Answers

Atomic structure and the periodic table

Atoms, elements and compounds

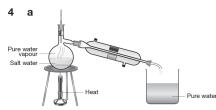
- a Atom The smallest part of an element that can exist; Element - A substance made of only one type of atom; Compound - A substance that contains two or more elements chemically combined; Mixture - A substance that contains two or more elements not chemically combined
 - **b** Br₂; Ar c B
- a Any two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

Mixtures and compounds

- Element: hydrogen, oxygen; Compound: sodium hydroxide, water; Mixture: air, salty water.
- Heat the solution; Allow water to evaporate/leave to form crystals.
- a Condenser 3
 - 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.
- 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

- Pure substances are either single elements or single compounds.
- a Although milk doesn't contain additives; it is a mixture of compounds.
 - 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'.)
- It is not pure it contains other elements or compounds.



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.
- 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.
 - 0.5g + 0.25g + 1.25g = 2g $0.5g/2g = 0.25 \times 100 = 25\%$
 - i Paracetamol = $151 \rightarrow 0.5/151$

= 0.003 moles or 3×10^{-3} moles

 8×10^{-3} moles

Starch $= 162 \rightarrow 1.25/162$ = 0.008 moles or

Magnesium stearate = 591 → 0.25/591 = 0.0004 moles or 4 × 10⁻⁴ moles

0.003 + 0.008 + 0.004 = 0.0114. $0.003/0.0114 \times 100 = 26.3\%$

Chromatography

- 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.
- 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.
 - R_f = distance travelled/solvent front = 22/25 = 0.88. C is yellow.

Scientific models of the atom

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

Atomic structure, isotopes and relative atomic mass

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

- There are equal numbers of protons and electrons/6 protons and electrons; The positive and negative charges cancel each other out.
- 74 protons and 74 electrons; 110 3 neutrons.
 - **b** Gold (not Au)
- Atomic; mass; protons; neutrons;
- 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.
- The other isotope makes up 25%; $(35 \times 75) + (CI \times 25)/100 = 35.5;$ CI = 37.

The development of the periodic table and the noble gases

- **a** 4 **b** 4
 - Same number of electrons/5 electrons in outer shell
- Same number of electron shells
- 2 а Periods
 - b For missing/undiscovered elements
 - By increasing atomic/proton number
 - They are unreactive.
- Increase down the group. 3
 - Any number between -185 and -109

Electronic structure

Nucleus

2 а

2

3

- b Protons; and neutrons
- Aluminium or Al
- 14 B, E
- C B, F

h

Α

Metals and non-metals

- Malleable Can be hammered into shape; Ductile - Can be drawn into wires; Sonorous - Makes a ringing sound when hit.
 - а Na
- d Ar
- Ca g h

Ν

- b Αu
- В е
- Si f Br
- Non-metal а b Good electrical conductor; С

Group 1 - the alkali metals

shiny.

- They all have 1 electron in their outer shell.
- 2 Potassium
- 3 Francium
- 4 Na