

Metals and non-metals

- 1 Malleable – Can be hammered into shape; Ductile – Can be drawn into wires; Sonorous – Makes a ringing sound when hit.
- 2 a Na d Ar g Ca
 b Au e B h N
 c Si f Br
- 3 a Non-metal b 2
 c Good electrical conductor; shiny.

Group 1 – the alkali metals

- 1 They all have 1 electron in their outer shell.
- 2 Potassium
- 3 Francium
- 4 Na
- 5 *Any three from:* Fizzing/bubbling/effervescence, not gas given off; Lithium floats; Lithium moves on the surface; Lithium dissolves/gets smaller/disappears.
- 6 *Any two from:* Potassium melts/forms a ball; Potassium catches fire; Lilac/purple; Reaction is faster/more vigorous.

Group 7 – the halogens

- 1 F 2 Fluorine
- 3 Br₂ 4 Chlorine
- 5 a Lithium and chlorine, as chlorine is more reactive.
 b Lithium + chlorine → lithium chloride
 c 2Li + I₂ → 2LiI (correct; balanced)

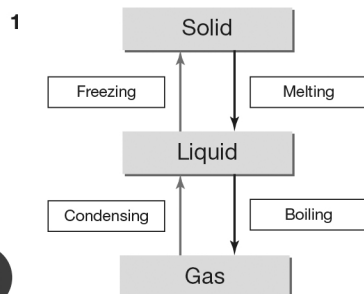
6 a

	Chlorine	Bromine	Iodine
Potassium chloride	x	No reaction	No reaction
Potassium bromide	Orange solution formed	x	No reaction
Potassium iodide	Brown solution formed	Brown solution formed	x

- b Chlorine + potassium bromide → bromine + potassium chloride
- c Add iodine to potassium astatide (or any astatide salt); Brown colour of iodine disappears/solution turns darker.
 $I_2 + 2At^- \rightarrow 2I^- + At_2$

Bonding, structure and the properties of matter

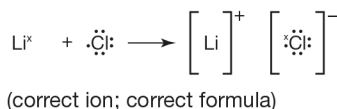
Bonding and structure



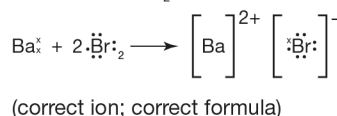
- 2 a 0°C b 100°C
- 3 a Gas b Solid
 c Liquid
- 4 a Oxygen b Nitrogen
 c Oxygen d Oxygen

Ions and ionic bonding

- 1 Magnesium is a metal which is found in group 2 of the periodic table. This means it has 2 electrons in its outer shell. When it reacts, it loses 2 electrons and forms an ion with a 2+ charge. Fluorine is a non-metal which is found in group 7 of the periodic table. When it reacts, it gains 1 electron to form an ion with a 1- charge. When magnesium reacts with fluorine, it forms magnesium fluoride which has the formula **MgF₂**.
- 2 Potassium chloride, KCl; Magnesium oxide, MgO; Magnesium chloride, MgCl₂; Aluminium fluoride, AlF₃.
- 3 a Formula = LiCl



- b Formula = BaBr₂



The structure and properties of ionic compounds

- 1 High melting points; Conduct electricity when molten or in solution; Made of ions.
- 2 a B b A c C
- 3 Ionic bonds are formed when **metals** react with **non-metals**. Atoms either lose or gain **electrons** to become positive or negative particles called ions. The ions are held together in a giant ionic **lattice** by strong **electrostatic** forces of attraction acting in all **directions**.
- 4 Level 1 (marks 1–2)
 KI is ionic/made of ions/consists of a giant ionic lattice.
 KI will have a high melting point *or* will conduct electricity when molten or in solution.

Level 2 (marks 3–4)

KI will have a high melting point because the ions are strongly attracted together/ lots of energy is needed to break the strong ionic bonds *or*

KI will conduct electricity when molten or in solution/dissolved because the ions are free to move.

Level 3 (marks 5–6)

KI will have a high melting point because the ions are strongly attracted together/ lots of energy is needed to break the strong ionic bonds *and*

KI will conduct electricity when molten or in solution/dissolved because the ions are free to move *and*

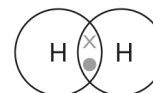
KI will not conduct electricity when solid as the ions do not move/are in fixed positions.

Covalent bonds and simple molecules

- 1 NH₃; Water.

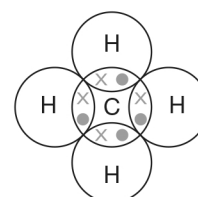
- 2 a and b

Hydrogen



Formula: H₂

Methane



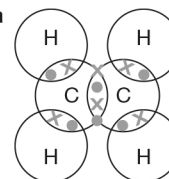
Formula: CH₄

- 3 a



- b Covalent bond – triple bond

- 4 a



(each single bond; correct double bond)

- b Covalent bonds – 4 × single and 1 × double

Diamond, graphite and graphene

- 1 a A b C

- 2 a Strong covalent bonds; large amounts of energy needed to overcome/break covalent bonds.
 b Each carbon is bonded to 4 other carbon atoms; covalent bonds are very strong.
 c Both have delocalised electrons; both conduct electricity.
- 3 a Does not have delocalised electrons. (do not allow free/mobile ions).
 b High melting/boiling points hard. (due to no delocalised electrons).

Fullerenes and polymers

- 1 a D b C

c A d B

- 2 a Hollow/spherical
 b Large surface area
- 3 a Covalent