

Question	Scheme	Marks
4	$\frac{dA}{dt} = 50\pi \quad \frac{dr}{dt} = \frac{5}{12}$ $\left(A = 4\pi r^2 \Rightarrow \frac{dA}{dr} = 8\pi r \right)$ $\frac{dr}{dt} = \frac{1}{\frac{dA}{dr}} \times \frac{dA}{dt} \quad \text{oe} \quad \Rightarrow \frac{5}{12} = \frac{1}{8\pi r} \times 50\pi \Rightarrow r = 15$ $V = \frac{4}{3} \times \pi \times 15^3 = 4500\pi \text{ [cm}^3\text{]}$	B1,B1 B1 M1dM1A1 M1A1 [8]
Total 8 marks		

Mark	Notes
B1	For either the correct $\frac{dA}{dt} = 50\pi$ or $\frac{dr}{dt} = \frac{5}{12}$ May be seen explicitly or used implicitly in the candidate's work.
B1	For both correct $\frac{dA}{dt} = 50\pi$ and $\frac{dr}{dt} = \frac{5}{12}$ May be seen explicitly or implicitly in the candidate's working.
B1	For $8\pi r$ May be seen explicitly or implicitly in the candidate's working.
M1	For a correct chain rule, relevant to the question. Look for equivalences. This may be explicitly stated or can be awarded for use of the appropriate values or expressions implicitly.
dM1	For correctly substituting their values and rearranging their equation to find a value for r . Allow errors in rearrangement. Dependent on the previous method mark, though M1 dM1 can be awarded if the implicit use of their values in a correct chain rule is correct, without the chain rule being stated.
A1	For $r = 15$ (cm)
M1	For using the formula for the volume of a sphere with their r Note – although this has not been made a dependent mark, this mark can only be awarded if 'their r' has come from some attempt at calculus.
A1	For the correct volume of a sphere given exactly.