole of a substance is called the molar mass, recorded as the atomic molar mass
- Underneath the atomic name on the periodic table

Jan 30-8:46 AM

Ex.) Determine the following:

a) What is the molar mass of methane gas: $CH_{4(g)}$?

1 carbon + 4 hydrogen

= 1(12.01) + 4(1.01)

= 16.05 g/mol

b) What is the molar mass of $(NH_4)_3PO_{4(g)}$?

= 3(14.01) + 12(1.01) + 1(30.97) + 4(16.00)

= 149.12 g/mol

c) What is the molar mass of carbon dioxide?

$CO_{2(g)}$

1(12.01) + 2(16.00)

= 44.01 g/mol

From the data booklet (pg. 10), this equation can be used to find any of the following things:

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

n = number of moles (mol)

m = mass (g)

M = molar mass (g/mol)

m M

g ÷ g/mol

g · mol/g

Si M = 28.09 g/mol

Ex.) How many moles of silicon are in a 56.18 g sample?

$$n = \frac{m}{M} = \frac{56.18\ g}{28.09\ g/mol} = 2.00\ mol$$

Ex.) What is the mass of 10.0 mol of water? H_2O $2(1.01) + 16.00$

$= 18.02 g/mol$

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

$m = M \cdot n = \frac{18.02 g}{mol} \cdot 10.0 mol = \boxed{180.2 g}$

Ex.) How many moles are in 360 g of glucose? $C_6H_{12}O_{6(s)}$

$n = \frac{m}{M} = \frac{360 g}{180.18 g/mol} = \boxed{2.00 mol}$ $6(12.01) + 12(1.01) + 6(16.00)$

$= 180.18 g/mol$

Ex.) What is the mass of 5.00 mol of $NH_{3(g)}$? 1.998 2.00

$1(14.01) + 3(1.01)$

$= 17.04 g/mol$

Worksheet

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

$m = n \cdot M = (5.00 mol)\left(\frac{17.04 g}{mol}\right) = \boxed{85.20 g}$

$5 = \frac{m}{17.04}$