

Shells, groups and the periodic table

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

Each model answer is followed by the marking points. Accept any correct equivalent wording, and give credit where the reasoning is clear even if the arrangement is written without commas.

Level: Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** HS-PS1-1, HS-PS1-2

Question 1 Electron arrangements (3 marks)

- (a) **2,8,3**
- (b) **2,8,6**
- (c) **2,8,8**

Marking: 1 mark each.

Question 2 Group and period (2 marks)

Two outer electrons: **Group 2**. Four shells: **period 4** (calcium).

Marking: 1 mark each.

Question 3 Mendeleev's table (3 marks)

- (a) Increasing relative atomic mass.
- (b) Elements with similar properties had to line up in columns, so a space was left where none was known.
- (c) Germanium was discovered with properties that matched his predictions for eka-silicon.

Marking: 1 mark each.

Question 4 Atom Y (2 marks)

- (a) 5 outer electrons: **Group 5**.
- (b) 2 shells: **period 2**.

Marking: 1 mark each.

Question 5 Similar elements (2 marks)

Their atoms each have one electron in the outer shell. Chemical reactions depend on the

outer electrons, so the elements behave alike.

Marking: 1 mark for one outer electron; 1 mark for reactions depend on outer electrons.

Question 6 Moseley's contribution (2 marks)

Moseley showed that elements should be ordered by atomic number, not mass. Tellurium (52) comes before iodine (53), which puts iodine in the same group as chlorine, even though iodine has a lower relative atomic mass.

Marking: 1 mark for atomic number; 1 mark for the correct order of the two elements.

Question 7 Noble gases (2 marks)

Neon has the arrangement 2,8, with a full outer shell. This is stable, so its atoms do not lose, gain or share electrons.

Marking: 1 mark for the full outer shell; 1 mark for no need to lose, gain or share electrons.

Question 8 Identify an element (2 marks)

Arrangement 2,8,6: $2 + 8 + 6 = 16$ electrons, so atomic number 16.

Atomic number 16, sulfur

Marking: 1 mark for the sum; 1 mark for the element.

Question 9 Losing or gaining (2 marks)

Magnesium loses 2 electrons to reach 2,8. Oxygen gains 2 electrons to reach 2,8.

Mg loses 2; O gains 2

Marking: 1 mark each.