

# Cambridge IGCSE Chemistry

## Topic 3: atoms, elements and compounds

### Macromolecules

#### Notes

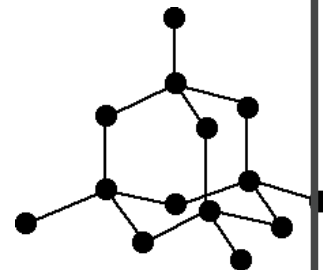




## Describe the giant covalent structures of graphite and diamond

### Diamond

- In diamond (right), each carbon is joined to 4 other carbons covalently.
  - It's very hard, has a very high melting point and does not conduct electricity.



### Graphite

- In graphite, each carbon is covalently bonded to 3 other carbons, forming layers of hexagonal rings, which have no covalent bonds between the layers.
  - The layers can slide over each other due to no covalent bonds between the layers, but weak intermolecular forces. Meaning that graphite is soft and slippery.
- One electron from each carbon atom is delocalised.
  - This makes graphite similar to metals, because of its delocalised electrons.
  - It can conduct electricity – unlike Diamond.

## (Extended only) Describe the macromolecular structure of silicon(IV) oxide (silicon dioxide)

- Each silicon atom is covalently bonded to 4 oxygen atoms
- Each oxygen atom is covalently bonded to 2 silicon atoms
- Therefore, the formula is  $\text{SiO}_2$ . This is the empirical formula, which is used for all giant molecules, because there are too many atoms to give the molecular formula

## Relate their structures to their uses, e.g. graphite as a lubricant and a conductor, and diamond in cutting tools

- Graphite
  - Lubricant – layers slide over each other
  - Conductor – can conduct electricity
- Diamond
  - Cutting tools – very hard due to rigid structure





*(Extended only) Describe the similarity in properties between diamond and silicon(IV) oxide, related to their structures*

- Similar properties:
  - o Very hard
  - o Very high melting and boiling points
  - o Insoluble in water
  - o Does not conduct electricity
- These are due to the strong covalent bonds that hold the atoms in a rigid structure

