

GCSE Chemistry A (Gateway Science)

J248/02 C4-C6 and C7 Foundation (Foundation Tier)

Question Set 29

1 This question is about properties of materials.

Police bullet-resistant vests could be made from steel or Kevlar®.



The table shows some information about steel and Kevlar®.

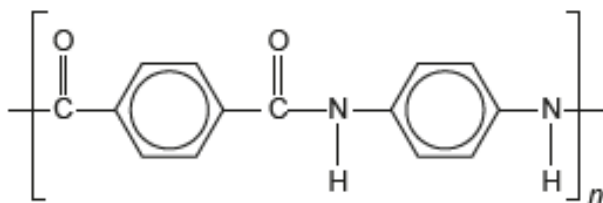
	Steel	Kevlar®
Density (g/cm ³)	7.85	1.44
Relative strength	1	5
Flexibility	low	high
Resistance to corrosion	low	high

(a) Describe and explain **two** reasons why bullet-resistant vests are made from Kevlar® instead of steel.

- 1 The relative strength is higher than steel thus it is more difficult for the bullet to penetrate the kevlar
- 2 It is much lighter than steel thus more comfortable for people to wear

[4]

(b) Look at the structure of Kevlar®.



What type of molecule is Kevlar®? *polymer*

[1]

(c) Nanoparticles are being used to make a material that is better than Kevlar® at resisting bullets.

Nanoparticles are often made of silicon dioxide.

A silicon dioxide nanoparticle has a diameter of 18 nm.

The diameter of a silicon atom is 0.22 nm.

(i) Estimate how many times larger the silicon dioxide nanoparticle is, compared to a silicon atom.

Give your answer to 1 significant figure.

$$\frac{18}{0.22} = 81.81 \dots$$

Number of times larger = *80* [3]

(ii) Silicon dioxide is used as a **catalyst**.

Suggest why 1 g of silicon dioxide is **more effective** as a catalyst when used as nanoparticles rather than as a powder.

[3]

- Nanoparticles have a greater surface area to volume ratio than powder.
- Because chemical reactions takes place on the surface of the catalyst, there would be more frequent collisions.
- Thus the rate of reaction would be faster.

Total Marks for Question Set 29: 11

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