

Inside the atom: particles and isotopes

Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Test answers (mark scheme)

Each model answer is followed by the marking points. Award the method mark even when the final rounding is wrong, and accept any correct equivalent wording.

Level: Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** HS-PS1-1, GCSE C1

Question 1 Nuclear particles (2 marks)

Protons, charge +1; neutrons, charge 0.

Marking: 1 mark for both names; 1 mark for both charges.

Question 2 Iron atom and ion (3 marks)

(a) Protons = 26. Neutrons = $56 - 26 = 30$. **26 protons, 30 neutrons.**

(b) $26 - 3 = \mathbf{23 \text{ electrons}}$.

Marking: (a) 1 mark each; (b) 1 mark.

Question 3 Defining isotopes (2 marks)

Isotopes are atoms of the same element with the same number of protons but different numbers of neutrons.

Marking: 1 mark same protons (same element); 1 mark different neutrons or mass numbers.

Question 4 Lithium relative atomic mass (3 marks)

$A_r = (6 \times 7.5 + 7 \times 92.5) \div 100 = (45 + 647.5) \div 100 = 692.5 \div 100 = 6.925$.

$A_r = 6.9$

Marking: 1 mark for the method; 1 mark for 6.925; 1 mark for rounding to 6.9.

Question 5 Neutral atoms (2 marks)

It has equal numbers of protons and electrons, so the total positive charge equals the total negative charge and they cancel.

Marking: 1 mark for equal numbers; 1 mark for opposite charges cancelling.

Question 6 Same chemistry (2 marks)

Both have 17 protons and 17 electrons arranged in the same way. Reactions depend on electrons, and the extra neutrons do not affect them.

Marking: 1 mark same electron arrangement; 1 mark reactions depend on electrons.

Question 7 Atom Z (2 marks)

(a) 7 protons, so **nitrogen**.

(b) $7 + 8 = 15$, so the atom is nitrogen-15.

Marking: 1 mark each.

Question 8 A decimal Ar (2 marks)

Chlorine is a mixture of isotopes with mass numbers 35 and 37. Ar is the average of these, weighted by abundance, so it falls between them.

Marking: 1 mark mixture of isotopes; 1 mark weighted average.

Question 9 Uranium isotopes (2 marks)

U-235: $235 - 92 = 143$ neutrons. U-238: $238 - 92 = 146$ neutrons.

143 and 146

Marking: 1 mark each.