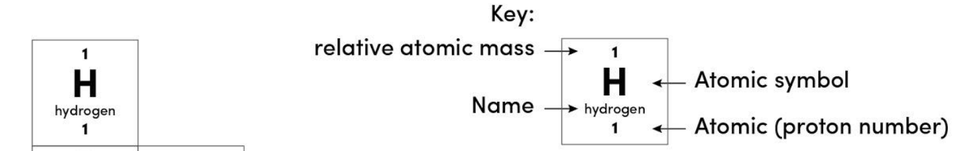
Structures and Bonding - The Properties of Ionic Compounds Worksheet

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.

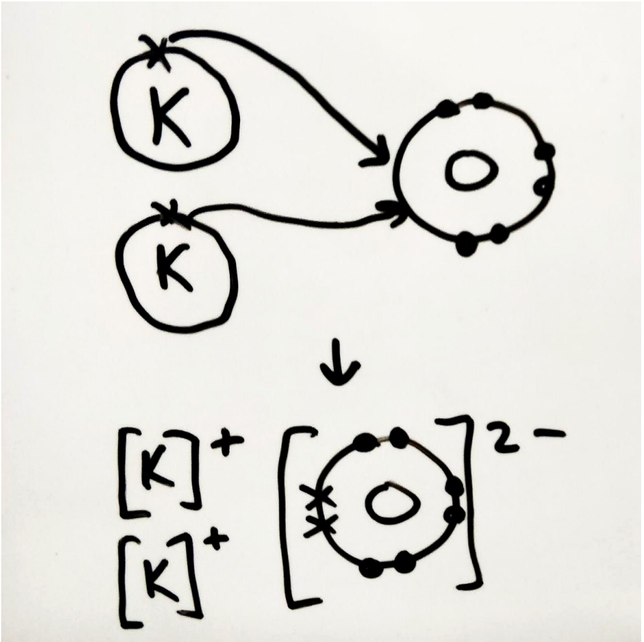
Ionic bonding and properties: Summary questions

These questions are aimed to help consolidate all the work on ionic bonding.

Potassium oxide is an ionic compound. Answer the questions below about potassium oxide.

1. How many protons are in potassium?
2. How many neutrons are in oxygen?
3. Explain why oxygen ions take a 2- charge in terms of protons and electrons.
4. Draw a set of diagrams to explain, in terms of electrons, what occurs when potassium and oxygen react together.
5. What is the formula for potassium oxide?
6. Why are potassium and oxygen ions attracted to each other?
7. What is the name for potassium oxide's structure?
8. Give two properties of potassium oxide.
9. Explain why solid potassium oxide does not conduct electricity.
10. Explain why potassium oxide has a high melting point.

Answers



1. 19
2. 8
3. Gained two electrons / 8 protons, 10 electrons
4. Two potassium atoms each transfer one electron to an oxygen, forms $2K^+$ and O^{2-} or
5. K_2O
6. They have opposite charges
7. Giant ionic lattice
8. High melting and boiling point, does not conduct electricity as solid, does conduct as (aq) or (l)
9. Giant ionic lattice; Its ions are not free to move and it does not have delocalised electrons
10. Giant ionic lattice; strong ionic bonds formed from electrostatic force of attraction between oppositely charged ions, requires lots of energy to break

Quick check:

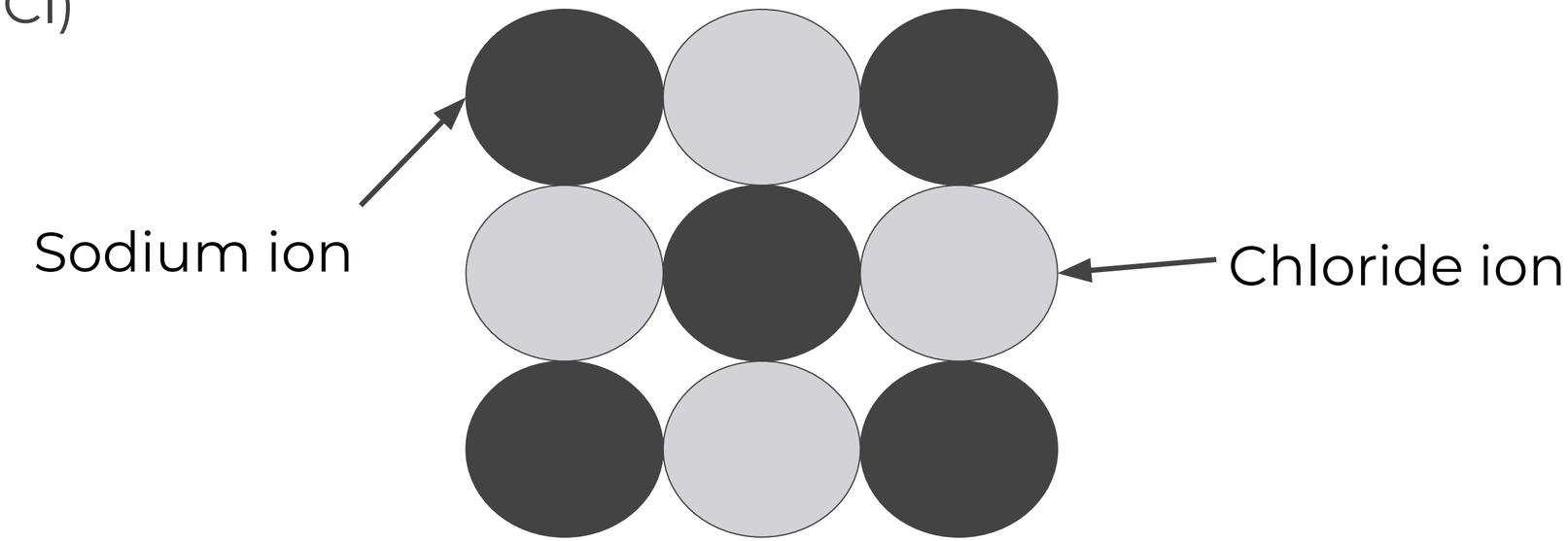
1. What type of crystal structure do ionic compounds form?
2. What are the three properties of ionic compounds?
3. What does molten mean?
4. Wax melts easily and does not dissolve. Is it ionically bonded?

Quick check on conduction and solubility

1. Why do ionic compounds conduct when molten?
2. Why do ionic compounds conduct when in solution?
3. Why does a solid ionic compound not conduct electricity?
4. Why does distilled (pure) water not conduct electricity?

Exam style question

The diagram below shows part of the structure and bonding in sodium chloride (NaCl)

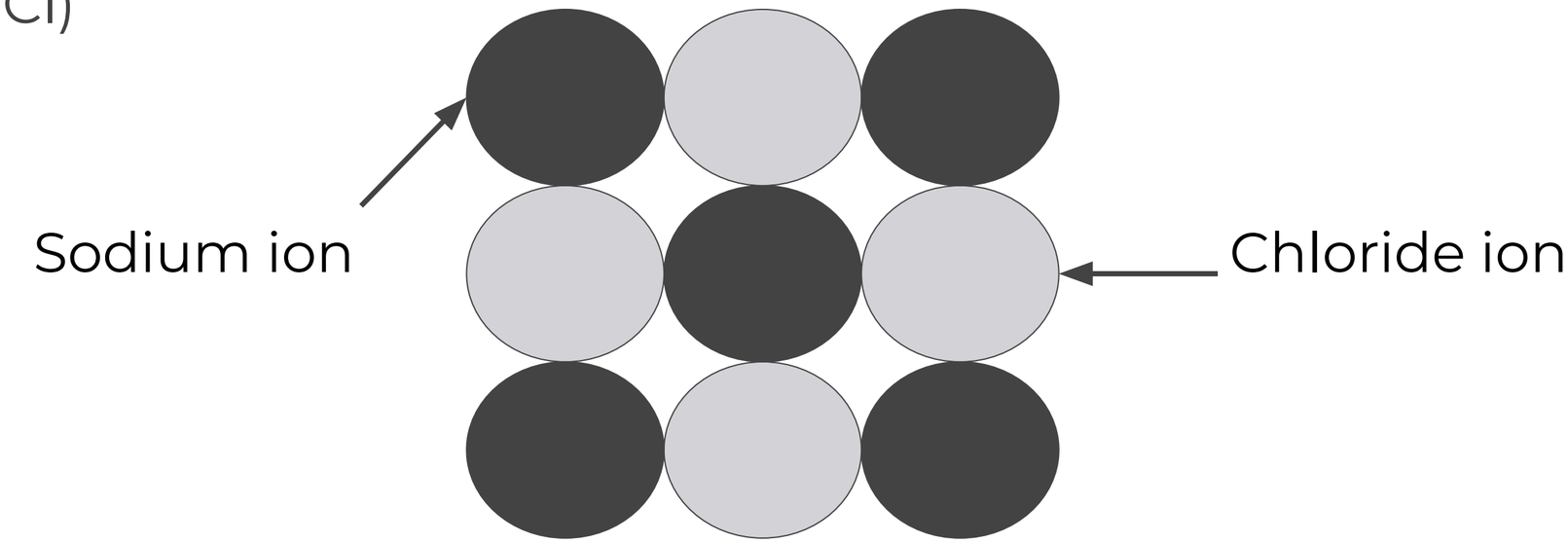


Describe the conditions needed for sodium chloride to conduct electricity

[2 marks]

Exam style question

The diagram below shows part of the structure and bonding in sodium chloride (NaCl)



Explain why sodium chloride conducts electricity when molten or in solution, but not as a solid [1 mark]