

Q	Marking instructions	AO	Marks	Typical solution
8(a)	Obtains $\frac{dV}{dh} = \frac{3\pi h^2}{12}$ or $\frac{\pi h^2}{4}$ OE Condone missing or incorrect labels	1.1b	B1	
	Obtains $v = 8 \times 3$ or 24 Can be embedded eg 288 or 96×3	3.1b	B1	$\frac{dV}{dh} = \frac{3\pi h^2}{12} = \frac{\pi h^2}{4}$
	Equates their 24 to $\frac{\pi h^3}{12}$ to obtain $h = \sqrt[3]{\frac{24 \times 12}{\pi}}$ or $h^2 = \left(\frac{288}{\pi}\right)^{\frac{2}{3}}$ Can be embedded Condone decimal values $h = 4.51$ $h^2 = 20.3$	1.1b	M1	When $t = 3$ $V = \frac{\pi h^3}{12} = 24$ $\Rightarrow h = \left(\frac{288}{\pi}\right)^{\frac{1}{3}}$ $\frac{dV}{dh} = \frac{\pi}{4} \left(\frac{288}{\pi}\right)^{\frac{2}{3}}$ $= \pi^{\frac{1}{3}} \times \frac{1}{4} \times 82944^{\frac{1}{3}}$ $= \sqrt[3]{1296\pi}$ $= \sqrt[3]{216 \times 6\pi}$ $= 6\sqrt[3]{6\pi}$
	Completes reasoned argument to show given result AG Must include $\frac{dV}{dh}$ with at least one intermediate step without 288 Must not include incorrect working in the manipulation	2.1	R1	
	Subtotal		4	

Q	Marking instructions	AO	Marks	Typical solution
8(b)	<p>States any correct chain rule connecting $\frac{dV}{dt}$, $\frac{dV}{dh}$ and $\frac{dh}{dt}$</p> <p>PI by $\frac{8}{6\sqrt[3]{6\pi}}$ or correct answer</p> <p>or</p> <p>states that $h = \sqrt[3]{\frac{96t}{\pi}}$</p>	3.1b	M1	$\frac{dh}{dt} = \frac{dV}{dt} \times \frac{dh}{dV}$ $\Rightarrow \frac{dh}{dt} = \frac{8}{6\sqrt[3]{6\pi}}$ $= 0.501 \text{ cm s}^{-1}$
	<p>Substitutes $\frac{dV}{dt} = 8$ and $\frac{dV}{dh} = 6\sqrt[3]{6\pi}$ in their chain rule</p> <p>PI by $\frac{8}{6\sqrt[3]{6\pi}}$ or correct answer</p> <p>or</p> <p>substitutes $t = 3$ in their $\frac{dh}{dt} = \left(\frac{96}{\pi}\right)^{\frac{1}{3}} \times \frac{t^{-2/3}}{3}$ ACF</p>	1.1a	M1	
	<p>Obtains correct $\frac{dh}{dt}$</p> <p>AWRT 0.501 cm/s</p> <p>Must be at least 3sf with correct unit cm/s or cm s⁻¹</p>	3.2a	A1	
	Subtotal		3	

	Question 8 Total	7	
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