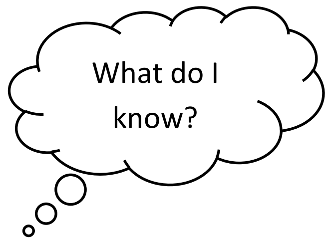
● CHEMISTRY

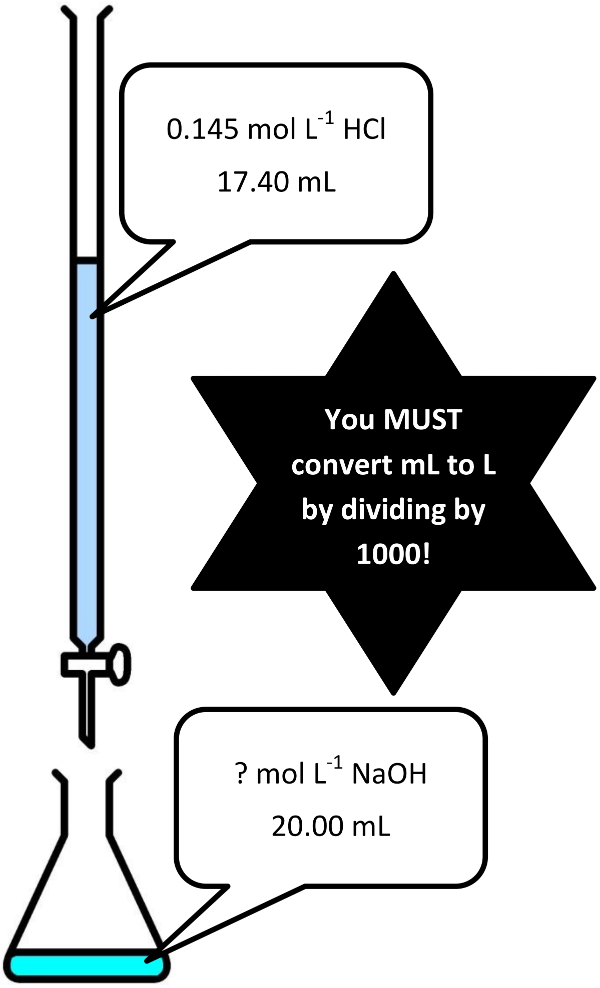
QUANTITATIVE ANALYSIS HELP SHEET

Titrations calculations made simple

1 : 1 mole ratio: e.g. HCl + NaOH → NaCl + H_2O

Aim: To find the concentration of the NaOH.





	HCl	NaOH
ratio	1	1
n		
c	0.145 mol L^{-1}	
V	0.01740 L	0.0200 L

	HCl	NaOH
ratio	1	1
n	❶ 0.002523 mol	❷ 0.002523 mol
c	0.145 mol L^{-1}	❸ 0.126 mol L^{-1}
V	0.01740 L	0.0200 L

It's as easy as n….n….c….. ☺

❶ n(HCl)   n= cV   n(HCl) = 0.145 x 0.01740 = 0.002523 mol (keep all the figures in your calculator!) You can write this as 2.523 x 10^{-3} mol, if you prefer.

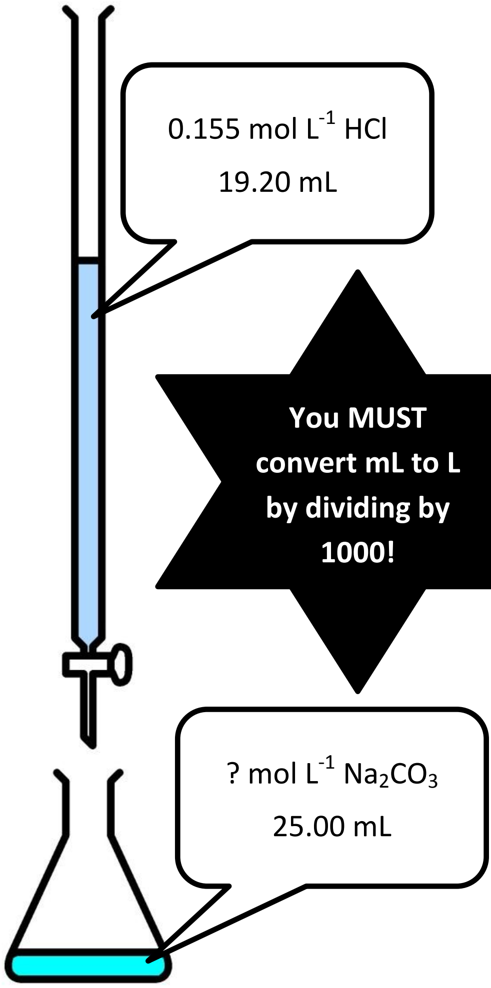
❷ n(NaOH)   HCl and NaOH react in a 1 : 1 ratio, so n(NaOH) = 0.002523 mol (AND YES, still keep all the figures in your calculator!)

❸ c(NaOH) c = n/V so c(NaOH) = 0.002523 / 0.0200 = 0.12615 mol L^{-1}. You know you are right if n was already (still) in your calculator.

Now write your final answer to 3 s.f. c(NaOH) = 0.126 mol L^{-1}.

<u>2 : 1 mole ratio</u>: e.g. $2HCl + Na_2CO_3 \rightarrow 2NaCl + H_2O + CO_2$

Aim: To find the concentration of the Na_2CO_3.



You MUST convert mL to L by dividing by 1000!

What do I know?

	HCl	Na_2CO_3
ratio	2	1
n	❶	❷
c	0.155 mol L^{-1}	❸
V	0.01920 L	0.0250 L

❶ n(HCl) = cV   n(HCl) = 0.155 x 0.01920 = 0.002976 mol

❷ n(Na_2CO_3) = 0.002976 / 2* = 0.001488 mol

❸ c(Na_2CO_3) = 0.001488 / 0.0250 = 0.05952 mol L^{-1}.

c(Na_2CO_3) = 0.0595 mol L^{-1} (3 s.f.)

We find the “2 thing” (❶HCl) and want the “1 thing” (❷ Na_2CO_3), the smaller “thing”, so we DIVIDE by 2. ☺

<u>1 : 2 mole ratio</u>: e.g. $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$

This isn’t difficult either. Remember n,n,c ☺

	H_2SO_4	NaOH
ratio	1	2
n	0.00625 mol	0.0125 mol
c	0.125 mol L^{-1}	0.553 mol L^{-1}
V	0.0250 L	0.02260 L

25.0 mL of 0.125 mol L^{-1} H_2SO_4 was neutralised by 22.60 mL of NaOH solution. What was the concentration of the NaOH solution?

Start with the substance you know 2 things about – the c and V – and find its n; find n of the other using the mol ratio, Then n/V will give you the c that you are after. Don’t forget to give final answer to 3 s.f. And make sure numbers have units... mL or L, mol and mol L^{-1}.