

Combined Science - Chemistry - Key Stage 4

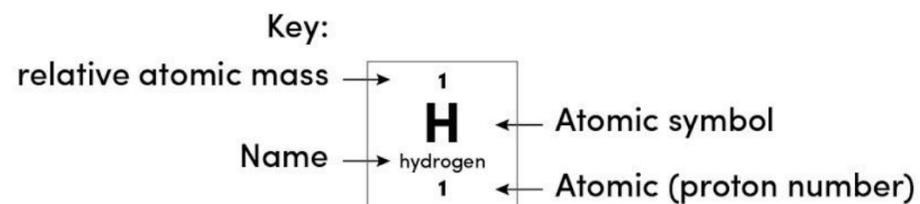
Quantitative Chemistry

# Relative Formula Mass - Higher

Mrs. Begum



# Periodic Table of Elements



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



# Percentage composition questions

1. Calculate the percentage composition for the named element in these compounds:
- a) Aluminium in  $\text{Al}_2\text{O}_3$
  - b) Oxygen in  $\text{K}_2\text{SO}_4$
  - c) Hydrogen in  $\text{Al}(\text{OH})_3$
  - d) Nitrogen in  $\text{Mg}(\text{NO}_3)_2$

Relative atomic masses:

- Al = 27
- H = 1
- K = 39
- Mg = 24
- N = 14
- O = 16
- S = 32
- Cu = 63.5



# Relative formula mass question

2. The relative formula mass of a Group 1 sulphate is 174.

The formula is  $X_2SO_4$ .

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

- Calculate the relative atomic mass of the Group 1 metal.
- Name the metal.



# Exam Question 1

3. Potassium nitrate is another nitrogen compound. It is used in fertilisers. It has the formula **KNO<sub>3</sub>**.

The **M<sub>r</sub>** of potassium nitrate is **101**.

Calculate the percentage of **oxygen** by mass in potassium nitrate.

Relative atomic mass: O = 16.

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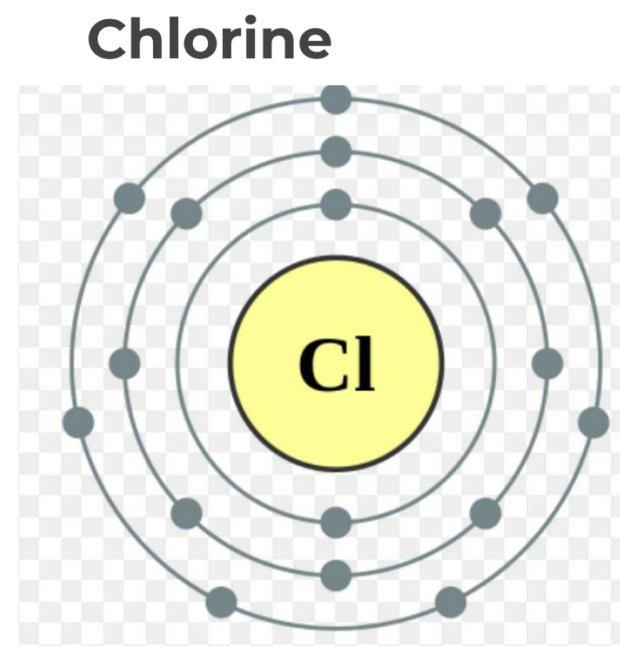
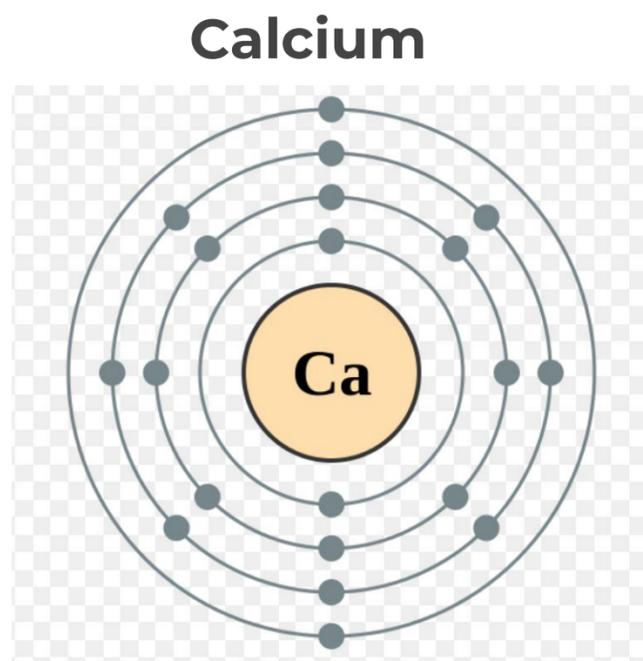
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Percentage of oxygen = \_\_\_\_\_ %  
**(2)**



# Exam Question 2

4. (a) The diagram shows an atom of calcium and an atom of chlorine.



(b) Calculate the relative formula mass ( $M_r$ ) of calcium chloride ( $\text{CaCl}_2$ ).

Relative atomic masses ( $A_r$ ):  
calcium = 40; chlorine = 35.5

Relative formula mass ( $M_r$ ) = \_\_\_\_\_  
**(2)**

Describe, in terms of electrons, how calcium atoms and chlorine atoms change into ions to produce calcium chloride ( $\text{CaCl}_2$ ).  
**(4)**

Credit - Calcium and chlorine atom by Pumbaa, Wikimedia Commons.



# Exam Question 3

5.

- (a) The percentage by mass of oxygen in carbon dioxide ( $\text{CO}_2$ ) is calculated by the equation:

$$\text{percentage by mass} = \frac{\text{number of atoms of O} \times \text{Relative atomic mass of oxygen (O)}}{\text{relative molecular mass of carbon dioxide (CO}_2\text{)}} \times 100$$

Relative atomic masses ( $A_r$ ): C = 12 O = 16

Calculate the percentage by mass of oxygen in carbon dioxide ( $\text{CO}_2$ ). **(2)**



# Answers

1. a) 52.9%  
b) 45.1%  
c) 3.8%  
d) 18.9%

2. a) 39  
b) Potassium

3. 47.5%

4. a) Calcium loses two electrons  
two atoms of chlorine gain one electron each

$$b) 40 + (2 \times 35.5) = 111$$

5. a)  $M_r = 12 + (2 \times 16)$

$$M_r = 44$$

$$\text{Mass of oxygen} = 2 \times 16 = 32$$

$$32/44 \times 100 = 72.7\%$$

