

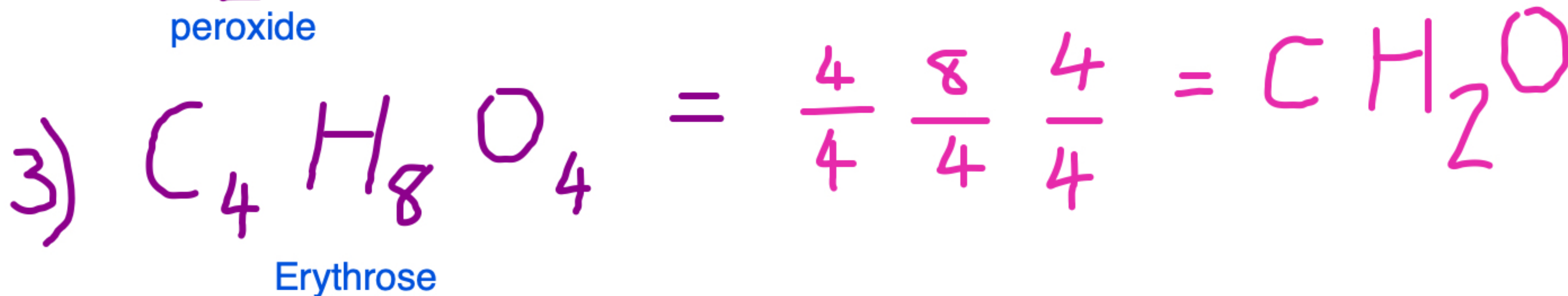
The empirical formula of a compound is the simplest ratio of the elements in that compound.

What makes up the relative atomic mass of an element?

The mass number = the number of negatively charged electrons in the outer shells

The relative atomic mass number, also known as atomic mass number = positively charged protons + neutrons.

We can always identify the A_r (relative atomic mass number) as it is always bigger/ larger than the mass number.



A sample of a compound was found to contain 55.56 grams of carbon and 9.29 grams of hydrogen.
Determine the empirical formula of this compound.

	carbon	hydrogen
Mass =	<u>55.56 g</u>	<u>9.29 g</u>

$$A_r = \quad \quad 12 \quad \quad 1$$

$$n \text{ (no of mols)} = \quad \frac{4.63}{4.63} \quad \quad \frac{9.29}{4.63}$$

$$\text{ratio} = \quad \quad 1 \quad \quad 2.007 \text{ (round down to 2)}$$



A sample of a compound contains 560g of iron and 160g of oxygen, calculate the empirical formula of the substance.

Method: Work out the number of mols of each.

Iron
Fe

Oxygen
O

mass = 560g

160g

Ar = 56

16

(mols) n = 10

10

$$\frac{10}{10} : \frac{10}{10} = 1 : 1 = \text{FeO}$$

Iron (II) oxide

1 H Hydrogen 1.008	2 He Helium 4.0026	3 Li Lithium 6.94	4 Be Beryllium 9.0122	5 B Boron 10.81	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180	11 Na Sodium 22.990	12 Mg Magnesium 24.305	13 Al Aluminium 26.982	14 Si Silicon 28.085	15 P Phosphorus 30.974	16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.630	33 As Arsenic 74.922	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 83.798

A different sample contains 336g iron and 144g Oxygen.
Calculate the empirical formula of this sample

mass = 336g.

144g

Ar = 56.

16

(mols) n = 6 ÷ 3

9 ÷ 3

2

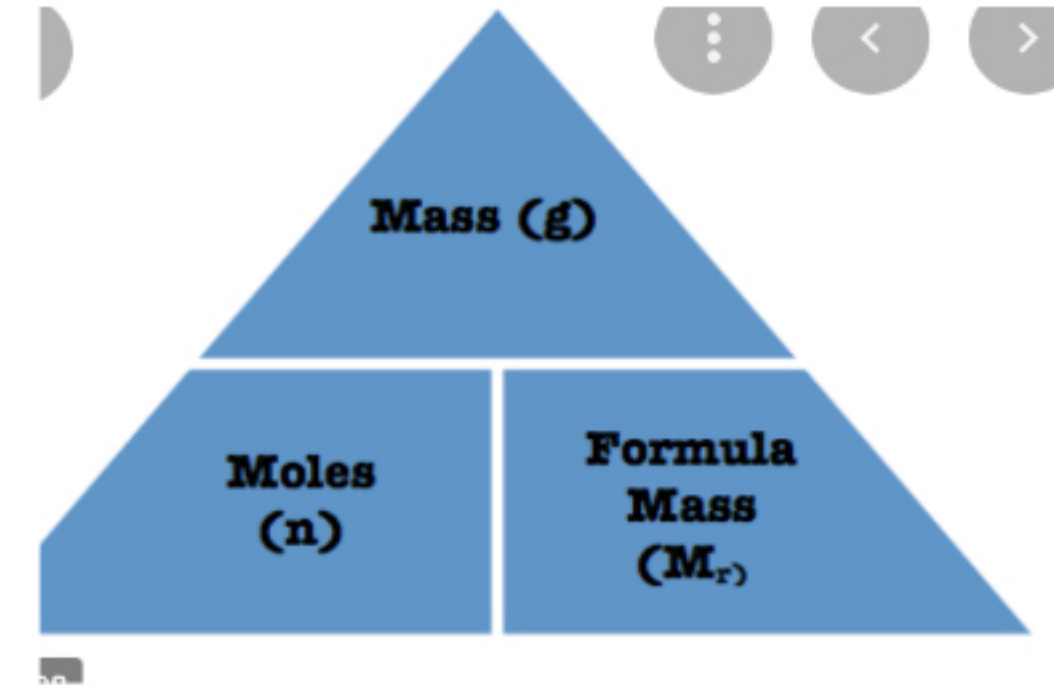
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Homework

1) A substance has 180g of carbon, 40g of hydrogen and 80g of oxygen. Calculate the empirical formula of the substance.

$$C = \frac{180}{12} = 15 \text{ mols}$$



$$H \frac{40}{1} = 40 \text{ mols}$$

$$O \frac{80}{16} = 5 \text{ mols}$$

$$15 : 40 : 5 = 3 : 8 : 1$$

divide them all by the smallest number in the ratio.

2) The percentage by mass of copper in a substance is 66.8%. The rest is oxygen, find the empirical formula of the substance.

$$100 - 66.8 = 33.2\% \text{ Oxygen}$$

$$Ar = 16$$

$$\frac{33.2}{16} = 2.075 = 2 \text{ mols}$$

$$\frac{66.8}{64} = 1.04 = 1 \text{ mol}$$

2 : 1

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18																													
															Prnctogens	Chalcogens	Halogens																															
1	H	Atomic Symbol	C Solid												2	He																																
	Hydrogen	Name	Hg Liquid													Helium																																
	1.008	Weight	H Gas													4.0026																																
3	Li	Lithium	Rf Unknown												5	B	6	C	7	N	8	O	9	F	10	Ne																						
	6.94													10.81		12.011		14.007		15.999		18.998		20.180																								
4	Be	Beryllium											11	Na	12	Mg	13	Al	14	Si	15	P	16	S	17	Cl	18	Ar																				
	9.0122													22.990		24.305		26.982		28.085		30.974		32.06		35.45		39.948																				
11	Na	Sodium											19	K	20	Ca	21	Sc	22	Ti	23	V	24	Cr	25	Mn	26	Fe	27	Co	28	Ni	29	Cu	30	Zn	31	Ga	32	Ge	33	As	34	Se	35	Br	36	Kr
	22.990													39.098		40.078		44.956		47.867		50.942		51.996		54.938		55.845		58.933		58.693		63.546		65.38		69.723		72.630		74.922		78.971		79.904		83.798

reweigh the crucible

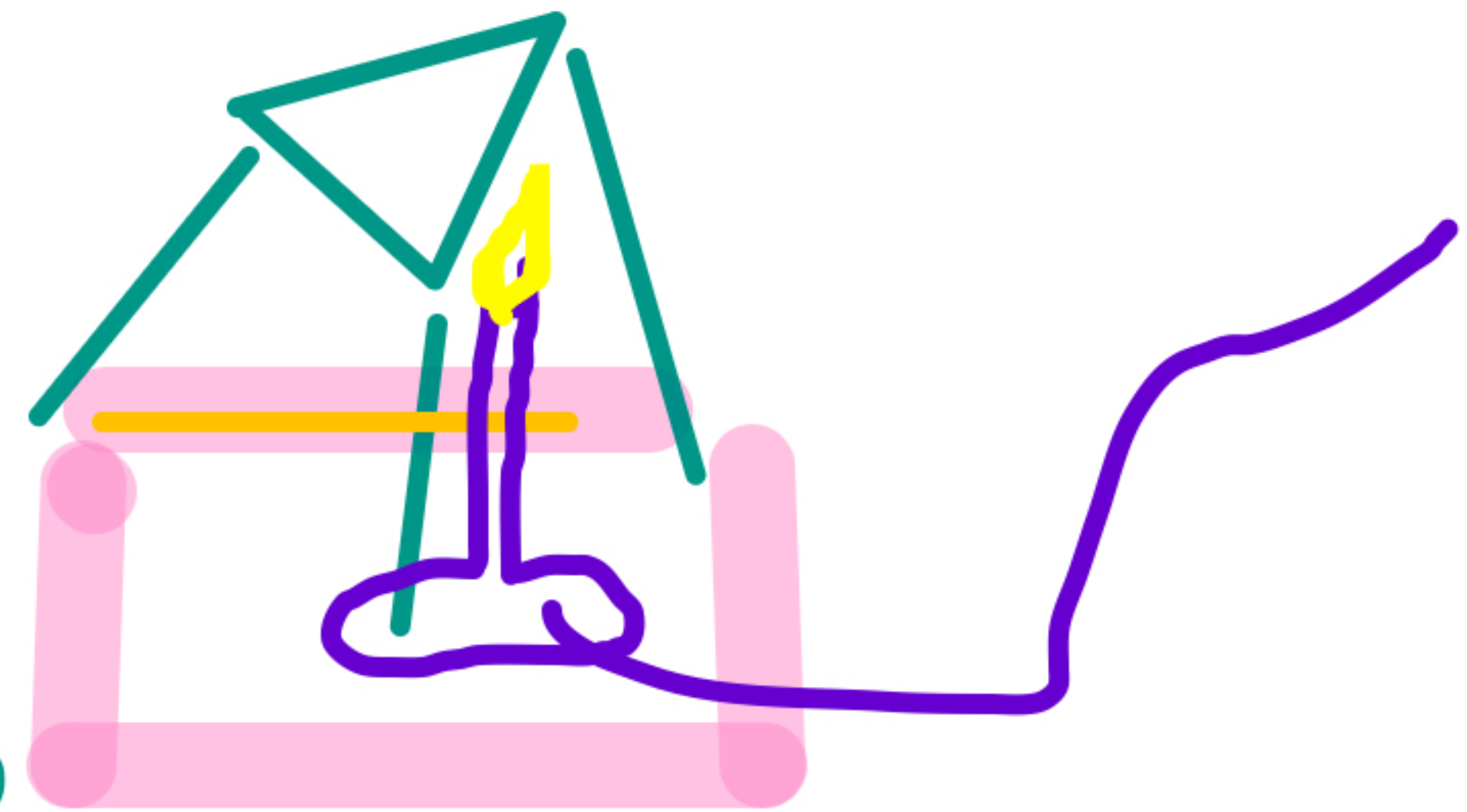
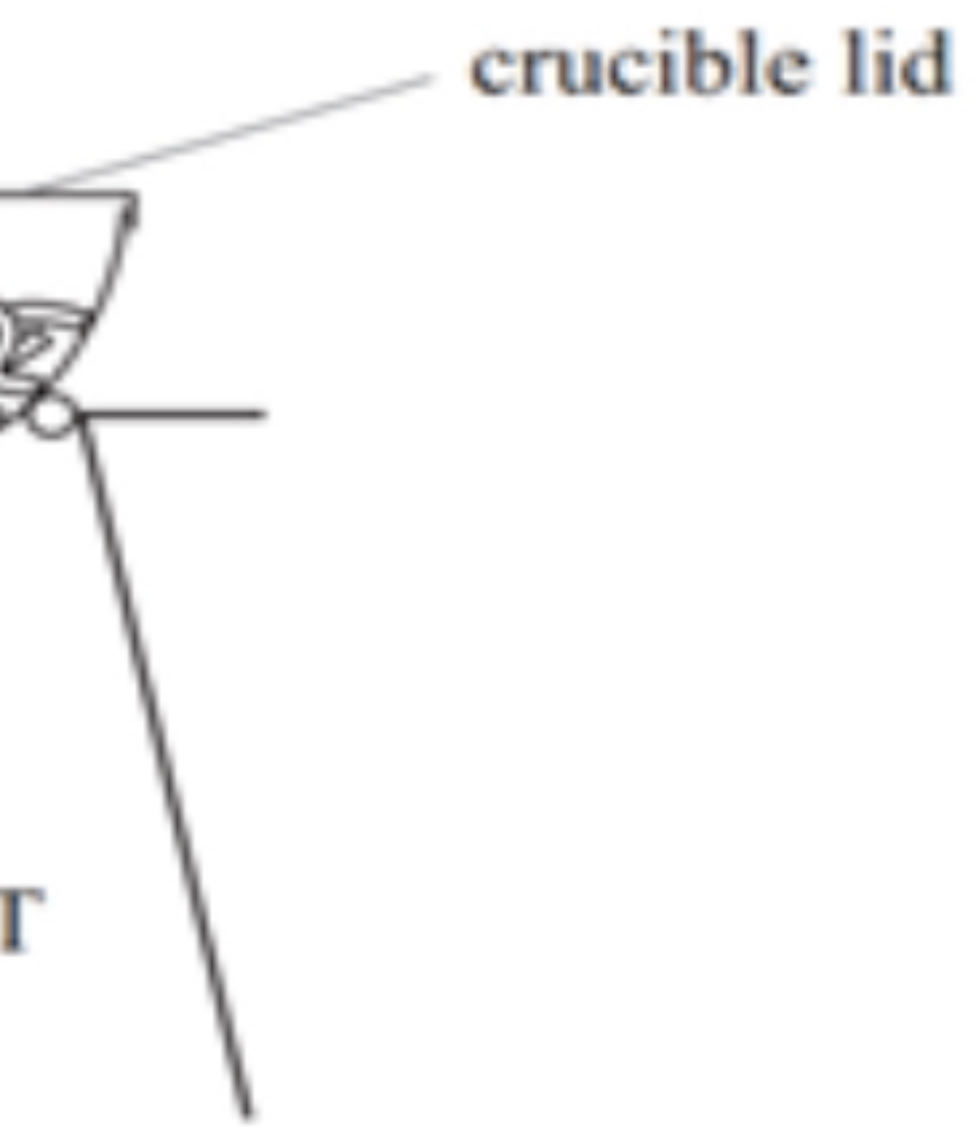
mass of c + contents after experiment (g) **52.80**

get the mass of magnesium.

$$52.65\text{g} - 52.4\text{g} = 0.25\text{g} \quad \text{weight of Mg ribbon at the start}$$

$$52.80 - 52.65 = 0.15\text{g} \quad \text{at the end of the exp}$$

0.15g increase in weight



$$\frac{0.25}{24} = 0.01\text{mol}$$

mols of Mg

$$\frac{0.15}{16} = 0.009\text{mol}$$

mols of Oxygen

$$\frac{0.01 \times 100}{0.009 \times 100}$$

1 : 0.9