Atoms, ions and isotopes

AQA 8462 Separate Chemistry · Foundation and Higher

Show your working where needed. Check the worked answers when you finish.

Name _____ Date _____

1. Charge and position

Name the three particles in an atom. For each particle, give its relative charge and say whether it is in the nucleus or outside it.

2. Count the particles

A neutral sulfur atom has atomic number 16 and mass number 34. Find its numbers of protons, neutrons and electrons.

3. Draw the shells

A neutral aluminium atom has atomic number 13. Write its electronic configuration in numbers, then draw it using electron shells.

Scan to try fresh questions online

Try a core or harder question. Use clues and worked answers.

gcse.chemistryhelp.co.uk/worksheets/aqa-atoms-and-isotopes/

Atoms, ions and isotopes

AQA 8462 Separate Chemistry · Foundation and Higher

4. An oxide ion

Oxygen has atomic number 8. Give the numbers of protons, neutrons and electrons in an O^{2-} ion with mass number 16. Explain how it acquired its charge.

5. Spot the isotopes

Atom P has 17 protons and 18 neutrons. Atom Q has 17 protons and 20 neutrons. Atom R has 18 protons and 20 neutrons. Which pair are isotopes of the same element? Explain.

6. Gold foil evidence

Most alpha particles passed straight through thin gold foil. Very few were scattered through large angles. Give one conclusion about atomic structure supported by each observation.

Scan to try fresh questions online

Try a core or harder question. Use clues and worked answers.

gcse.chemistryhelp.co.uk/worksheets/aqa-atoms-and-isotopes/

Atoms, ions and isotopes

AQA 8462 Separate Chemistry · Foundation and Higher

7. Relative atomic mass

In a magnesium sample, 80% of the atoms have relative isotopic mass 24, 10% have mass 25 and 10% have mass 26. Calculate the relative atomic mass of magnesium in this sample.

8. Compare two samples

Sample A of bromine contains 60% bromine-79 and 40% bromine-81. Sample B contains 40% bromine-79 and 60% bromine-81.

Calculate the relative atomic mass in each sample. Explain how the abundances account for the difference. Use 79 and 81 for the relative isotopic masses.

9. Extra challenge · A proposed isotope ratio

Boron has isotopes of masses 10 and 11. One sample has relative atomic mass 10.8. A student says there are equal numbers of each isotope. Test the claim, then find the percentage of atoms with mass 11.

Scan to try fresh questions online

Try a core or harder question. Use clues and worked answers.

gcse.chemistryhelp.co.uk/worksheets/aqa-atoms-and-isotopes/

Worked answers

Atoms, ions and isotopes · AQA 8462 Separate Chemistry · Foundation and Higher

1. Charge and position

The nucleus contains protons, with relative charge +1, and neutrons, with relative charge 0. Electrons, with relative charge −1, occupy shells outside the nucleus.

2. Count the particles

There are 16 protons. Neutrons = 34 − 16 = 18. A neutral atom has the same number of electrons as protons, so it has 16 electrons.

3. Draw the shells

2,8,3. Draw three occupied shells with 2 electrons in the first, 8 in the second and 3 in the third.

4. An oxide ion

There are 8 protons, 16 − 8 = 8 neutrons and 10 electrons. The neutral oxygen atom gained two electrons, giving it two more electrons than protons.

5. Spot the isotopes

P and Q. Both have 17 protons, so they are atoms of the same element. Their numbers of neutrons differ.

Scan to try fresh questions online

Try a core or harder question. Use clues and worked answers.

gcse.chemistryhelp.co.uk/worksheets/aqa-atoms-and-isotopes/

Worked answers

Atoms, ions and isotopes · AQA 8462 Separate Chemistry · Foundation and Higher

6. Gold foil evidence

Most passed straight through because most of the atom is empty space. Large deflections were rare because the positive charge is concentrated in a tiny region, the nucleus, so few alpha particles pass close to it.

7. Relative atomic mass

Use the abundances as weights. (24 × 80 + 25 × 10 + 26 × 10) ÷ 100 = 24.3. Relative atomic mass has no units.

8. Compare two samples

A = (79 × 60 + 81 × 40) ÷ 100 = 79.8. B = (79 × 40 + 81 × 60) ÷ 100 = 80.2.

The heavier isotope is more abundant in sample B, so it has a greater effect on that sample’s average.

9. Extra challenge · A proposed isotope ratio

Equal numbers give (10 + 11) ÷ 2 = 10.5, so the claim is false.

Each mass-11 atom contributes one extra mass unit relative to mass 10. The mean is 0.8 higher than 10, so 0.80 of the atoms, or 80%, have mass 11.

Scan to try fresh questions online

Try a core or harder question. Use clues and worked answers.

gcse.chemistryhelp.co.uk/worksheets/aqa-atoms-and-isotopes/