

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

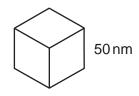
Question Set 5

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]

 Inhaling or ingesting nanoparticles could cause damage
 to all 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

$$SA: SD^2 \times 6 = 15000$$
 V: $SO^3 = 125000$

$$caho = \frac{15000}{05000} = 0.12$$

(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.

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

Give your answer to 2 significant figures.

32 nm \longrightarrow 100 000 nm $\frac{100000}{32} = 3125$ fixes

Number of nanoparticles = 3125

[2]

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

Total Marks for Question Set 5: 9

The Periodic Table of the Elements

1	0)	18	2 H	helium 4.0	10	Ne	neon 20.2	18	Ar	argon 39.9	36	궃	krypton 83.8	54	Xe	xenon 131.3	98	몺	radon			
Car A	(2)	•		17	6	щ	fluorine 19.0	17	23	chlorine 35.5	35	Ŗ	bromine 79.9	53	-	lodine 126.9	85	At	astatine			
Carry Carr	(9)			16	œ	0	oxygen 16.0	16	တ	sulfur 32.1	34	Se	selenium 79.0	52	Te	tellurium 127.6	84	Po	polonium	116	۲	livermorium
Canada C	(2)			15	7	z	nitrogen 14.0	15	۵.	phosphorus 31.0	33	As	arsenic 74.9	51	Sb	antimony 121.8	83	ö	bismuth 209.0			
C 2	(4)			14	9	ပ	carbon 12.0	14	S	slicon 28.1	32	Ĝ	germanium 72.6	20	Sn	tin 118.7	82	Рь	le ad 207.2	114	F1	flerovium
C 2 Fe A Fe Fe A Fe A Fe A A A A A A A A A	(3)			13	2	ω	boron 10.8	13	Αl	aluminium 27.0	31	Ga	gallium 69.7	49	딥	indium 114.8	81	11	thallium 204.4			
Canonic number Symbol Sy						12	30	Zn	zinc 65.4	48	ర	cadmium 112.4	80	Нg	mercury 200.6	112	ပ်	copernicium				
Carry Symbol Sy						7	29	ರ	ооррег 63.5	47	Ag	siliver 107.9	6/	Αn	gold 197.0	111	Rg	roentgenium				
Ca						10	28	Z	nickel 58.7	46	Pd	palladium 106.4	28	ቷ	platinum 195.1	110	Ds	darmstadfium				
Key Symbol Felative atomic mass Symbol Symbol Felative atomic mass Symbol Symbo						6	27	ပိ	oobalt 58.9	45	R	modium 102.9	22	=	iridium 192.2	109	Ĭ	meitnerium				
Key atomic number Symbol Felative atomic mass 4						œ	26	Fe	lron 55.8	44	Ru	ruthenium 101.1	9/	Os	08mium 190.2	108	Нs	hassium				
Key atomic numb Symbol Symbol Symbol Symbol 4						7	25	Mn	manganese 54.9	43	ည	technetium	22	Re	menium 186.2	107	뮵	bohrium				
2			Jer.	mass						9	24	ပ်	chromium 52.0	42	Mo	molybdenum 95.9	74	>	ungsten 183.8	106	Sg	seaborgium
2 4 Be beryllum 24.3 3 4 4.1		Key	mic numb Symbol	name /e atomic							23	>	vanadium 50.9	41	qN	niobium 92.9	73	Та	tantalum 180.9	105	Op	dubnium
2 4 4 4 Be beryllium 9.0 112 Mgg magnesium 24.3 20 Ca calcium 40.1 38 Sr strontium 87.6 Ba bartum 137.3 88 Ra radum			ato	relativ						4	22	F	ttanium 47.9	40	Zr	arconium 91.2	72	Ξ	hafinium 178.5	104	₹	rufherfordium
	•									က	21	သွ	scandium 45.0	39	>	yttrium 88.9	1	57-71	lanthanoids	3	89-103	actinol ds
(1) 1	(2)	_		2	4	Be	beryllium 9.0	12	Mg	magnesium 24.3	20	Sa	calcium 40.1	38	Š	strontium 87.6	26	Ba	137.3	88	Ra	radium
	Ð	-	← I	hydrogen 1.0	က	:	lithium 6.9	11	Na	sodium 23.0	19	¥	potassium 39.1	37	Rb	rubidium 85.5	22	S	caesium 132.9	87	ቷ	francium



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