



# Chem!stry

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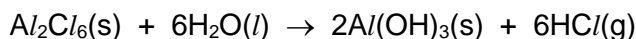
## Self-Assessment Checklist for Mole Calculations – Assignment Ten

Essential Formulae for Mole Calculations		
<p>• Mass in Grams</p> <p>moles = mass in g ÷ <math>A_r</math> or <math>M_r</math>  mass in g = moles × <math>A_r</math> or <math>M_r</math>  <math>A_r</math> or <math>M_r</math> = mass in g ÷ moles</p>	<p>• Volume of Gas</p> <p>*at room temperature and pressure</p> <p>moles = vol. of gas in <math>\text{dm}^3 \div 24.0 \text{ dm}^3</math>  vol. of gas in <math>\text{dm}^3 = \text{moles} \times 24.0 \text{ dm}^3</math></p>	<p>• Concentration of Solution</p> <p>moles = conc. × (vol. × <math>10^{-3}</math>)  conc. = moles ÷ (vol. × <math>10^{-3}</math>)  vol. = moles ÷ (conc. × <math>10^{-3}</math>)</p>

### 1. Mass in Grams or Kilograms

- Yes, I can do this:       • I'm almost there:       • I need a little more help:

What mass of aluminium hydroxide, in kilograms, is produced when 2.67 kg of aluminium chloride is added to an excess of water?



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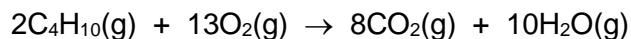
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## 2. Volume of Gas in Centimetres Cubed or Decimetres Cubed

- Yes, I can do this:       • I'm almost there:       • I need a little more help:

What volume of carbon dioxide gas, in decimetres cubed, is produced when 174 dm<sup>3</sup> of butane burns in an excess of oxygen? Note: All volumes are measured at room temperature and pressure.



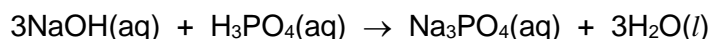
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## 3. Mass Concentration or Mole Concentration of Solution

- Yes, I can do this:       • I'm almost there:       • I need a little more help:

8.40 g of sodium hydroxide were dissolved in 250 cm<sup>3</sup> of distilled water. 25.0 cm<sup>3</sup> of this alkaline solution were pipetted into a conical flask and were found to react with exactly 28.00 cm<sup>3</sup> of phosphoric acid, which was added from a burette.

Using the mass of sodium hydroxide dissolved in 250 cm<sup>3</sup>, calculate the concentration of the sodium hydroxide solution that was used in mol/dm<sup>3</sup>, and hence calculate the concentration of the phosphoric acid.

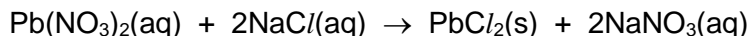


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#### 4. Percentage Yield

- Yes, I can do this:
- I'm almost there:
- I need a little more help:

38.0 cm<sup>3</sup> of 0.900 mol/dm<sup>3</sup> aqueous sodium chloride were added to excess aqueous lead(II) nitrate to form a precipitate of insoluble lead(II) chloride. Calculate the mass in grams of lead(II) chloride that should be produced by the reaction (the theoretical yield).



After the lead(II) chloride had been washed with cold distilled water and dried, it was found that only 3.21 g of the salt had been produced (the experimental yield). Calculate the percentage yield of the lead(II) chloride produced by this experiment.

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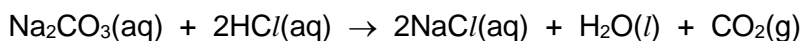
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#### 5. Percentage Purity

- Yes, I can do this:
- I'm almost there:
- I need a little more help:

A 3.00 g mixture of sodium carbonate and sodium chloride was dissolved in 25.0 cm<sup>3</sup> of distilled water. The sodium carbonate in the mixture was found to react with exactly 22.80 cm<sup>3</sup> of 2.00 mol/dm<sup>3</sup> hydrochloric acid by titration.



Calculate the moles of hydrochloric acid that reacted with then sodium carbonate, and hence calculate the mass of sodium carbonate in the mixture and then the percentage sodium carbonate in the mixture (percentage purity).

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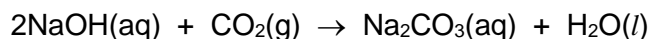
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## 6. Limiting Reagent

- Yes, I can do this:       • I'm almost there:       • I need a little more help:

800 cm<sup>3</sup> of carbon dioxide gas were bubbled through 50.0 cm<sup>3</sup> of a 1.20 mol/dm<sup>3</sup> solution of sodium hydroxide.



By calculation, identify the limiting reagent and hence calculate the mass of sodium carbonate that could be produced by the reaction.

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## 7. Percentage Composition

- Yes, I can do this:       • I'm almost there:       • I need a little more help:

Iron tablets are prescribed by doctors to treat anaemia, which is a lack of haemoglobin in the blood. Different brands of iron tablets contain different iron(II) salts. One brand of iron tablet, weighing 0.800 g, contains hydrated iron(II) sulfate – FeSO<sub>4</sub>·7H<sub>2</sub>O. A second brand of iron tablet, weighing 0.500 g, contains hydrated iron(II) oxalate – FeC<sub>2</sub>O<sub>4</sub>·2H<sub>2</sub>O. Calculate the percentage iron in each of the two hydrated salts, and hence calculate the mass of iron in each of the two different brands of tablets.

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## 8. Molecular and Empirical Formulae

- Yes, I can do this:
- I'm almost there:
- I need a little more help:

An organic compound, with a relative molecular mass of 401.6, was found to have the following percentage composition by mass:

$$\%C = 17.93 \quad \%H = 2.49 \quad \%Br = 79.58\%$$

Calculate the simple (empirical) formula of the compound and the true (molecular) formula of the compound.

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- Scan the QR code below for the answers to this assignment.



[http://www.chemist.sg/mole/assignments/mole\\_ten\\_ans.pdf](http://www.chemist.sg/mole/assignments/mole_ten_ans.pdf)

# The Periodic Table of Elements

Group																																																																																							
1	2																17	18																																																																					
	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px;">                     1 H hydrogen 1.0                 </div> <div style="border: 1px solid black; padding: 5px;">                     2 He helium 4.0                 </div> </div>																																																																																						
Key																																																																																							
atomic number atomic symbol name relative atomic mass																																																																																							
3 Li lithium 6.9	4 Be beryllium 9.0	5 B boron 10.8	6 C carbon 12.0	7 N nitrogen 14.0	8 O oxygen 16.0	9 F fluorine 19.0	10 Ne neon 20.2	11 Na sodium 23.0	12 Mg magnesium 24.3	13 Al aluminium 27.0	14 Si silicon 28.1	15 P phosphorus 31.0	16 S sulfur 32.1	17 Cl chlorine 35.5	18 Ar argon 39.9	19 K potassium 39.1	20 Ca calcium 40.1	21 Sc scandium 45.0	22 Ti titanium 47.9	23 V vanadium 50.9	24 Cr chromium 52.0	25 Mn manganese 54.9	26 Fe iron 55.8	27 Co cobalt 58.9	28 Ni nickel 58.7	29 Cu copper 63.5	30 Zn zinc 65.4	31 Ga gallium 69.7	32 Ge germanium 72.6	33 As arsenic 74.9	34 Se selenium 79.0	35 Br bromine 79.9	36 Kr krypton 83.8	37 Rb rubidium 85.5	38 Sr strontium 87.6	39 Y yttrium 88.9	40 Zr zirconium 91.2	41 Nb niobium 92.9	42 Mo molybdenum 95.9	43 Tc technetium —	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3	55 Cs caesium 132.9	56 Ba barium 137.3	57–71 lanthanoids	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.8	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.6	81 Tl thallium 204.4	82 Pb lead 207.2	83 Bi bismuth 209.0	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89–103 actinoids	104 Rf rutherfordium —	105 Db dubnium —	106 Sg seaborgium —	107 Bh bohrium —	108 Hs hassium —	109 Mt meitnerium —	110 Ds darmstadtium —	111 Rg roentgenium —	112 Cn copernicium —	113 Nh nihonium —	114 Fl flerovium —	115 Lv livermorium —	116 Uu ununoctium —	117 Ts tennessine —	118 Og oganesson —
57 La lanthanum 138.9	58 Ce cerium 140.1	59 Pr praseodymium 140.9	60 Nd neodymium 144.2	61 Pm promethium —	62 Sm samarium 150.4	63 Eu europium 152.0	64 Gd gadolinium 157.3	65 Tb terbium 158.9	66 Dy dysprosium 162.5	67 Ho holmium 164.9	68 Er erbium 167.3	69 Tm thulium 168.9	70 Yb ytterbium 173.1	71 Lu lutetium 175.0	89 Ac actinium	90 Th thorium 232.0	91 Pa protactinium 231.0	92 U uranium 238.0	93 Np neptunium —	94 Pu plutonium —	95 Am americium —	96 Cm curium —	97 Bk berkelium —	98 Cf californium —	99 Es einsteinium —	100 Fm fermium —	101 Md mendelevium —	102 No nobelium —	103 Lr lawrencium —																																																										