

2.6 Giant covalent structures

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS silicon(iv) oxide 二氧化硅 • graphite 石墨 • giant covalent structure 巨型共价结构
• diamond 金刚石 • lubricant 润滑剂

Objective

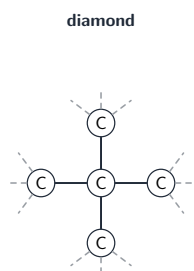
Build the skills to answer exam questions on **giant covalent structures** 巨型共价结构 — **diamond** 金刚石, **graphite** 石墨 and silicon(IV) oxide, and how structure explains their properties.

You must be able to:

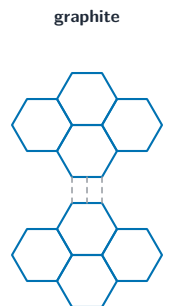
- describe the bonding in diamond and graphite
- link structure to properties (hardness, conductivity, lubrication)
- describe silicon(IV) oxide as a giant covalent structure

1 Worked examples

■ Diamond vs graphite



each carbon bonded to 4 others: a hard 3-D network



flat layers of hexagonal rings (each C bonded to 3); weak forces let the layers slide

Diamond: each C bonded to 4 others (hard). Graphite: flat layers with weak forces between (slippery)

- **diamond:** rigid 3-D network → very hard → cutting tools.

- **graphite:** layers slide (lubricant); one free electron per C → conducts (electrodes).
- **SiO₂:** giant covalent like diamond → very hard, very high melting point.

2 Practice

2.1 State how many carbon atoms each carbon is bonded to in diamond. [1]

2.2 State one use of graphite. [1]

3 Exam-style questions

3.1 Graphite conducts electricity because: [1]

- | | |
|---|---|
| A | B |
| C | D |
- A it contains ions
B each carbon has a free (delocalised) electron
C the layers are strongly bonded
D it is a metal

3.2 Diamond and graphite are both forms of carbon.

(a) Explain why diamond is very hard. [2]

(b) Explain why graphite is a good lubricant. [2]

3.3 Explain why both diamond and graphite have very high melting points. [2]