Your notes

GCSE Chemistry: revision notes

Nanoparticles

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Sizes of particles

- **Nanoscience** is the study of structures 1–100 nm in size, of the order of a few hundred atoms. 1 nm = 1×10^{-9} m.
- **Nanoparticles** are smaller than **fine particles** (PM2.5), which have diameters between 100 and 2500 nm (1×10^{-7} m to 2.5×10^{-6} m).
- **Coarse particles** (PM10), often called dust, have diameters between 1×10^{-5} m and 2.5×10^{-6} m.

Surface area to volume ratio

- As the side of a cube decreases by a factor of 10, its **surface area to volume ratio** increases by a factor of 10.
- **Nanoparticles** have a very high **surface area to volume ratio**.
- This means they can have different properties from the same material in bulk, and smaller quantities are needed to be effective.

Uses

- Medicine: delivering drugs to specific cells in the body.
- Electronics, cosmetics and sunscreens (which give better skin coverage), deodorants, and catalysts (a large surface area speeds up reactions).
- Silver **nanoparticles** are antibacterial and used in some fabrics and wound dressings.

Risks

- **Nanoparticles** may be absorbed into the body or pass into cells, and their long-term effects on health and the environment are not yet fully known.
- More research is needed, and some people think products containing **nanoparticles** should be clearly labelled.

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Key terms

Nanoparticle	A particle between 1 nm and 100 nm in size.
Nanometre	One billionth of a metre (1×10^{-9} m).
Nanoscience	The study of structures between 1 nm and 100 nm in size.
Fine particles	Particles 100–2500 nm across (PM2.5).
Coarse particles	Particles 2500 nm to 10 000 nm across (PM10), often called dust.
Surface area to volume ratio	The surface area of an object divided by its volume.
Bulk material	A large amount of a material, not in nanoparticle form.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What size range are nanoparticles?
2. How many metres is 1 nm?
3. What happens to surface area to volume ratio when the side of a cube is divided by 10?
4. Why can nanoparticles make good catalysts?
5. What are PM2.5 particles?
6. Why might nanoparticles in sunscreen be a concern?
7. Why is a smaller amount of a nanoparticle material needed to be effective?
8. A cube has sides of 2 nm. What is its surface area to volume ratio?

Answers

1. 1 to 100 nm
2. 1×10^{-9} m
3. It increases by a factor of 10
4. They have a very high surface area to volume ratio
5. Fine particles 100–2500 nm across
6. Their long-term effects on health are not fully known
7. Its high surface area to volume ratio makes it more effective
8. 3 : 1

What to do next

Practise 10 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

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