# Edexcel GCSE Chemistry

## Topic 9: Separate chemistry 2

### Bulk and surface properties of matter including nanoparticles

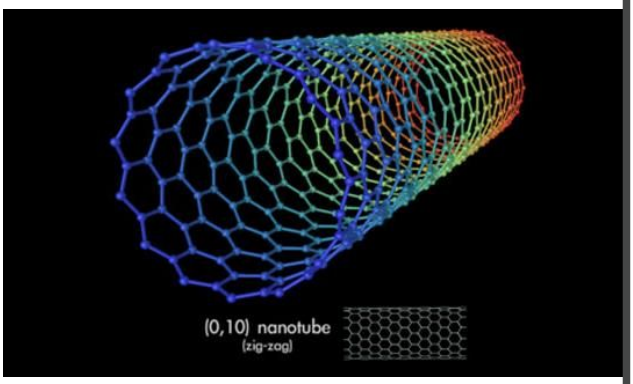
**Notes**

## *9.35C Compare the size of nanoparticles with the sizes of atoms and molecules*

- Nanoparticles are 1-100 nanometers across.
- They contain a few hundred atoms.
- Nanoparticles, are smaller than fine particles, which have diameters between 100 and 2500 nm ($1 \times 10^{-7}$ m and $2.5 \times 10^{-6}$ m).
- As the side of cube decreases by a factor of 10 the surface area to volume ratio increases by a factor of 10

## *9.36C Describe how the properties of nanoparticulate materials are related to their uses including surface area to volume ratio of the particles they contain, including sunscreens*

- Nanoparticles involve fullerenes.
- A nanoparticle has different properties to the 'bulk' chemical it's made from, because of their high surface area to volume ratio. It may also mean that smaller quantities are needed to be effective than for materials with normal particle sizes. e.g fullerenes have different properties to big lumps of carbon.
- They have a high surface area to volume ratio, and therefore would make good catalysts.
- They can also be used to produce highly selective sensors.
- Nanotubes could make stronger, lighter building materials.
- New cosmetics, e.g sun tan cream and deodorant. They make no white marks.
- Lubricant coatings, as they reduce friction. These can be used for artificial joints and gears.
- Nanotubes conduct electricity, so can be used in small electrical circuits for computers.




## *9.37C Explain the possible risks associated with some nanoparticulate materials*

- Some worries that they may be harmful to health – i.e. enter bloodstream and cause harm
- A lot of effects of nanoparticulate materials are unknown and this is worrying for some people as risks are not fully known

## *9.38C Compare, using data, the physical properties of glass and clay ceramics, polymers, composites and metals*

- glass ceramics: transparent, hard, brittle, poor heat and electrical conductors
    - uses: windows, bottles
- clay ceramics: opaque, hard, brittle, poor heat and electrical conductors
    - uses: bricks and porcelain
- polymers: can be made transparent/translucent/opaque, poor heat and electrical conductors, can be tough or ductile
    - uses: plastic bags, bottles
- metals: shiny, good heat and electrical conductors, hard, tough
    - uses: cars, bridges, electrical cables

## *9.39C Explain why the properties of a material make it suitable for a given use and use data to select materials appropriate for specific uses*

- use the different properties of the different materials in 9.38 to evaluate why something may be suitable/unsuitable for a certain use
- e.g. for electrical cables: a metal is suitable because it's a good electrical conductor and is ductile, whereas a polymer is unsuitable as it's a poor electrical conductor