

2.5 Simple molecules and covalent bonds

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS covalent bond

• intermolecular forces

• ion

• electrons

• atom

Objective

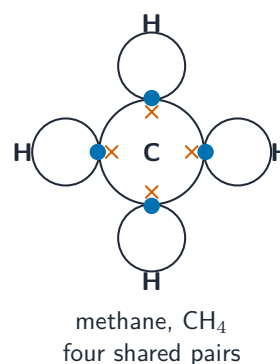
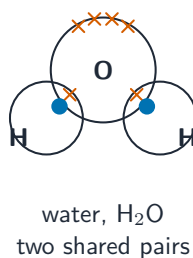
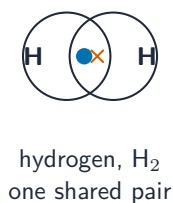
Build the skills to answer exam questions on **simple molecules and covalent bonds**
 – sharing electrons, dot-and-cross diagrams, and the properties of simple molecular substances.

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 Key knowledge and worked examples

■ Covalent bonding



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, CH₄. [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, H₂O, 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, Cl₂, has a low boiling point. [2]

Solutions

Each answer shows the steps, then the **result**.

2.1

- a covalent bond is a **shared pair of electrons** between two (non-metal) atoms

2.2

- methane has four C–H bonds
- **four** shared pairs

3.1 B

- simple molecules have **weak forces between molecules**
- A confuses intermolecular forces with covalent bonds; C and D are ionic/metallic

3.2

(a)

- oxygen shares one pair of electrons with **each** of the two hydrogens
- 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 simple molecules with **weak intermolecular forces**
- little energy is needed to separate them, so the **boiling point is low**