

Answers

Atomic structure and the periodic table

Atoms, elements and compounds

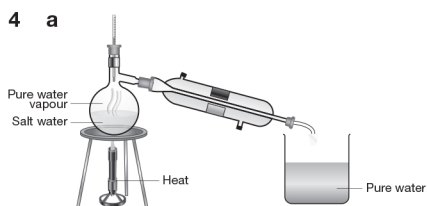
- 1 a Atom – The smallest part of an element that can exist; Element – A substance made of only one type of atom; Compound – A substance that contains two or more elements chemically combined; Mixture – A substance that contains two or more elements not chemically combined.
- b Br₂; Ar c B d 9 e 3
- 2 a Any two from fluorine, chlorine, bromine, iodine or astatine (must be the name, not the symbol).
- b Any two from Li, Na, K, Rb, Cs or Fr (not H as not in group 1 of the periodic table).

Mixtures and compounds

- 1 Element: hydrogen, oxygen; Compound: sodium hydroxide, water; Mixture: air, salty water.
- 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.

Pure substances and formulations

- 1 Pure substances are either single elements or single compounds.
- 2 a Although milk doesn't contain additives; it is a mixture of compounds.
- b You could heat the mixture and using a thermometer; observe a range of boiling points; pure substances have a specific boiling/melting point. (No mark for 'separate the mixture'.)
- 3 It is not pure – it contains other elements or compounds.



- b The salt water is heated; water boils at 100°C; the water vapour rises up the round-bottomed flask and enters a condenser where it cools and turns into a liquid; the

salt is left behind as it boils at a higher temperature.

- 5 a A formulation is a mixture that is designed to be an improvement on the activate substance on its own – the lubricant stops the paracetamol sticking/makes it easier to swallow.
- b $0.5\text{g} + 0.25\text{g} + 1.25\text{g} = 2\text{g}$
 $0.5\text{g}/2\text{g} = 0.25 \times 100 = 25\%$
- c i Paracetamol = 151 → 0.5/151
 = 0.003 moles or
 3×10^{-3} moles
- ii Starch = 162 → 1.25/162
 = 0.008 moles or
 8×10^{-3} moles
- iii Magnesium stearate = 591 →
 $0.25/591 = 0.0004$ moles or
 4×10^{-4} moles
- d $0.003 + 0.008 + 0.004 = 0.0114$.
 $0.003/0.0114 \times 100 = 26.3\%$

Chromatography

- 1 Chromatography is a technique that can be used to separate mixtures into their components; Chromatography works because different compounds have different levels of attraction for the paper and the solvent.
- 2 a Water line is above the base line; which will cause the inks to disperse in the water rather than up the paper; The base line is drawn in ink; which may contain colours that could contaminate the chromatogram/which could interfere with the experiment.
- b $R_f = \text{distance travelled/solvent front} = 22/25 = 0.88$. C is yellow.

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

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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%;
 $(35 \times 75) + (\text{Cl} \times 25)/100 = 35.5$;
 Cl = 37.

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 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