Question Number	Scheme	Marks
6(a)	$(V=)\ \ 5x\times 2x\times h=1000$ or $10x^2h=1000$	B1
	$(S=)\ 5x\times 2x+2h(5x+2x)$	M1
	$S=10x^2+\dfrac{1400}{x}$ *	M1A1cso (4)
(b)	$\dfrac{\mathrm{d}S}{\mathrm{d}x}=20x-1400x^{-2}$	M1
	$\dfrac{\mathrm{d}S}{\mathrm{d}x}=0\Rightarrow x^3=70,$ or $x=\sqrt[3]{70}$ $\quad(x=4.121...)$	M1,A1
	$S_{\min}=10\left(\sqrt[3]{70}\right)^2+\dfrac{1400}{\sqrt[3]{70}}=509.54...=510$	M1A1 (5)
(c)	$\dfrac{\mathrm{d}^2S}{\mathrm{d}x^2}=20+2800x^{-3}$	M1
	$x=\sqrt[3]{70}\Rightarrow\dfrac{\mathrm{d}^2S}{\mathrm{d}x^2}>0\ \ \therefore$ min	A1ft (2)
		[11]

(a)

B1 Obtain a correct equation connecting *x* and *h* (any equivalent allowed)

M1 Obtain an expression for *S* in terms of *x* and *h*, correct or with top included. This is a "show that" question so we require adequate evidence for this expression, in particular areas of the separate sides must be identifiable. (14*xh* with no evidence scores M0)

M1 Use the equation to eliminate *h* to give an expression for *S* in terms of *x* only.

A1cso Obtain the **given** expression for *S*. Must start *S* =... No errors in the working

(b)

M1 Differentiate the **given** expression, power of *x* to decrease in at least one term

M1 Equate their derivative to zero and solve for x^3

A1 Correct value of x^3 or *x*, seen explicitly or used. (Correct *x* implies correct method.)

M1 Use their value of *x* to obtain the corresponding value of *S*

A1 Correct value of *S*. **Must** be 3 sf.

NB: These last 2 marks may only be given for work seen in (b)

(c)

Working for (c) must be seen or used in (c) to gain credit in (c).

If work not labelled (c) there must be no following work for marks to be awarded.

M1 Obtain the second derivative.

(If signs of d*S*/d*x* on either side of their *x* are considered, numerical calculations must be shown.)

A1ft Establish that the minimum has been obtained and give a conclusion. No need to calculate the value of the second derivative.

Follow through their *x* provided *x* > 0 **and the second derivative is algebraically correct.**

NB: Solutions for (b) and (c) by trial and improvement – send to Review.