

Structures and Bonding

Review 2: Bonding Review

Worksheet

Combined Science - Chemistry - Key Stage 4

Mr Robbins



Periodic Table of Elements

Key:

relative atomic mass	1	Atomic symbol
Name	hydrogen	Atomic (proton number)

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 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.



Good scientific language Rewrite the sentence using correct scientific language

Poor statement	Corrected/improved statement
Ionic bonds are formed when metals and non-metals share electrons	
Diamond has a high melting and boiling point because it has strong intermolecular forces	
Carbon dioxide is a gas at room temperature because the bonds between carbon and oxygen are weak	
An alloy is when two metals are joined together	
Metals conduct electricity because they have free electrons	
When an ionic compound is melted a solution is formed	
Ionic compounds conduct electricity as liquids or in solution because then the electrons are free to move	
Atoms that lose electrons become negatively charged ions	



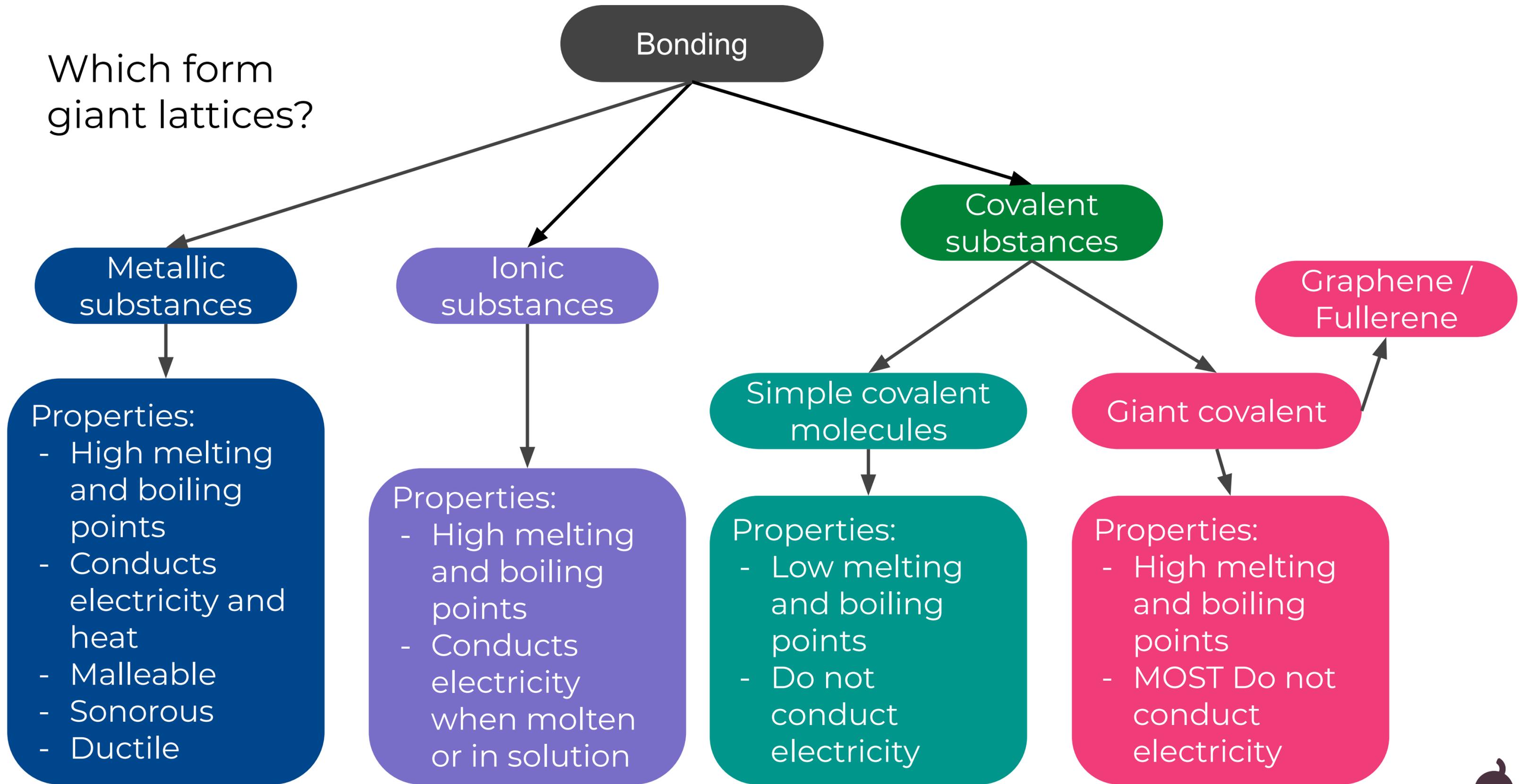
Good scientific language Rewrite the sentence using correct scientific language

ANSWERS

Poor statement	Corrected/improved statement
Ionic bonds are formed when metals and non-metals share electrons	Ionic bonds are formed when metals lose electrons and non-metals gain them
Diamond has a high melting and boiling point because it has strong intermolecular forces	Diamond has a high melting and boiling point because it is a giant lattice of strong covalent bonds that take a lot of energy to break
Carbon dioxide is a gas at room temperature because the bonds between carbon and oxygen are weak	Carbon dioxide is a gas at room temperature because the forces of attraction between the CO ₂ molecules is weak
An alloy is when two metals are joined together	An alloy is a mixture of two metals
Metals conduct electricity because they have free electrons	Metals conduct electricity because they have free electrons that can move through the metal
When an ionic compound is melted a solution is formed	When an ionic compound is melted a liquid is formed
Ionic compounds conduct electricity as liquids or in solution because then the electrons are free to move	Ionic compounds conduct electricity as liquids or in solution because then the ions are free to move
Atoms that lose electrons become negatively charged ions	Atoms that lose electrons become positively charged ions



Which form
giant lattices?



Revision quiz: Independent task

1. Which type of elements form ionic bonds?
2. What is a covalent bond?
3. Why do some structures form giant covalent structures?
4. Why do ionic substances have high melting points?
5. Why do substances like carbon dioxide, oxygen and hydrogen have low melting and boiling points?
6. Which element is contained in both diamond and graphite?
7. How many bonds does each carbon atom in diamond form?
8. Why does graphite conduct electricity?



Revision quiz part 2: Independent task

9. Why is graphite slippery and soft?
10. What holds metals together?
11. What is a polymer?
12. What is an alloy?
13. Why are alloys harder than pure metals?
14. What is “electrostatic attraction”?
15. What does “aq” mean?
16. (CHEM ONLY) What is a nanoparticle?



Identifying bonding from properties

Substance	Melting point (°C)	Boiling point (°C)	Conductor of electricity when:			Type of structure and bonding
			solid	liquid	in solution	
A	1083	2567	yes	yes	insoluble	
B	-107	13	no	no	no	
C	2300	4000	no	no	insoluble	
D	605	1350	no	yes	yes	
E	6	80	no	no	insoluble	



Identifying bonding from properties

Identify which of the substances in the table could be:

- i** sodium chloride (NaCl)
- ii** aluminium metal (Al)
- iii** diamond (C)
- iv** carbon tetrachloride (CCl₄).

Substance	Melting point (°C)	Boiling point (°C)	Electrical conductor as...		
			solid (s)	liquid (l)	solution (aq)
A	660	2467	yes	yes	insoluble
B	-23	77	no	no	insoluble
C	801	1413	no	yes	yes
D	3550	4827	no	no	insoluble

