Question	Scheme	Marks	AOs
14(a)	Sets $500 = \pi r^2 h$	B1	2.1
	Substitute $h = \dfrac{500}{\pi r^2}$ into $S = 2\pi r^2 + 2\pi r h = 2\pi r^2 + 2\pi r \times \dfrac{500}{\pi r^2}$	M1	2.1
	Simplifies to reach given answer $S = 2\pi r^2 + \dfrac{1000}{r}$ *	A1*	1.1b
		(3)	
(b)	Differentiates S with both indices correct in $\dfrac{\mathrm{d}S}{\mathrm{d}r}$	M1	3.4
	$\dfrac{\mathrm{d}S}{\mathrm{d}r} = 4\pi r - \dfrac{1000}{r^2}$	A1	1.1b
	Sets $\dfrac{\mathrm{d}S}{\mathrm{d}r} = 0$ and proceeds to $r^3 = k,\, k$ is a constant	M1	2.1
	Radius $= 4.30\,\mathrm{cm}$	A1	1.1b
	Substitutes their $r = 4.30$ into $h = \dfrac{500}{\pi r^2} \Rightarrow$ Height $= 8.60\,\mathrm{cm}$	A1	1.1b
		(5)	
(c)	States a valid reason such as • The radius is too big for the size of our hands • If $r = 4.3\,\mathrm{cm}$ and $h = 8.6\,\mathrm{cm}$ the can is square in profile. All drinks cans are taller than they are wide • The radius is too big for us to drink from • They have different dimensions to other drinks cans and would be difficult to stack on shelves with other drinks cans	B1	3.2a
		(1)	
		9 marks	

Notes:

(a)

B1: Uses the correct volume formula with $V = 500$. Accept $500 = \pi r^2 h$

M1: Substitutes $h = \dfrac{500}{\pi r^2}$ or $rh = \dfrac{500}{\pi r}$ into $S = 2\pi r^2 + 2\pi r h$ to get S as a function of r

A1*: $S = 2\pi r^2 + \dfrac{1000}{r}$ Note that this is a given answer.

(b)

M1: Differentiates the given S to reach $\dfrac{\mathrm{d}S}{\mathrm{d}r} = Ar \pm Br^{-2}$

A1: $\dfrac{\mathrm{d}S}{\mathrm{d}r} = 4\pi r - \dfrac{1000}{r^2}$ or exact equivalent

M1: Sets $\dfrac{\mathrm{d}S}{\mathrm{d}r} = 0$ and proceeds to $r^3 = k,\, k$ is a constant

A1: $R = $ awrt 4.30cm

A1: $H = $ awrt 8.60 cm

(c)

B1: Any valid reason. See scheme for alternatives