2 Chemical bonding – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	**Write it 3 times** (English)		
electrons			
bonding			
ions			
ionic bond			
lattice			
molten			
covalent bond			
diamond			
graphite			
metallic bonding			
delocalised electrons			

Recall

From Part 1 you know atoms have **electrons** in shells. Atoms join up to fill their outer shell – this is **bonding**. Here we meet the three types.

- Atoms bond to reach a full outer shell (like a noble gas).
- The type of bond decides the substance's properties.

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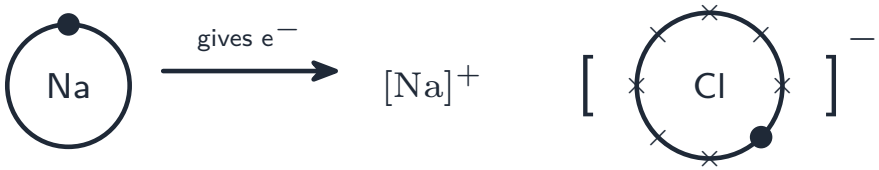
Nothing here is hard – it just compares three bonds.

New ideas

Read these first, then do the Practice.

■ 1 Ionic bonding (metal + non-metal)

A metal atom **gives** electrons to a non-metal atom, making charged **ions** . An **ionic bond** is the strong attraction between the opposite charges.



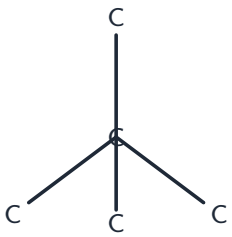
Ionic compounds form a giant **lattice** . They have **high melting points** and conduct only when **molten** or dissolved (the ions can then move).

■ 2 Covalent bonding (non-metal + non-metal)

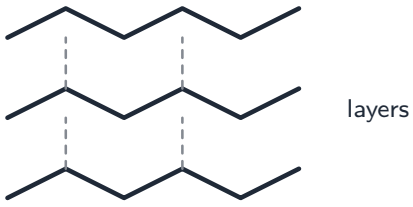
A **covalent bond** is a **shared** pair of electrons between two non-metal atoms. Small molecules (like H_2O) have **low** melting points (the forces **between** molecules are weak) and do not conduct.

■ 3 Giant covalent and metallic

- **diamond** – each carbon bonds to **four** others → very hard.
- **graphite** – carbon in flat **layers** that slide (a lubricant); spare electrons let it **conduct**.



diamond (network)



graphite (layers)

- **metallic bonding** – positive metal ions in a "sea" of **delocalised electrons** . This is why metals **conduct** and can be hammered into shape.

> **Watch out:** ionic bonding **transfers** electrons (metal → non-metal); covalent bonding **shares** them (non-metal + non-metal) – don't confuse the two. An ionic solid conducts only when **molten or dissolved**, never as a solid (the ions must be free to move).

Practice

Try these in order.

2.1 What type of elements form (a) an ionic bond, (b) a covalent bond? [2]

2.2 Define an *ionic bond*. [2]

2.3 Why does an ionic compound conduct electricity when molten but not when solid? [2]

2.4 What is a *covalent bond*? [1]

2.5 Explain why graphite can conduct electricity but diamond cannot. [2]

2.6 Challenge. Sodium chloride has a high melting point, but methane (a small covalent molecule) has a very low one. Explain this difference. [2]