

- 2 Heat the solution; Allow water to evaporate/leave to form crystals.
- 3 a Condenser
- b Water boils and turns into a gas/vapour; The vapour is then cooled in the condenser and turns back into water; The salt remains in the flask as it has a higher melting/boiling point than water.
- 4 *Any four from:* Crush rock salt; Add rock salt to water; Heat/stir until NaCl dissolves; Filter to remove sand; Heat remaining solution; Leave to crystallise/allow water to evaporate.

Scientific models of the atom

- 1 Before the discovery of the electron, atoms were thought to be tiny spheres that could not be divided.
- 2 Ball/sphere of positive charge; electrons embedded in the sphere.
- 3 a Positive
- b Most of the atom is empty space.
- c Only part of the atom has a positive charge.
- d Mass of the atom is concentrated in the middle/nucleus; this positive charge is found in the middle of the atom/nucleus.
- e Neutrons

Atomic structure, isotopes and relative atomic mass

1

Sub-atomic particle	Relative charge	Relative mass
Proton	+1	1
Electron	-1	Very small
Neutron	0	1

- 2 There are equal numbers of protons and electrons/6 protons and electrons; The positive and negative charges cancel each other out.
- 3 a 74 protons and 74 electrons; 110 neutrons.
- b Gold (not Au)
- 4 atomic; mass; protons; neutrons; 6; 6; 7
- 5 Both isotopes have 35 protons; and 35 electrons; Br-79 has 44 neutrons and Br-81 has 46 neutrons or Br-81 has 2 more neutrons than Br-79.
- 6 The other isotope makes up 25%; $(35 \times 75) + (Cl \times 25)/100 = 35.5$; Cl = 37. (Final answer of 37 gains all 3 marks)

The development of the periodic table and the noble gases

- 1 a 4 b 4
- c Same number of electrons/5 electrons in outer shell.
- d Same number of electron shells.
- 2 a Periods

- b For missing/undiscovered elements.
- c By increasing atomic/proton number.
- d Because they are unreactive.
- 3 a Increase down the group.
- b Any number between -185 and -109.

Electronic structure

- 1 a Nucleus
- b Protons; and neutrons
- c Aluminium or Al. d 14
- 2 a C b A c B, E
- d B, F e D f A

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 $2Li + I_2 \rightarrow 2LiI$ (correct; balanced)

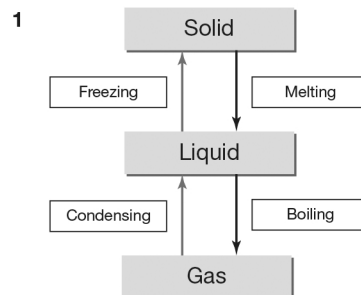
6 a

	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

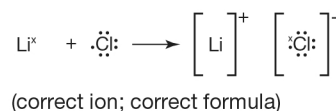
Bonding and structure



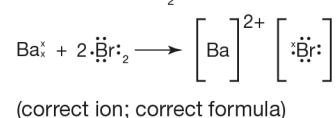
- 2 a 0°C b 100°C
- 3 a Gas b Solid
- c Liquid
- 4 a Oxygen b Nitrogen
- c Oxygen d Oxygen

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)