

2.5 Simple molecules and covalent bonds

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS covalent bond 共价键 • intermolecular forces 分子间作用力 • ion 离子
• electrons 电子 • atom 原子

Objective

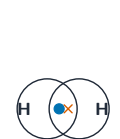
Build the skills to answer exam questions on **simple molecules and covalent bonds**
简单分子与共价键 — sharing electrons, dot-and-cross diagrams, and the properties of simple molecular substances.

You must be able to:

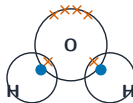
- describe a covalent bond (a shared pair of electrons between non-metals)
- draw/interpret dot-and-cross diagrams (H_2 , H_2O , CH_4 , etc.)
- explain why simple molecular substances have low melting points and don't conduct

1 Worked examples

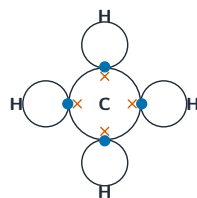
■ Covalent bonding



hydrogen, H_2
one shared pair



water, H_2O
two shared pairs



methane, CH_4
four shared pairs

Atoms share pairs of electrons so each reaches a full outer shell

- covalent bond:** a shared pair of electrons (between non-metals).
- low melting point:** weak intermolecular forces between molecules (the bonds inside are strong).
- poor conductor:** no free electrons or ions to carry charge.

2 Practice

2.1 Define a covalent bond.

[1]

2.2 State how many shared pairs of electrons there are in a molecule of methane, CH_4 .

[1]

3 Exam-style questions

3.1 Simple molecular substances have low melting points because:

[1]

- A** the covalent bonds are weak
- B** the forces between molecules are weak
- C** they contain ions
- D** they have delocalised electrons

3.2 Water, H_2O , is a simple molecule.

(a) Describe how the bonds in a water molecule form.

[2]

(b) Explain why water does not conduct electricity (when pure).

[2]

3.3 Explain why chlorine, Cl_2 , has a low boiling point.

[2]

Solutions

2.1 a shared pair of electrons between two (non-metal) atoms.

2.2 four shared pairs.

3.1 B. The forces between molecules (intermolecular forces) are weak.

3.2 (a) the oxygen atom shares one pair of electrons with each of the two hydrogen atoms; so each atom reaches a full outer shell.

(b) the molecules have no overall charge and there are no free electrons or ions; so there is nothing to carry the charge.

3.3 chlorine is made of simple molecules with weak intermolecular forces; little energy is needed to separate them, so the boiling point is low.