

1(a). Nanoparticles are very small particles.

Which statements about nanoparticles are **true** and which are **false**?

Put a tick (✓) in one box in each row.

	True	False
Nanoparticles can be used to make sports equipment stronger.		
Nanoparticles can occur naturally.		
Nanoparticles have the same properties as larger particles.		
Nanoparticles are about the same size as molecules.		

[2]

(b). Doctors use stitches to hold together large cuts so that they can heal properly.

Doctor Khaliq is considering buying a new type of material to use for stitches.

He needs to choose between a material that contains silver nanoparticles and a material that does not.

(i) Doctor Khaliq thinks that there are advantages of using the material that contains nanoparticles instead of the material that does not.

Give **one** advantage of using the material with silver nanoparticles for stitches.

----- [1]

(ii) Doctor Khaliq has some concerns about using a material that contains nanoparticles on patients.

Give **one** reason against using nanoparticles.

----- [1]

(iii) Doctor Khaliq decides to buy the new material with nanoparticles.

Use the ideas of risk and benefit to justify his decision.

----- [1]

[Total: 5]

2(a). Nanoparticles of cerium oxide, CeO_2 , are added to diesel fuel.

What is the size of a nanoparticle?

Tick (✓) one box.

0.1 nm	<input type="checkbox"/>
10 nm	<input type="checkbox"/>
150 nm	<input type="checkbox"/>
1000 nm	<input type="checkbox"/>

[1]

(b). Cerium oxide is a very expensive solid.

The cerium oxide nanoparticles act as a catalyst.

They help the fuel to burn completely so that less pollutant gases are formed.

Nanoparticles have a much higher surface area to volume ratio than solids.

Explain the advantages of using cerium oxide in the form of nanoparticles rather than as a solid.

[2]

END OF QUESTION PAPER

Mark Scheme

Question		Answer/Indicative content			Marks	Guidance															
1	a	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">Sentence</th> <th style="width: 15%;">True</th> <th style="width: 15%;">False</th> </tr> </thead> <tbody> <tr> <td>..... to make sports equipment.</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>..... can occur naturally.</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>.....same properties as larger</td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>.....about the same size as molecules.</td> <td style="text-align: center;">✓</td> <td></td> </tr> </tbody> </table>			Sentence	True	False to make sports equipment.	✓	 can occur naturally.	✓	same properties as larger		✓about the same size as molecules.	✓		2	4 or 3 correct = 2 marks 2 or 1 correct = 1 mark
		Sentence	True	False																	
	 to make sports equipment.	✓																		
	 can occur naturally.	✓																		
	same properties as larger		✓																	
.....about the same size as molecules.	✓																				
b	i	nanoparticle material is stronger / has antibacterial properties;	1	Ignore ideas about speeding up the healing process. Ignore 'kills germs'																	
	ii	nanoparticles may be harmful to the body / not been fully investigated / long term effects are not known;	1	Accept ideas about allergies as an alternative to harmful.																	
	iii	benefit outweighs the risk;	1																		
Total			5																		
2	a	10 nm ✓			1 (AO 1.1)	<u>Examiner's Comments</u> A minority of candidates could recall the size of a nanoparticle.															
	b	Uses less ✓ (large surface area means) faster / AW ✓			2 (AO 1.1 × 2)	<u>Examiner's Comments</u> Explaining the advantage of using cerium oxide nanoparticles proved to be highly problematic for most candidates. There were many answers along the lines of "it works better".															
Total			3																		