

5	(a)		<p>An example of a correct method:</p> $l = \frac{4}{r} \text{ or } l = \frac{4\pi}{r\pi} \text{ exactly (not } lr = 4)$ $(h = \sqrt{l^2 - r^2})$ $h = \sqrt{\frac{16}{r^2} - r^2} \text{ or } \frac{\sqrt{16-r^4}}{r} \text{ oe}$ $V = \frac{1}{3}\pi r^2 \sqrt{\frac{16}{r^2} - r^2} \text{ or } \frac{1}{3}\pi r^2 \frac{\sqrt{16-r^4}}{r} \text{ oe}$ $(= \frac{\pi}{3} \sqrt{16r^2 - r^6} \text{ AG})$	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>[4]</p>		<p>Other correct methods may be seen eg $lr = 4$: B1, find h into l & r: B1, Subst h & lr into V: M1, convincing: A1</p> <p>3.1a Express l correctly in terms of r May be implied</p> <p>1.1 Express h (or h^2) correctly in terms of r alone</p> <p>1.1 Sub their h (in terms of r alone) into $\frac{1}{3}\pi r^2 h$</p> <p>2.1 Must see a correct previous expression in terms of r only, and the answer</p>	<p>NB Must be <u>clearly</u> using this alternative method to score any marks on this scheme.</p> <p>Allow $l = \frac{4-r^2}{r}$ oe B1 $(h^2 = l^2 - r^2)$ or $h^2 = \frac{16}{r^2} - r^2$ or $\frac{16-r^4}{r^2}$</p>
5	(b)	DR	$\frac{d}{dr} \left(\frac{\pi}{3} \sqrt{16r^2 - r^6} \right)$ $\frac{\pi(32r - 6r^5)}{3 \times 2\sqrt{16r^2 - r^6}} = 0 \text{ oe}$ <p>(Their derivative = 0)</p> $r = \frac{2}{\sqrt[4]{3}} \text{ or } \sqrt[4]{\frac{16}{3}} \text{ oe or } 1.52 \text{ (3 sf) Allow } 1.5$ <p>or $r^2 = \frac{4}{\sqrt{3}}$</p> $r = -\frac{2}{\sqrt[4]{3}} \text{ or } -1.52 \text{ invalid OR } r = 0 \text{ invalid or } r > 0$ $(V_{\max} = \frac{\pi}{3} \sqrt{16 \times 1.51967^2 - 1.51967^6})$ <p>Max $V = 5.20$ (3 sf) Allow 5.2 or a.r.t. 5.2</p>	<p>M1</p> <p>A1</p> <p>A1</p> <p>B1f</p> <p>A1</p> <p>[5]</p>		<p>1.1a Attempt differentiate V or $\frac{V}{\pi}$ or $3V$</p> <p>2.1 Correct derivative of one of the above Condone missing brackets.</p> <p>1.1 Lose this mark if incorrect values of r also given, eg $r = \pm 2$ obtained from $(16r^2 - r^6)^{-\frac{1}{2}} = 0$</p> <p>3.2a Comment needed, about their negative r (ft) or about $r = 0$</p> <p>1.1 Condone $V = 5.20 \text{ m}^3$</p>	<p>or $\frac{3V}{\pi}$ or $\sqrt{16r^2 - r^6}$ or $16r^2 - r^6$</p> <p>All subsequent marks can be scored even if this A1 not scored.</p> <p>Allow without $r = 0$</p> <p>T & I: 5.20 (3sf) SC B2 5.2 (2 sf) SC B1</p>