

How atoms share electrons in covalent bonds

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

Compare your answers with the model answers and the marking points. Award the marks for the idea, not for exact wording. Count your total out of 20 and look again at the lesson sections that match any question where you lost marks.

Level: Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE C2

Question 1 Define (2 marks)

- a. A covalent bond is a shared pair of electrons between two atoms.
- b. Water, H_2O (or any other suitable non-metal substance).

Marking: 1 mark for a shared pair of electrons, 1 mark for a correct substance.

Question 2 Hydrogen sulfide (3 marks)

- a. 2 shared pairs.
- b. 2 lone pairs.
- c. Sulfur needs two more electrons to fill its outer shell, and each hydrogen supplies one.

Marking: 1 mark each part.

Question 3 Bonds in methane (3 marks)

- a. 4 C-H bonds.
- b. $4 \times 2.5 \times 10^{21} = \mathbf{1.0 \times 10^{22} \text{ bonds}}$.

Marking: 1 mark for 4, 1 mark for the method, 1 mark for the answer (2 marks in total for part b).

Question 4 Diamond tools (2 marks)

Each carbon atom forms four strong covalent bonds in a rigid giant network, so diamond is extremely hard.

Marking: 1 mark for four strong bonds or giant network, 1 mark for hardness.

Question 5 Graphite conducts (2 marks)

Each carbon forms only three bonds, so one outer electron per atom is free to move along

the layers and carry charge.

Marking: 1 mark for three bonds per atom, 1 mark for free electrons moving.

Question 6 A mystery solid (2 marks)

It is a simple molecular substance, because it has a low melting point and no mobile charged particles.

Marking: 1 mark for the classification, 1 mark for the reason.

Question 7 Chlorine and iodine (3 marks)

Both are simple molecular, with covalent bonds only inside the molecules. Iodine molecules are larger than chlorine molecules, so the forces between them are stronger. More energy is needed to separate iodine molecules, so iodine is solid at room temperature.

Marking: 1 mark for simple molecules, 1 mark for larger molecules, 1 mark for stronger forces or more energy.

Question 8 Melting wax (3 marks)

He is wrong. Wax is a simple molecular substance. When it melts, the forces between molecules are overcome so the molecules can move past each other, but the covalent bonds inside the molecules stay intact.

Marking: 1 mark for stating it is incorrect, 1 mark for forces between molecules, 1 mark for bonds within molecules unchanged.