3-D Shapes and Volume

Mark Scheme 1

Level	IGCSE
Subject	Maths
Exam Board	Edexcel
Topic	Shape, Space and Measures
Sub Topic	3-D Shapes and volume
Booklet	Mark Scheme 1

Time Allowed: 57   minutes

Score: /47

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	75%	70%	60%	55%	50%	<50%

Question Number	Working	Answer	Mark	Notes	
1.	$\pi \times r \times 9 = 100$ oe		5	M1	
	$(r =) 3.53677…$			A1	for 3.53 or for value rounding to 3.54 $(3.14 \to 3.53857…)$
	$\sqrt{9^2 - "3.53..."^2}$			M1	
	$(h =) 8.2759…$			A1	for 8.27 or for value rounding to 8.28
		108		A1	for answer rounding to 108 $(\pi \to 108.40…$ $3.14 \to 108.45…)$ If both M1s scored , award 5 marks for an answer which rounds to 108
					Total 5 marks

Question Number	Working	Answer		Mark	Notes	
2.	$\pi r^2 \times 4r - 2 \times 4\pi\, r^3/3 = 125\pi/6$ oe $24\, r^3 - 16\, r^3 = 125$ oe				M2	Any equation based on cylinder – 2 spheres = space oe h = 4r must be implicit for award of M2 {decimal form: $12.6r^3 - 8.4r^3 = 65.4$ (1 dp or better)} If not M2 then M1 for $\pi r^2 \times 4r$ or better
	$r^3 = 125/8$ oe $r = \sqrt[3]{(125/8)}$				M1 M1	One occurrence of r^3 in correct equation.
		2.5		5	A1	awrt to 2.5 Ans dep on M3
						Total 5 marks

3.	$2\times\pi\times5.1^2 + 2\times\pi\times5.1\times3.7$ oe **or** 163.42... + 118.56... (using π) **or** 163.3428 + 118.5036 (using 3.14) (rounded or truncated to at least 3 sig figs) **or** $2\times\pi\times5.1\times(5.1+3.7)$ **or** $\dfrac{2601}{50}\pi + \dfrac{1887}{50}\pi$ **or** $\dfrac{2244}{25}\pi$		3	M2	M1 for one of $2\times\pi\times5.1^2$ **or** value in range 163-163.43 inc **or** $\dfrac{2601}{50}\pi$ $2\times\pi\times5.1\times3.7$ oe **or** value in range 118-119 inc **or** $\dfrac{1887}{50}\pi$ NB. Accept 3.14(...) or 22/7 in place of π
		282		A1	for answer in range 281.8-282 inc
					Total 3 marks

4.	$2\times\pi\times3.4\times8.3$ **or** 56.44π **or** 177.3...		4	M1	
	$\pi\times3.4^2$ **or** 11.56π **or** 36.31...			M1	
	$2\times\pi\times3.4^2$ **or** 23.12π **or** 72.63..			M1	
		286		A1	for awrt 286
					Total 4 marks

Question	Working	Answer	Mark		Notes
5.	$2\times\pi\times2.7\times4.9$ or 83(.12654...)		3	M1	May be rounded or truncated to at least 2 sf (83.0844 if 3.14 used)
	6×8.7^2 oe or 454.14			M1	May be rounded or truncated to at least 2 sf
		537		A1	for answer rounding to 537
					Total 3 marks

6. (a)	$0.5 \times (11 + 7) \times 10$				M1	M1 for $(0.5 \times 2 \times 10) + (7 \times 10) + (0.5 \times 2 \times 10)$
			90	2	A1	
(b)	"90" x 12				M1 ft	Their area in (a) x 12
			1080	2	A1 ft	
						Total 4 marks

7.	$130 = \pi \times 4.5 \times l$				M1	
	$l = \dfrac{130}{4.5\pi}$ or $l = 9.1956$				M1	For exact expression or answer which rounds to 9.2
	$\sin (AVO) = 4.5/"9.20" (= 0.489..)$				M1	For a correct expression for sin AVO or cos AVB $\cos (AVB) = ("9.2"^2 + "9.2"^2 - 9)/ 2 \times "9.2" \times "9.2"$ (=0.521...)
			58.6	4	A1	awrt 58.6
						Total 4 marks

Question	Working	Answer	Mark	Notes	
8.	$0.5 \times 10 \times 12$ (= 60) or 13×8 (= 104) or 8×10 (= 80)			M1	One correct face
	$0.5 \times 10 \times 12$ (= 60) and $0.5 \times 10 \times 12$ (= 60) and 13×8 (= 104) and 13×8 (= 104) and 8×10 (= 80) or $2 \times "60"$ and $2 \times "104"$ and "80"			M1	dep on M1 above (exactly 5 correct faces)
		408		A1	
			3		Award M0A0 for $0.5 \times 10 \times 12 \times 8$ and M0A0 for $0.5 \times 10 \times 12 = 60$ followed by 60×8, etc
					Total 3 marks

Question	Working	Answer	Mark	Notes	
9.	$(A =) 0.5 \times (4 + k) \times \sqrt{3}$ $(= 5\sqrt{6})$ oe			M1	$4\sqrt{3} + 0.5(k - 4) \times \sqrt{3}$ oe
	$k + 4 = \dfrac{10\sqrt{6}}{\sqrt{3}}$				
	$(k =) 2 \times \dfrac{5\sqrt{6}}{\sqrt{3}} - 4$ or $(k =) \dfrac{5\sqrt{6} - 2\sqrt{3}}{0.5\sqrt{3}}$ oe			M1	correctly isolating k
		$(k =) 10\sqrt{2} - 4$		A1	Accept $2(5\sqrt{2} - 2)$ but don't accept $10\sqrt{2} - 4$
			3		followed by $5\sqrt{2} - 2$
					Total 3 marks

Question	Working	Answer	Mark	Notes
10.	12π		3	M1 for circumference accept value which rounds to 37.7
	$30 \times 12\pi$ or 360π			M1 correct expression for surface area
		1130		A1 accept awrt 1130 (3SF) e.g 1131 If full Surface Area given, then award 2 marks as long as you see 360π oe in working (M1 for 12π oe) Do not isw.
				Total 3 marks

Question	Working	Answer	Mark	Notes	
11.	$4\pi r^2 = 81\pi$ **or** $4r^2 = 81$			M1	M2 for $r = 4.5$ **or**
	$r = \sqrt{\dfrac{81\pi}{4\pi}}$ (=4.5)			M1	$r = \sqrt{\dfrac{81\pi}{4\pi}}$ oe (may be seen in two stages)
	$\dfrac{4}{3} \times \pi \times "4.5"^3$			M1 ft for "r" dep on first M1	
		382	4	A1 for 381 - 382	
					Total 4 marks

Question	Working	Answer	Mark	Notes
12.	(Slant Height =) $\sqrt{(5a)^2 + (12a)^2}$ (= 13a)			M1 correct use of Pythagoras – condone missing brackets
	(total surface area =) $\pi \times (5a)^2 + \pi \times 5a \times$ "13a" oe **or** $\pi \times (5a)^2 + \pi \times 5a \times \sqrt{(5a)^2 + (12a)^2}$ (=90 πa^2)			M1 dep on first M1 – must have either $25a^2$ or $(5a)^2$
	eg. 90 $\pi a^2 = 360\pi$ oe **or** $\pi \times (5a)^2 + \pi \times 5a \times$ "13a" = 360π oe			M1 dep on first M1 for equation formed (need not be simplified) – must have either $25a^2$ or $(5a)^2$
				A1 $a = 2$
	$V = \dfrac{1}{3} \times \pi \times (5 \times "2")^2 \times 12 \times "2"$ (=100πa^3) **or** $V = \dfrac{1}{3} \times \pi \times 10^2 \times 24$ oe **or** $k = \dfrac{1}{3} \times (5 \times "2")^2 \times 12 \times "2"$			M1 dep on first M1 NB. For the award of this mark, brackets must be present or the value for r^2 evaluated correctly for the candidate's value of a
		800	6	A1 cao
				Total 6 marks