Question Number	Scheme	Marks
1	Volume $= \int_0^8 \frac{16\pi}{(x+2)^2}(\mathrm{d}x)$ oe e.g. $\pi\int_0^8\left(\frac{4}{x+2}\right)^2(\mathrm{d}x)$	B1
	$\int \frac{16}{(x+2)^2}\mathrm{d}x = \frac{-16}{(x+2)}$ or e.g. $u = x+2 \Rightarrow \int \frac{16}{(x+2)^2}\mathrm{d}x = \int \frac{16}{u^2}\mathrm{d}u = \frac{-16}{u}$	M1 A1
	$\left[\frac{-16\pi}{(x+2)}\right]_0^8 = \frac{-16\pi}{10} - \left(\frac{-16\pi}{2}\right)$ or e.g. $\left[\frac{-16\pi}{u}\right]_2^{10} = \frac{-16\pi}{10} - \left(\frac{-16\pi}{2}\right)$	M1
	$= \frac{32}{5}\pi$	A1
		(5)
		(5 marks)

B1: Correct expression for the volume in terms of x including the limits (which may be implied by later work). Condone omission of the "dx" but the correct integral with the correct limits and the 16π included must be seen or implied.

M1: For $\int \frac{\ldots}{(x+2)^2}(\mathrm{d}x) \to \frac{\ldots}{x+2}$ oe e.g. $\ldots(x+2)^{-1}$ where "…" are non-zero constants.

Or e.g. $\int \frac{\ldots}{(x+2)^2}\mathrm{d}x = \int \frac{\ldots}{u^2}(\mathrm{d}u) \to \frac{\ldots}{u}$ oe e.g. $\ldots u^{-1}$ where "…" are non-zero constants.

A1: $\int \frac{16}{(x+2)^2}(\mathrm{d}x) = \frac{-16}{(x+2)}$ or $\frac{-16}{u}$ where $u = x + 2$. Ignore any reference to π which could be 2π or e.g. 180°. The limits are not required for this mark so you can ignore any that are given.

M1: Substitutes the limits 0 and 8 into their attempted integration of $\frac{\ldots}{(x+2)^2}$ or e.g. 2 and 10 into their attempted integration of $\frac{\ldots}{u^2}$ and subtracts either way round. Allow this mark following poor attempts at integration, e.g. $\int \frac{\ldots}{(x+2)^2}(\mathrm{d}x) \to \ln(x+2)^2$ but it must be a "changed" function e.g. not $\int \frac{\ldots}{(x+2)^2}(\mathrm{d}x) \to \frac{\ldots}{(x+2)^2}$ and it must an expression that can be evaluated e.g. not expressions containing $\frac{1}{x}$ or e.g. $\ln x$ that cannot be evaluated at $x = 0$

If the integration is incorrect and the substitution of limits is not seen explicitly then you may need to check their answer.

A1: $\frac{32}{5}\pi$ or exact equivalent e.g. $\frac{64\pi}{10}$, 6.4π following fully correct work. $\frac{32}{5}\pi + c$ is A0.

Note $\int_0^8 \frac{16\pi}{(x+2)^2}\mathrm{d}x = \frac{32}{5}\pi$ on its own scores B1M0A0M0A0