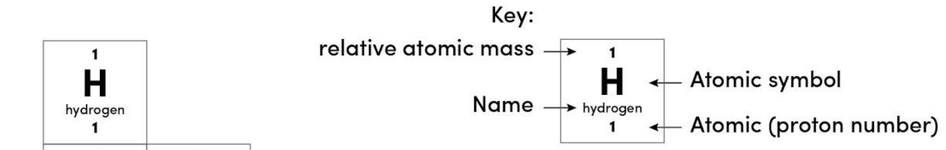
Structures and Bonding Solids, Liquids and Gases Worksheet

Combined Science - Chemistry - Key Stage 4

Mr Robbins

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 copemicium 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

* 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.

1. The table gives the melting points and boiling points of some elements.

a) What state is neon in at −247 °C?

b) What state is zirconium in at 2500 °C?

c) Which elements in the table are liquids at 2000 °C?

d) Which elements in the table are gases at 4000 °C?

e) Which elements are solids at −100 °C?

f) By using the data in the table which elements are most likely to be metals? Explain your answer.

g) David says “If an element has a high melting point then it must be because the atom is very heavy” Do you agree. Give a reason for your answer.

h) HT only. Why is the particle model not accurate when used for some substances?

Element	Melting point (°C)	Boiling point (°C)
Boron	2076	2550
Neon	−249	−246
Niobium	2469	4927
Zirconium	1855	4371
Yttrium	1522	3337

Answers

a) Liquid
b) Liquid
c) Zirconium, Yttrium
d) Yttrium, Neon, Boron
e) Boron, Niobium, Zirconium, Yttrium
f) Boron, Niobium, Zirconium, Yttrium. All have high melting and boiling points
g) I do not agree. It is to do with the strength of bonds or forces of attraction between the particles
h) It assumes particles are perfect spheres, dense and have no attractive forces between them

Quick check

	How are the particles arranged?	How do the particles move?
Solid		
Liquid		
Gas		

Independent task

When the particles of a solid are heated they begin to vibrate _____. We register this as a change in _____. When it reaches the melting point the temperature does not _____. The energy is used to overcome some of the _____ forces between the particles. When it has completely melted the temperature begins to _____ again.

When the boiling point is reached the _____ remains constant. The energy is used to overcome more intermolecular _____ allowing the particles to escape into the _____ phase

Quick check

$$Na_2S_2O_3(s) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + SO_2(g) + S(s)$$

1. List the solids
2. How many liquids are there?
3. What is the formula of the gas
4. Which substance is in solution before the reaction begins?