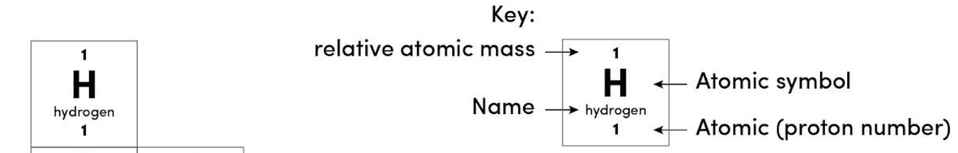
Combined Science - Chemistry - Key Stage 4

Investigating the Reactivity of Metals

Mr Campbell

Periodic Table of Elements



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 87	[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 organesson 118

Source: Oak

* 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.

Question 1.

A student wanted to investigate how changing the the concentration of acid affected the temperature rise when reacting with magnesium.

The student added 0.5g of magnesium to 25cm^3 of 0.5, 1.0, 1.5 and 2 mol/dm^3 acid. They then recorded the maximum temperature reached during the reaction.

Identify the

- Independent variable (only one)
- Dependent variable (only one)
- Control variables (try and find at least two)

Question 2

A student investigated the reactivity of three metals by reacting them with hydrochloric acid and recording the temperature change in the reaction.

Metal	Start Temperature (^{0}C)	End Temperature (^{0}C)	Temperature Change (^{0}C)
Zinc	20.0	36.5	16.5
Iron	20.0	33.0	13.0
Magnesium	19.5	87.5	68.0

The most reactive metal is _____ I know this because .....
The least reactive metal is _____ I know this because.....

Question 3

Answer the questions below in full sentences

i) Complete the general word equation for the reaction of a metal and acid

Metal + acid → _____ + _____

ii) Give **two** observations you would make when a metal reacts with an acid

iii) **Challenge** - If zinc chloride has been formed in the reaction between zinc and an acid, which acid must have been used?

Answers

Question 1

- Independent variable: **Concentration of acid**
- Dependent variable: **Maximum temperature reached**
- Control variables: any from **Mass of magnesium, volume of acid, temperature of acid, surface area of magnesium**

Question 2

The most reactive metal is **magnesium** I know this because **it gave the highest temperature rise**

The least reactive metal is **iron** I know this because **it gave the lowest temperature rise**

Question 3

i) Complete the general word equation for the reaction of a metal and acid

Metal + acid → **salt** + **hydrogen**

ii) Give two signs a chemical reaction is taking place when a metal reacts with an acid **Any two from, bubbles/fizzing/effervescence, metal disappears, temperature increase**

iii) Challenge - If zinc chloride has been formed in the reaction between zinc and an acid, which acid must have been used? **Hydrochloric acid**