

4 Gases and structures – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

*Write each word three times.***English****Write it 3 times** (English)

giant ionic

simple molecular

intermolecular
forces

giant molecular

covalent bonds

giant metallic

diamond

graphite

delocalised elec-
trons

melting point

Recall

From Part 1 you know how a gas behaves. Here we look at **solids** and why their properties differ so much – it all comes down to **structure**.

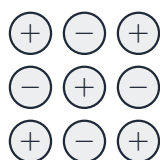
- At IGCSE you met giant ionic, simple molecular and giant covalent structures.
- The structure decides the melting point, conductivity and solubility.

New ideas

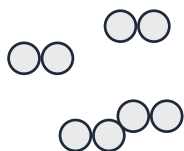
Read these first, then do the Practice.

■ 1 The four structures

Structure	Particles	Held by
giant ionic	ions in a lattice	strong ionic attraction
simple molecular	small molecules	weak intermolecular forces
giant molecular	atoms in a network	strong covalent bonds
giant metallic	metal ions + electron sea	metallic bonding



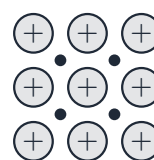
giant ionic



simple molecular



giant covalent

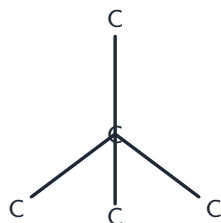


giant metallic

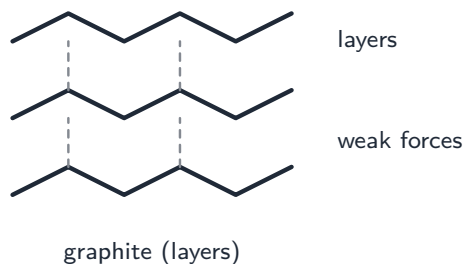
■ 2 Two forms of carbon

Both **diamond** and **graphite** are giant covalent:

- **diamond** – each carbon bonds to **four** others in a rigid 3-D network. Very hard; does **not** conduct.
- **graphite** – carbon in flat layers; the layers slide (a lubricant), and spare **delocalised electrons** let it **conduct**.



diamond (3-D network)



graphite (layers)

■ 3 Properties follow the structure

- **melting point** is high when strong forces (ionic, covalent, metallic) must be broken, and low when only weak forces break.
- **conducting** needs charged particles that can move – free ions (molten or dissolved) or delocalised electrons.
- ionic solids are usually **soluble** in water; molecular and giant covalent solids usually are not.

Watch out: when a simple molecular solid melts, only the *weak forces between* the molecules are broken – the strong covalent bonds *inside* each molecule stay intact. That is why the melting point is low.

Practice

Try these in order.

4.1 Name the four types of crystalline structure. [2]

4.2 Why does a simple molecular solid (like iodine) have a low melting point? [2]

4.3 Diamond and graphite are both made only of carbon. Explain why graphite conducts electricity but diamond does not. [2]

4.4 An ionic compound only conducts electricity when molten or dissolved, not when solid. Explain why. [2]

4.5 An unknown solid has a high melting point and conducts electricity as a solid. What type of structure is it? [1]

4.6 Challenge. Sodium chloride melts at 801°C , but iodine melts at only 114°C . Explain this large difference using their structures and bonding. [2]