

## **GCSE Chemistry B (Twenty First Century Science)**

**J258/04** Depth in chemistry (Higher Tier)

### **Question Set 13**

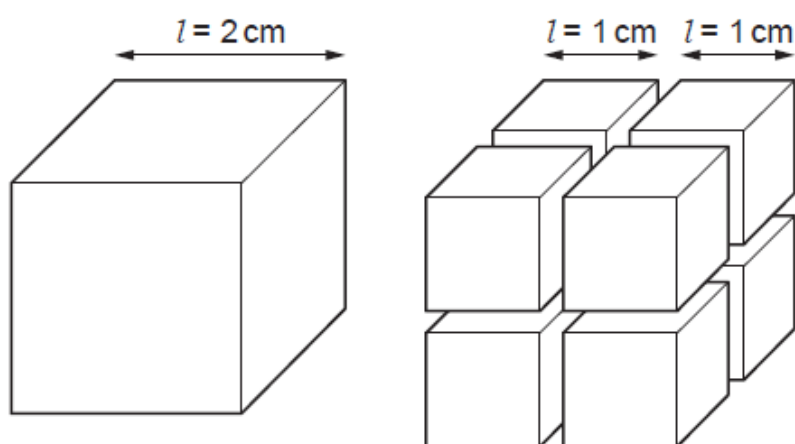
1

Silver nanoparticles are used in some socks to remove the smell of sweaty feet.



Silver nanoparticles have different properties to larger pieces of silver because they have a different surface area to volume ratio.

(a) The diagram shows what happens when a larger cube of silver is cut into eight smaller cubes.



The volume and surface area of a cube can be worked out using these formulae:

$$\text{volume} = l \times l \times l$$

$$\text{surface area} = 6 \times l \times l$$

**Table 2.1** shows the volume, surface area, and surface area to volume ratio for the larger cube.

Property	Larger cube	Smaller cubes
Total volume (cm <sup>3</sup> )	8	.....
Total surface area (cm <sup>2</sup> )	24	.....
Surface area to volume ratio (per cm)	3	.....

Table 2.1

- (i) Complete **Table 2.1** by filling in the blank spaces for the eight smaller cubes. Show your working. [3]
- (ii) Use ideas about surface area and volume to explain why nanoparticles of silver have a different surface area to volume ratio than larger silver particles. [2]

(b) New research has shown that nanoparticles may be used to treat cancer.

We are worried that metal nanoparticles may go through the natural holes in membranes into the brain where they might cause damage. Metal particles cannot usually go through the natural holes in membranes.



However, some scientists are worried about the negative effects of nanoparticles on the body.

- (i) Explain why metal nanoparticles may be able to enter the brain even though metal particles usually cannot. [2]
- (ii) Use ideas about **risk** and **benefit** to evaluate the use of nanoparticles in socks and to treat cancer. [3]

**Total Marks for Question Set 13: 10**

---

# OCR

Oxford Cambridge and RSA

## **Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge