Question Number	Scheme	Marks
5(a)	$V = x\times 4x\times h = 772$	
	$h=\dfrac{193}{x^2}=\dfrac{772}{4x^2}$	B1
	$A = 2\times 4x^2+2xh+2\times 4xh = 8x^2+10xh$	
	$A = 8x^2+10x\times\dfrac{193}{x^2}=8x^2+\dfrac{1930}{x}$ *	M1A1cso (3)
(b)	$(A=)8x^2+1930x^{-1}$	
	$\left(\dfrac{dA}{dx}=\right)16x-1930x^{-2}$	M1
	$\left(\dfrac{dA}{dx}=0\ \Rightarrow\right)16x=\dfrac{1930}{x^2}$	dM1
	$x^3=\dfrac{1930}{16}\qquad x=4.9409...=4.94$	A1
	$\left(\dfrac{d^2A}{dx^2}=\right)16+3860x^{-3}$	M1
	$x=4.94\ \Rightarrow\dfrac{d^2A}{dx^2}>0\quad\therefore$ minimum	A1ft (5)
(c)	$A_{\min}=8\times 4.940...^2+\dfrac{1930}{4.940...}=585.9...,=586$	M1,A1cao (2)
		[10]
(a)B1	$h=\dfrac{193}{x^2}$ or $\dfrac{772}{4x^2}$ or $xh=\dfrac{193}{x}$ oe Seen explicitly or used in the expression for A	
M1	Form an expression for A in terms of x and h which must be dimensionally correct and replace h with a function of x	
A1cso	Obtain the given expression for A. No errors seen. Must start A = ... or area = ...	
(b)		
M1	Differentiate the GIVEN expression for A	
dM1	Equate their derivative to 0. Dependent on the previous M mark.	
A1	$x=4.94$ Must be 3 sf **Special Case**: 4.94 with no working (calculator solution) scores M1M1A1	
M1	Attempt the second derivative - must have 2 terms.	
A1ft	Deduce that their value of x gives a minimum, follow through their x. No need to evaluate the derivative provided the value of x is positive and the derivative is algebraically correct. Must have a conclusion.	
ALTs	For last 2 marks: Look at signs of $\dfrac{dA}{dx}$ either side of $x=4.94$ **and** calculate the values of $\dfrac{dA}{dx}$ (M1) All correct with conclusion (A1) or refer to the graph - sketch must be shown.	
(c)		
M1	Use their value of x in the given expression for A and complete to A = ...	
A1cao	586 Must be 3sf unless rounding already penalised in (b)	