Moles

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Everyone loves moles.

Moles are so important they even make a guest appearance in A Level Physics...

A mole is just a number. Like 'kilo' just means 1000.

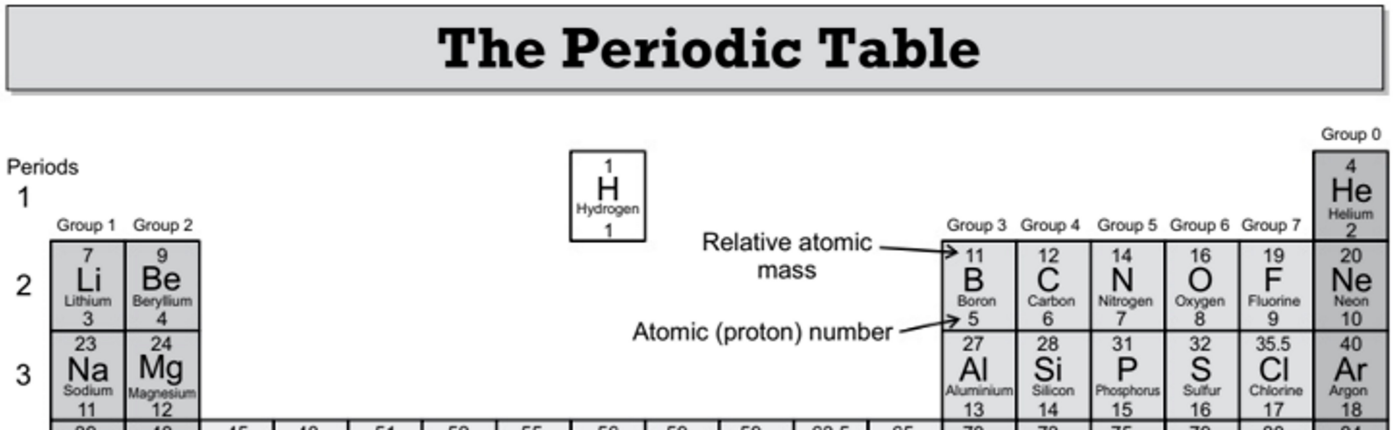
A mole is 6.02×10^{23} so... Its a pretty flipping big number. It always takes students a bit of time to get their head around the fact that it is just a number.

Moles and Particles

In chemistry it is often a number of particles. So when we say 1 mole of atoms we mean a pile of 6.02×10^{23} atoms. So a big pile. We could in theory at least, have a mole of anything. But a pile containing 1 mole of, shall we say, tennis balls, would be stupidly big. Imagine a pile of 6.02×10^{23} tennis balls ...

So why all the fuss?

Well the big deal is that it links really well with the periodic table and A_r (and M_r)



It turns out that the Ar in grams will contain 6.02×10^{23} atoms.

Pick an element - carbon. It has a Ar of 12. So if we have 12g of carbon atoms we will in fact have 6.2×10^{23} carbon atoms. For sodium (Na) the Ar is 23 - so we need 23g of carbon to have 6.02×10^{23} atoms.

And For Molecules....

Remember that 1 Mole (6.02×10^{23}) is a pile of particles. The examples above are for sodium and carbon atoms. But it also works really well for molecules from the M_r

Take CO_2 again. It has an Mr of 12 +16+16 = 44. This means that 1 mole of CO2 will have a mass of 44g. So if we had a pile of CO_2 gas that had a mass of 44g you would have ... wait for it... 6.02×10^{23} molecules.

You might well remember that gasses go round in pairs.... So what would the mass of a mole of Fl be?
Ar Fl is 19 ... But don't forget the pairs .... Fl doesn't exist on its own - but rather Fl_2. So the mass of a mole of Fluorine gas would be 2X19=38g.

You will be asked to find the number of moles in a given mass.

$$\text{Number of moles} = \frac{\text{mass in g (of an element or compound)}}{M_r \text{ (of the element or compound)}}$$

Learn this. It is 99% likely to come up.

Example..... You have 50g of Sulfuric acid (H_2SO_4). How many moles of sulphuric acid is this ?

A_r: H=1, S=32, O=16

$M_r = 2\times1 + 32 + 4\times16 = 98$

So... 1 mole of $H_2SO_4 \equiv 98g$.

So... we have $\frac{50}{98}$ moles = 0.51 moles