

4 Gases and structures – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
giant ionic	离子晶体	_____	_____	_____
simple molecular	分子晶体	_____	_____	_____
intermolecular forces	分子间作用力	_____	_____	_____
giant molecular	原子晶体	_____	_____	_____
covalent bonds	共价键	_____	_____	_____
giant metallic	金属晶体	_____	_____	_____
diamond	金刚石	_____	_____	_____
graphite	石墨	_____	_____	_____
delocalised electrons	离域电子	_____	_____	_____
melting point	熔点	_____	_____	_____

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**.

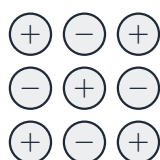
- At IGCSE you met giant ionic, simple molecular and giant covalent structures.
- The structure decides the melting point, conductivity and solubility.

New ideas

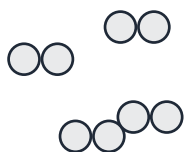
Read these first, then do the Practice.

■ 1 The four structures

Structure	Particles	Held by
giant ionic 离子晶体	ions in a lattice	strong ionic attraction
simple molecular 分子晶体	small molecules	weak intermolecular forces 分子间作用力
giant molecular 原子晶体	atoms in a network	strong covalent bonds 共价键
giant metallic 金属晶体	metal ions + electron sea	metallic bonding



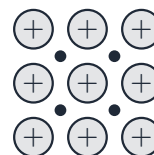
giant ionic



simple molecular



giant covalent

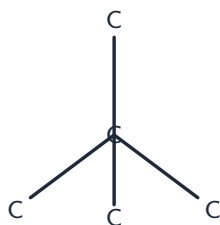


giant metallic

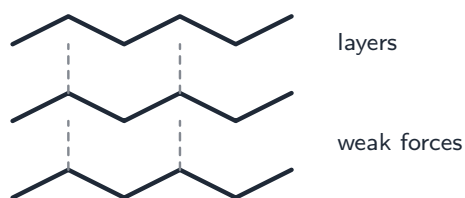
■ 2 Two forms of carbon

Both **diamond** 金刚石 and **graphite** 石墨 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** 离域电子 let it **conduct**.



diamond (3-D network)



graphite (layers)

■ 3 Properties follow the structure

- **melting point** 熔点 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]