

**GCSE Chemistry A (Gateway Science)**  
**J248/03 C1-C3 and C7 Higher (Higher Tier)**

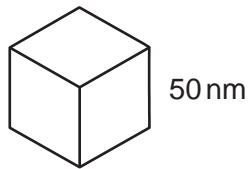
**Question Set 5**

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]

(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  $\div$  volume

Surface area to volume ratio = ..... [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]

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

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

Number of nanoparticles = .....

**[2]**

**Total Marks for Question Set 5: 9**

# The Periodic Table of the Elements

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(0)																												
1 H hydrogen 1.0	2 He helium 4.0	3 Sc scandium 45.0	4 Ti titanium 47.9	5 V vanadium 50.9	6 Cr chromium 52.0	7 Mn manganese 54.9	8 Fe iron 55.8	9 Co cobalt 58.9	10 Ni nickel 58.7	11 Cu copper 63.5	12 Zn zinc 65.4	13 B boron 10.8	14 C carbon 12.0	15 N nitrogen 14.0	16 O oxygen 16.0	17 F fluorine 19.0	18 Ne neon 20.2																		
11 Na sodium 23.0	12 Mg magnesium 24.3	19 K potassium 39.1	20 Ca calcium 40.1	21 Sc scandium 45.0	22 Ti titanium 47.9	23 V vanadium 50.9	24 Cr chromium 52.0	25 Mn manganese 54.9	26 Fe iron 55.8	27 Co cobalt 58.9	28 Ni nickel 58.7	29 Cu copper 63.5	30 Zn zinc 65.4	31 Ga gallium 69.7	32 Ge germanium 72.6	33 As arsenic 74.9	34 Se selenium 79.0	35 Br bromine 79.9	36 Kr krypton 83.8																
37 Rb rubidium 85.5	38 Sr strontium 87.6	39 Y yttrium 88.9	40 Zr zirconium 91.2	41 Nb niobium 92.9	42 Mo molybdenum 95.9	43 Tc technetium	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3	55 Cs caesium 132.9	56 Ba barium 137.3	57-71 lanthanoids	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.8	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.6	81 Tl thallium 204.4	82 Pb lead 207.2	83 Bi bismuth 209.0	84 Po polonium	85 At astatine	86 Rn radon
87 Fr francium	88 Ra radium	89-103 actinoids	104 Rf rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicium	113 Nh nihonium	114 Fl flerovium	115 Mc moscovium	116 Lv livermorium	117 Ts tennessine	118 Og oganeson																		

Key  
atomic number  
Symbol  
name  
relative atomic mass

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