# CAIE Chemistry IGCSE

## 2.6 Giant covalent structures

Flashcards

# Give examples of giant covalent structures

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Examples of giant covalent structures:

Graphite

Diamond

Silicon (IV) oxide (extended only)

# Describe the structure and properties of diamond

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In diamond, each carbon atom is covalently bonded to 4 other carbon atoms and arranged in a tetrahedral 3D shape

- Diamond is very hard due to many strong covalent bonds
- Cannot conduct electricity as there are no delocalised electrons

# Describe the structure and properties of graphite

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In graphite, each carbon atom is covalently bonded to 3 other carbons and its structure consists of layers of hexagonal rings with no covalent bonds between the layers

- Graphite is very soft, since the layers can slide over each other
- Graphite can conduct electricity since each carbon atom has a delocalised electron

# Explain the uses of diamond, using its structure and bonding

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Diamond can be used in cutting tools due its hardness through its tetrahedral, rigid arrangement of atoms bonded with many strong covalent bonds

# Explain the uses of graphite, using its structure and bonding

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- Lubricant – layers slide over each other due to weak intermolecular forces between layers
- Conductor (e.g. electrodes in batteries) – can conduct electricity due to delocalised electrons

Describe the structure of silicon (IV) oxide $SiO_2$ (extended only)

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- Each silicon atom is covalently bonded to 4 oxygen atoms
- Each oxygen atom is covalently bonded to 2 silicon atoms
- Therefore, the formula is $SiO_2$ (since $Si_2O_4$ simplified is $SiO_2$)

Describe the similarities between diamond and silicon (IV) oxide (extended only)

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- In silicon (IV) oxide, each silicon atom is covalently bonded to 4 oxygen atoms and in diamond, each carbon atom is covalently bonded to 4 carbon atoms
- high melting and boiling points- Both have strong covalent bonds
- Atoms bonded in a tetrahedral arrangement- both structures are very hard and rigid