Question	Answer	Marks	Partial Marks
11(a)	$l=\frac{4}{r}$	**B1**	
	$h^2 = l^2 - r^2$ or $l^2 = r^2 + h^2$	**M1**	
	$h^2=\left(\frac{4}{r}\right)^2 - r^2$ or $\left(\frac{4}{r}\right)^2 = r^2 + h^2$ or $l^2 = \frac{16}{r^2}$ **and** $h^2 = l^2 - r^2$	**M1**	**FT** *their l* ; dep on previous **M1**
	Correct, convincing completion to $h^2 = \frac{16}{r^2} - r^2$	**A1**	
	Alternative method		
	$l=\sqrt{r^2+h^2}$	**(B1)**	
	$\pi r\sqrt{r^2+h^2} = 4\pi$	**(M1)**	
	$\left(\sqrt{r^2+h^2}\right)^2=\left(\frac{4}{r}\right)^2$	**(M1)**	
	Correct, convincing completion to $h^2 = \frac{16}{r^2} - r^2$	**(A1)**	
11(b)	$\frac{\pi}{3} r^2 \sqrt{\frac{16}{r^2} - r^2}$	**M1**	
	$\frac{\pi}{3}\sqrt{r^4\left(\frac{16}{r^2} - r^2\right)}$ and correct completion to $\frac{\pi}{3}\sqrt{16r^2 - r^6}$	**A1**	

Question	Answer	Marks	Partial Marks
11(c)	$\frac{\mathrm{d}V}{\mathrm{d}r} = \frac{\pi}{3}\left(\frac{1}{2}\left(16r^2 - r^6\right)^{-\frac{1}{2}}\right)\left(32r - 6r^5\right)$ oe	**B3**	**B2** for $k\left(16r^2 - r^6\right)^{-\frac{1}{2}}\left(32r - 6r^5\right)$ where k is a constant and $k \neq 0$ or **B1** for $k\left(16r^2 - r^6\right)^{-\frac{1}{2}} \times \left(\mathrm{f}(r)\right)$ where $\mathrm{f}(r) \neq 32r - 6r^5$
	Equates *their* $\frac{\mathrm{d}V}{\mathrm{d}r}$ to 0 and solves as far as $r^4 = \ldots$	**M1**	**FT** *their* $\mathrm{f}(r) = ar + br^5$ for $a, b \neq 0$
	$r = 1.52$ or 1.519[67…] rot to 4 or more sf or $\frac{2}{\sqrt[4]{3}}$ oe	**A1**	