AQA GCSE Chemistry

Topic 2: Bonding, structure, and the properties of matter

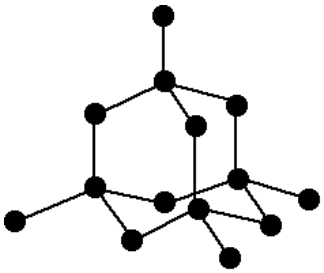
Structure and bonding of carbon

Notes

(Content in bold is for Higher Tier only)

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, because the delocalised electrons can move

Graphene and fullerenes

- Graphene
    - Single layer of graphite
    - Has properties that make it useful in electronics and composites
    - graphene is very strong because atoms within its layers are very tightly bonded and it is also elastic because the planes of atoms can flex relatively easily without the atoms breaking apart.
- Carbon can also form fullerenes with different numbers of carbon atoms.
    - Molecules of carbon atoms with hollow shapes
    - They are based on hexagonal rings of carbon atoms, but they may also contain rings with five or seven carbon atoms
    - The first fullerene to be discovered was Buckminsterfullerene (C60), which has a spherical shape
- Carbon nanotubes
    - Cylindrical fullerenes with very high length to diameter ratios
    - Their properties make them useful for nanotechnology, electronics and materials
- Examples of uses
    - They can be used as lubricants, to deliver drugs in the body and catalysts.
    - Nanotubes can be used for reinforcing materials, for example tennis rackets.