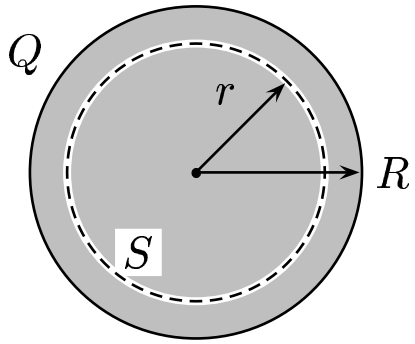
Consider an electrostatic situation. A sphere (insulator) has a uniform charge Q and radius R. Its charge density is therefore $\rho = \dfrac{Q}{V}$.



Construct a Gaussian surface S having concentric spherical surface with radius r.

Determine the charge enclosed by S.

A) $Q_{enclosed} = \dfrac{4}{3}\,\pi\, r^3\,\rho$

B) $Q_{enclosed} = \pi\, r^2\,\rho$

C) $Q_{enclosed} = 2\,\pi\, r^2\,\rho$

D) $Q_{enclosed} = \dfrac{4}{3}\,\pi\, R^3\,\rho$

E) $Q_{enclosed} = 2\,\pi\, R^2\,\rho$

For an electrostatic case, the charge(s) inside of a conductor. The volume of a sphere is $V = \dfrac{4}{3}\,\pi\, r^3$.

$$\begin{aligned} Q_{inside} &= \rho\, V \\ &= \rho\, \frac{4}{3}\,\pi\, r^3 \\ &= \frac{4}{3}\,\pi\, r^3\, rho\,. \end{aligned}$$

Answer **A**.