

Mark schemes

Q1.

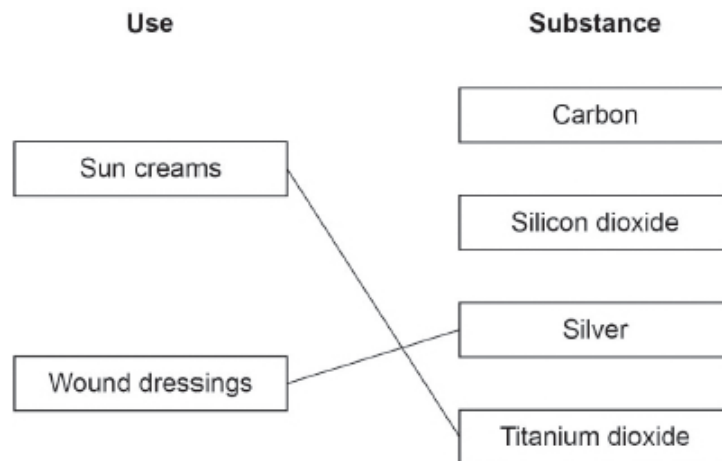
- (a) a few hundred atoms

1

- (b) iron

1

- (c)



1

do **not** accept more than one line from a box on the left

1

- (d) (surface area =)
- 6×4^2

1

$$= 96 \text{ (nm}^2\text{)}$$

1

$$\text{(volume =) } 4^3$$

1

$$= 64 \text{ (nm}^3\text{)}$$

1

$$\text{(ratio =) } 96 : 64$$

allow correct use of incorrectly determined area and/or volume

1

$$= 3 : 2$$

allow correct use of an incorrectly determined ratio

1

[10]

Q2.

(a) coarse particle

1

(b) 20 times

1

(c) (surface area) = 6×3^2

1

= $54 \text{ (nm}^2\text{)}$

1

(surface area : volume) = $54 : 27$ *allow correct ratio from an incorrectly determined
surface area*

1

(simplest ratio) = $2 : 1$

1

(d) a smaller mass of nanoparticles is needed to be effective

1

(e) TiO_2

1

[8]

Q3.

- (a) coarse particle 1
- (b) (volume =) 2^3
allow (volume =) $2 \times 2 \times 2$ 1
- = 8 (nm³) 1
- (surface area : volume) = 24 : 8
allow correct use of an incorrectly calculated volume 1
- (simplest ratio) = 3 : 1 1
- (c) high(er) / large(r) 1
- lower / less / smaller 1
- (d) (advantage)
 any **one** from:
 • stops (unpleasant) smells
 • can stop (foot) infections
allow specific (foot) infections
allow silver can kill bacteria 1
- (disadvantage)
 any **one** from:
 • high cost of socks
allow silver is (very) expensive
 • could be harmful if breathed in 1
- (e) 100 times 1

[10]