GCSE Chemistry A (Gateway Science)

J248/01 Chemistry A C1-C3 and C7 (Foundation Tier)

Question Set 32

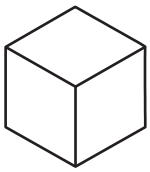
1 A new sun cream has been developed using zinc oxide nanoparticles.

The small particles provide better protection from the sun and they do not leave white marks on the skin.

(a) Explain **one** possible risk of using nanoparticles in sun cream. **[1]**

Inhaling or ingesting nanoparticles could cause damage to GI tract.

(b) A cube-shaped nanoparticle has sides of length 50 nm.



Calculate the surface area to volume ratio for this nanoparticle.

Use the equation: ratio = surface area ÷ volume

SA : $50^2 \times 6 = 15000$

V : $50^3 = 125000$

$\text{ratio} = \frac{15000}{125000} = 0.12$

Surface area to volume ratio = ... 0.12 ..... **[4]**

(c) (i) Scientists compare the size of nanoparticles to the sizes of other small objects.

Look at the table.

Object	Diameter (nm)
Gold atom	0.14
Water molecule	0.27
DNA strand	2.5
Zinc oxide nanoparticle	32
Red blood cell	7000
Human hair	100 000

The diameter of a DNA strand is 2.5 nm.

Explain why DNA is a nanoparticle but a water molecule is **not** a nanoparticle. **[2]**

because nanoparticle size ranges between 1 – 100 nm and DNA strand's diameter is within that range whilst water molecule is smaller than 1nm (outside the range)

(ii) Calculate how many zinc oxide nanoparticles would fit across a human hair.

Give your answer to **2** significant figures.

32nm → 100 000 nm

$\frac{100\,000}{32} = 3125$ times

Number of nanoparticles = 3100 **[2]**

Total Marks for Question Set 32: 9