

Combined Science - Chemistry - Key Stage 4

Quantitative Chemistry

Review Lesson

Higher

Mrs Begum



Periodic Table of Elements

Key:

relative atomic mass → **1**

Name → **H**

Atomic symbol → **H**

Atomic (proton number) → **1**

1 H hydrogen 1																	4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[97] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[267] Rf rutherfordium 104	[270] Db dubnium 105	[269] Sg seaborgium 106	[270] Bh bohrium 107	[270] Hs hassium 108	[278] Mt meitnerium 109	[281] Ds darmstadtium 110	[281] Rg roentgenium 111	[285] Cn copernicium 112	[286] Nh nihonium 113	[289] Fl flerovium 114	[289] Mc moscovium 115	[293] Lv livermorium 116	[293] Ts tennessine 117	[294] Og oganesson 118

* The lanthanides (atomic numbers 58 - 71) and the Actinides (atomic numbers 90 - 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.



Independent practice 1

Calculate the M_r of the following:

1. Ethanoic acid - CH_3COOH
2. Ethane - C_2H_6
3. Magnesium Nitrate - $\text{Mg}(\text{NO}_3)_2$
4. Aluminium nitrate - $\text{Al}(\text{NO}_3)_3$
5. Aluminium sulfate - $\text{Al}_2(\text{SO}_4)_3$

Relative atomic masses
(M_r):

- H - 1
- Al - 27
- Mg - 24
- N - 14
- C - 12
- O - 16
- S - 32



Independent practice 2

The relative formula mass (M_r) of a Group 2 sulfate is 142.

Formula X_2SO_4

Relative atomic masses (A_r): S = 32, O = 16

- Calculate the relative atomic mass (A_r) of the Group 2 metal in the metal carbonate.
- Name the Group 2 metal.



Independent practice 3

1. What is the percentage of fluorine in tin fluoride (SnF_2)?
2. What is the percentage of magnesium in magnesium carbonate (MgCO_3)?
3. What is the percentage of oxygen in aluminium hydroxide $\text{Al}(\text{OH})_3$?
4. What percentage of nitrogen in magnesium nitrate $\text{Mg}(\text{NO}_3)_2$?

Relative atomic masses (A_r):

- H - 1
- Al - 27
- Mg - 24
- N - 14
- C - 12
- O - 16
- Sn - 119
- F - 19



Independent practice 4

How many grams in:

- 5 mol of CaCO_3 ?
- 0.01 mol of NaHCO_3 ?

How many moles are in:

- 303 g of KNO_3 ?
- 9.80 g of H_2SO_4 ?

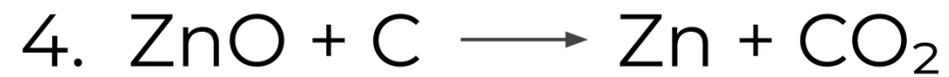
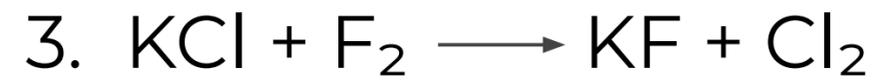
How many:

- atoms are 0.1 mol of carbon?
- molecules are in 0.01 mol of CH_4 ?
- atoms are in 0.01 mol of CH_4 ?



Independent practice 5

Balance the following equations:



Independent practice 6

Iron can be extracted from its ores by heating it with carbon. Some students found that 6.4 g of Fe_2O_3 reacted with 0.72 g of C to produce 4.48 g of Fe and 2.64 g of CO_2 . Use the masses to deduce the balanced equation.



Independent practice 7

Convert the volumes below to dm^3 :

1. 20 cm^3
2. 600 cm^3
3. 100 cm^3
4. 0.07 cm^3
5. 370 cm^3

Convert the volumes below to cm^3 :

6. 2 dm^3
7. 50 dm^3
8. 38 dm^3
9. 0.8 dm^3
10. 6.4 dm^3



Independent practice 8



80 g of Fe reacted with **100 g** of H_2SO_4 . Which reactant is the limiting reactant?

Relative atomic masses (M_r): Fe = 56, H = 1, O = 16, S = 32



Independent practice 1 answers

Calculate the M_r of the following:

1. Ethanoic acid - CH_3COOH . **60**
2. Ethane - C_2H_6 . **30**
3. Magnesium Nitrate - $\text{Mg}(\text{NO}_3)_2$. **148**
4. Aluminium nitrate - $\text{Al}(\text{NO}_3)_3$. **213**
5. Aluminium sulfate - $\text{Al}_2(\text{SO}_4)_3$. **342**



Independent practice 2 answers

$$X_2SO_4 = 146$$
$$X + X + 32 + (4 \times 16) = 146$$

$$X + X + 32 + 64 = 146$$

$$X + X + 96 = 146$$

$$X + X = 146 - 96$$

$$2X = 46$$

$$X = 46/2$$

$$X = 23$$

$$X = \text{Sodium}$$



Independent practice 3 answers

1. What is the percentage of fluorine in tin fluoride (SnF_2)? **$38/157 \times 100\% = 24\%$**
2. What is the percentage of magnesium in magnesium carbonate (MgCO_3)? **$24/84 \times 100\% = 29\%$**
3. What is the percentage of oxygen in aluminium hydroxide $\text{Al}(\text{OH})_3$? **$48/73 \times 100\% = 66\%$**
4. What percentage of nitrogen in magnesium nitrate $\text{Mg}(\text{NO}_3)_2$? **$28/148 \times 100\% = 19\%$**

Relative atomic masses (A_r):

- H - 1
- Al - 27
- Mg - 24
- N - 14
- C - 12
- O - 16
- Sn - 119
- F - 19



Independent practice 4 answers

How many grams in:

- 5 mol of CaCO_3 ? **$5 \times 100 = 500\text{g}$**
- 0.01 mol of NaHCO_3 ? **$0.01 \times 84 = 0.084\text{ g}$**

How many moles are in:

- 303 g of KNO_3 ? **$303/101 = 3$**
- 9.80 g of H_2SO_4 ? **$9.8/ 98 = 0.1$**

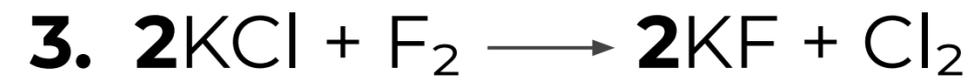
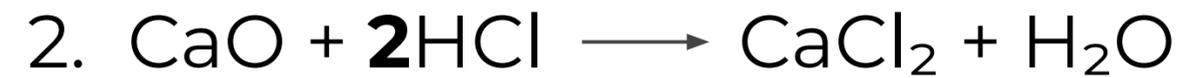
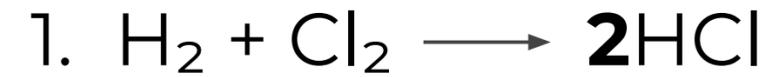
How many:

- atoms are 0.1 mol of carbon? **$(6.02 \times 10^{23}) \times 0.1 = 6.02 \times 10^{22}$**
- molecules are in 0.01 mol of CH_4 ? **$(6.02 \times 10^{23}) \times 0.01 = 6.02 \times 10^{21}$**
- atoms are in 0.01 mol of CH_4 ? **$(6.02 \times 10^{21}) \times 5 = 3.01 \times 10^{22}$**



Independent practice 5 answers

Balance the following equations:



Independent practice 6 answers

Convert the volumes below to dm^3 :

1. 20 cm^3 **0.02 dm^3**
2. 600 cm^3 **0.6 dm^3**
3. 100 cm^3 **0.1 dm^3**
4. 0.07 cm^3 **0.00007 dm^3**
5. 370 cm^3 **0.37 dm^3**

Convert the volumes below to cm^3 :

6. 2 dm^3 **2000 cm^3**
7. 50 dm^3 **50000 cm^3**
8. 38 dm^3 **38000 cm^3**
9. 0.8 dm^3 **800 cm^3**
10. 6.4 dm^3 **6300 cm^3**



Independent practice 7 answer



Work out the M_r

Take one mass from the question

Work out scale factor

Apply to the other reactant to see how much is needed

56



80

$\div 56$
 $\times 80$

98



140g

$\div 56$
 $\times 80$

153

2

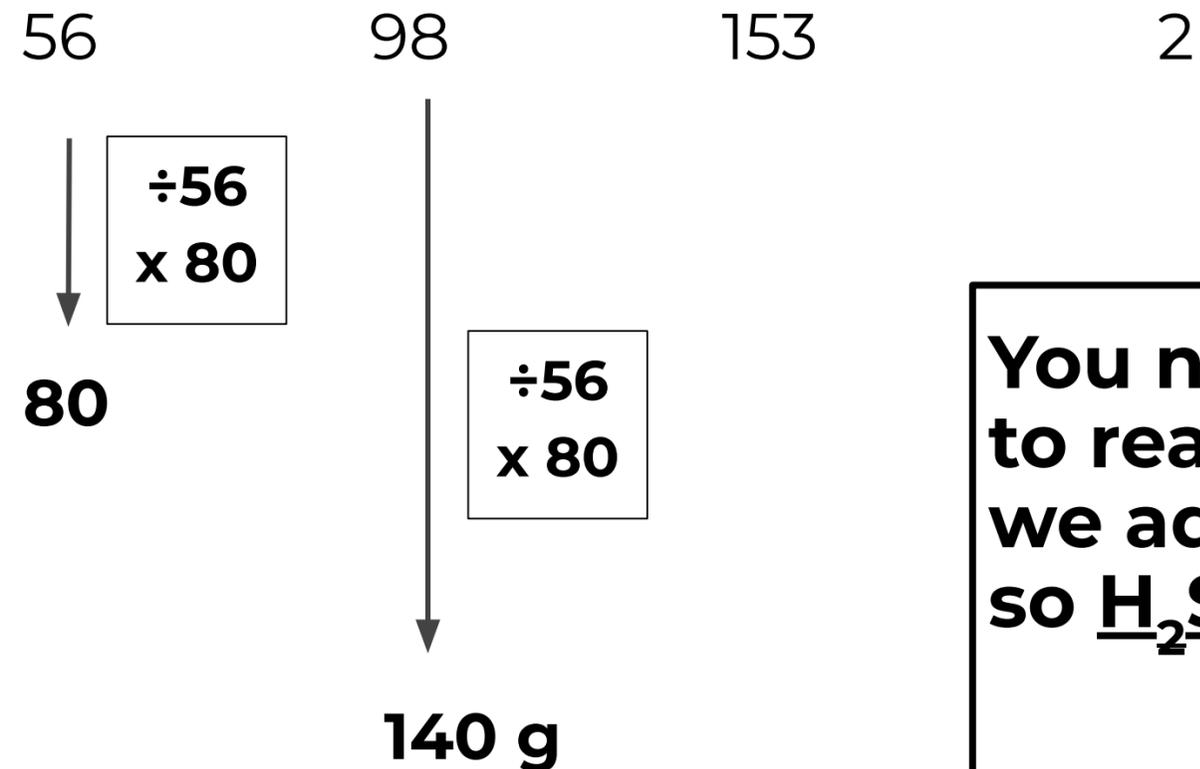
You need 140 g of H_2SO_4 to react with 80 g Fe, but we added 100 g of H_2SO_4 , so H_2SO_4 will run out first.



Independent practice 8 answer



- Work out the M_r
- Take one mass from the question
- Work out scale factor
- Apply to the other reactant to see how much is needed



You need 140 g of H_2SO_4 to react with 80 g Fe, but we added 100 g of H_2SO_4 , so H_2SO_4 will run out first.

