Question Number	Scheme	Marks
1(a)	$h = 0.5$	B1
	$A \approx \frac{1}{2} \times \frac{1}{2}\{2.287 + 2.834 + 2(4.470 + 6.719 + 7.291)\}$	M1
	= awrt 10.52	A1
		(3)
(b)(i)	$A \approx$ "10.52" $- 4$	M1
	= 6.52	A1ft
(b)(ii)	$A \approx$ "10.52"	B1ft
		(3)
		Total 6

(a)

B1 $h = 0.5$ oe seen or implied by sight of $\frac{0.5}{2}$ in front of the bracket. May also be implied by a correct answer if no incorrect working seen. $h = -0.5$ is B0

M1 Correct application of the trapezium rule with their *h*. Look for a correct bracket structure, condoning slips copying values from the table or the omission of the final brackets on the rhs

e.g. $\frac{1}{2} \times "\frac{1}{2}"(2.287 + 2.834 + 2(4.470 + 6.719 + 7.291$ is M1

but $\frac{1}{2} \times "\frac{1}{2}" \times 2.287 + 2.834 + 2(4.470 + 6.719 + 7.291)$ is M0 unless the brackets are recovered or implied by their answer (you may need to check this).

Also allow for a correct method adding individual trapezia using their *h* condoning copying errors but the brackets must be correct (or recovered or implied by later work)

e.g. $\frac{1}{2} \times "\frac{1}{2}"(2.287 + 4.470) + \frac{1}{2} \times "\frac{1}{2}"(4.470 + 6.719) + \frac{1}{2} \times "\frac{1}{2}"(6.719 + 7.291) + \frac{1}{2} \times "\frac{1}{2}"(7.291 + 2.834)$

A1 awrt 10.52 isw once a correct answer is seen. Correct answer with no working scores B1M1A1 but if there is evidence of using $h = -0.5$ then maximum awarded is B0M1A0

(b)(i) Note that they must be using their answer to part (a) to score marks in (b)

M1 Attempts to subtract 4 from their answer to part (a) or allow for the expression "10.52" $- \left[2x\right]_{-1}^{1}$ or e.g. "10.52" $-(2+2)$. Do not condone omission of brackets or arithmetical errors here. This mark cannot be scored from a new attempt at the trapezium rule.

"10.52" $-(2-2)$ is M0

A1ft awrt 6.52 correct answer or correct ft (allowing if they proceed to round a more accurate answer in (a) to 2dp). In both cases they must be using their answer to part (a) function which could even come from integration.

(ii)

B1ft awrt 10.52 Writes down the same answer as part (a) (follow through their (a)). Condone "same as **part (a)**" (again allow if they proceed to round a more accurate answer in (a) to 2dp)

Note (a) 10.5 (b)(i) 6.5 (b)(ii) 10.5 could score B1M1A0M1A1ftB1ft

Question Number	Scheme	Marks
2(a)	$(S=)\ 6x^2+6xh+2xh$	B1
	eg $V=3x^2h=972\Rightarrow h=\dfrac{972}{3x^2}$ or eg $hx=\dfrac{324}{x}$ $\Rightarrow (S=)\ 6x^2+8x\left(\dfrac{972}{3x^2}\right)$ or $\Rightarrow (S=)\ 6x^2+8\left(\dfrac{324}{x}\right)$	M1
	$S=6x^2+\dfrac{2592}{x}$*	A1*
		(3)
(b)	$\left(\dfrac{\mathrm{d}S}{\mathrm{d}x}=\right)12x-\dfrac{2592}{x^2}$	B1
		(1)
(c)	$12x-\dfrac{2592}{x^2}=0\Rightarrow 12x^3=2592$ $\Rightarrow x=\sqrt[3]{\dfrac{2592}{12}}$	M1
	$x=6$	A1
		(2)
(d)	$\left(\dfrac{\mathrm{d}^2S}{\mathrm{d}x^2}=\right)12+\dfrac{5184}{x^3}$	B1ft
	$\dfrac{\mathrm{d}^2S}{\mathrm{d}x^2}>0$ when $x=6$ so minimum	B1
		(2)
(e)	$S=6(6)^2+\dfrac{2592}{6}=648\ (\mathrm{cm}^2)$	B1
		(1)
		Total 9

(a)

B1 Correct expression for the surface area in any form.
It may be implied by a correct expression for the surface area in terms of x which is not the given answer.
Once a correct expression is seen then award B1.

M1 Uses the given volume in a dimensionally correct formula to obtain h or hx in terms of x and substitutes into their expression for S of the form $...xh+...x^2$ or equivalent e.g. $...xh+...xh+...x^2$
It may be implied by a correct expression for the surface area in terms of x which is not the given answer.

A1* Achieves the given answer with no errors including bracketing omissions.
As a minimum you must see:

- the separate equation for the volume
- a substitution before seeing the $\dfrac{2592}{x}$ term
- $S=$ in their solution at some point (or e.g. SA = or surface area = or Area=)