Stoichiometric Principle

Stoichiometry is the study of the relationships that exist in a balanced chemical equation.

Using conversions and the mole concept it is possible to make many predictions about the relationships between different reactants and products

eg

$$N_2 + 3H_2 \rightarrow 2NH_3$$

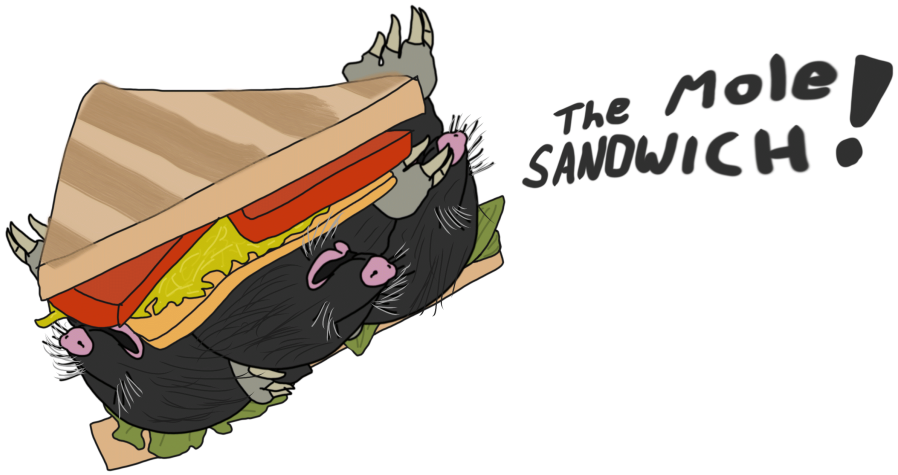
1 molec	3 molec	2 molec
2 molec	6 molec	4 molec
3 molec	9 molec	6 molec
10 molec	30 molec	20 molec
6.022×10^{23} molec	$18.066\ 10^{23}$ molec	$12.044\ 10^{23}$ molec
1 mol	3 mol	2 mol
2 mol	6 mol	4 mol
0.270 mol N_2	0.809 mol H_2	0.539 mol

$$0.539 \text{ mol } NH_3 \times \frac{1 \text{ mol } N_2}{2 \text{ mol } NH_3} = 0.270 \text{ mol } N_2$$

$$0.539 \text{ mol } NH_3 \times \frac{3 \text{ mol } H_2}{2 \text{ mol } NH_3} = 0.809 \text{ mol } H_2$$

- the Stoichiometric coefficients in the balanced chemical equation are used to provide mol to mol relationships

- this is the **only time** that you may have a number in front of mol other than 1 (a mole sandwich)



Find the mass of sodium phosphate required to produce 13.8 g of calcium phosphate through the following balanced chemical equation

$$2Na_3PO_4 + 3Ca(NO_3)_2 \rightarrow Ca_3(PO_4)_2 + 6NaNO_3$$

$$13.8\ g\ Ca_3(PO_4)_2 \times \frac{1\ mol\ Ca_3(PO_4)_2}{310.18 g\ Ca_3(PO_4)_2} \times \frac{2\ mol\ Na_3PO_4}{1\ mol\ Ca_3(PO_4)_2} \times \frac{163.94\ g\ Na_3PO_4}{1\ mol\ Na_3PO_4} = 14.6\ g\ Na_3PO_4$$

Stoichiometric Strategy: In order to be successful at stoichiometric calculations it helps to figure out where you are starting from and where you are going.

The Stoichiometric Strategy will help. The general concept is to convert to amount, change to different amount and then convert to whatever you have been asked to find.