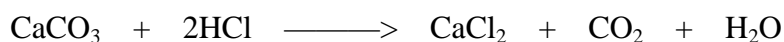# MOLE CALCULATIONS

- the mole is the standard unit of amount ... its value is 6.022 x 10^{23}
- molar mass = the mass of one mole ... it is usually measured in grams per mol... g mol^{-1}
- to calculate the number of moles ... use one of the following relationships

SINGLE SUBSTANCE	**MOLES**	**=**	**MASS / MOLAR MASS**
	mass	=	moles x molar mass
	molar mass	=	mass / moles
SOLUTION	**moles**	**=**	**concentration x volume**
	concentration	=	moles / volume
	volume	=	moles / concentration
BUT if volume is in cm^3	**MOLES**	**=**	$\dfrac{\textbf{CONCENTRATION x VOLUME (in } cm^3)}{\textbf{1000}}$

EQUATIONS
- give you the ratio in which chemicals react and are formed
- need to be balanced in order to do a calculation

WORKED EXAMPLE

$$CaCO_3 + 2HCl \longrightarrow CaCl_2 + CO_2 + H_2O$$

1. *What is the relative molecular mass of $CaCO_3$?* ANS *40 + 12 + (3 x 16) = 100*

2. *What is the mass of 1 mole of $CaCO_3$?* ANS *100 g*

3. *What does 0.1M HCl mean ?* ANS *the concentration is 0.1 mol dm^{-3}*

4. *How many moles of HCl are in $20cm^3$ of 0.1M HCl ?* ANS *$\dfrac{0.1 \ x \ 20}{1000}$ = 0.002 moles*

5. *How many moles of $CaCO_3$ will react ?* ANS *½ x 0.002 = 0.001 moles*

6. *What is the mass of 0.001 moles of $CaCO_3$?* ANS *mass = moles x molar mass = 0.001 x 100 = 0.1 g*

7. *What mass of CO_2 is produced ?* ANS *moles of CO_2 = moles of $CaCO_3$ moles of CO_2 = 0.001 moles mass of CO_2 = 0.001 x 44 = 0.044g*

QUESTION

a) Balance the equation :- $NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O$

b) How many moles in 30 cm^3 of 0.100M H_2SO_4 ?

c) How many moles of NaOH will react with 30 cm^3 of 0.100M H_2SO_4 ?

d) What volume of 0.08M NaOH will react with 30 cm^3 of 0.100M H_2SO_4 ?