

Nanoparticles

GCSE Chemistry · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Calculate the surface area to volume ratio of a cube with sides of 2 cm. (3 marks)

Step 1 · Surface area

$$6 \text{ faces} \times (2 \times 2) = 24 \text{ cm}^2$$

Step 2 · Volume

$$2 \times 2 \times 2 = 8 \text{ cm}^3$$

Step 3 · Ratio

$$24 \div 8 = 3 \text{ (per cm)}, \text{ written } 3 : 1$$

Answer: 3 : 1

Check: For a cube, SA:V = $6 \div \text{side} = 6 \div 2 = 3$ ✓

2. Now try one with the steps

A particle has a diameter of 45 nm. Write this in metres in standard form and classify the particle. (2 marks)

Step 1 · Convert

Step 2 · Classify

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. State the size range of nanoparticles in nanometres. [1]

2. Write 1 nanometre in metres in standard form. [1]

3. Give two uses of nanoparticles. [2]

4. Calculate the surface area to volume ratio of a cube with sides of 1 cm. [2]

5. Calculate the surface area to volume ratio of a cube with sides of 3 cm. [2]

6. Fine particles (PM2.5) have diameters between 100 and 2500 nm. Classify a particle with a diameter of 2000 nm. [1]

7. The side of a cube is reduced from 1 cm to 1 mm. State the factor by which the surface area to volume ratio increases. [1]

8. Explain why nanoparticles may have different properties from the same material in bulk. [2]

9. A nanoparticle is 20 nm across and each atom is 0.2 nm across. Calculate how many atoms fit across the nanoparticle. [1]

10. Give two advantages of using nanoparticles of zinc oxide in sun cream. [2]

11. Give one possible risk of using nanoparticles. [1]

12. Explain why less catalyst is needed if it is made of nanoparticles. [2]

13. A cube has sides of 50 nm. Calculate its surface area to volume ratio in nm^{-1} . [2]

14. Socks can contain silver nanoparticles that kill bacteria. Evaluate this use.

[3]

4. Before you hand it in

"Smaller particles have a smaller surface area to volume ratio."

As the side of a cube decreases by 10, its SA:V ratio INCREASES by 10.

Confusing nanometres and micrometres

Write every length in metres in standard form before comparing.

Evaluation answers with only advantages

Give benefits, risks and a justified conclusion.