Consider an electrostatic situation. A point charge \( Q \) is located at the center of a thick spherical conducting shell. The net charge on the shell is \(-\frac{1}{2}Q\). Let \( S \) (dashed circular line) be a concentric spherical surface (Gaussian surface) with a radius \( r \).

\[
\begin{array}{c}
\frac{-Q}{2} \\
\, \\
+Q \\
\, \\
R_1 \\
R_2 \\
R_3 \\
S
\end{array}
\]

Find the flux \( \Phi_S \) emanating through \( S \), the Gaussian surface.

A) \( \Phi_S = \frac{Q}{\epsilon_0} \)

B) \( \Phi_S = \frac{Q}{2\epsilon_0} \)

C) \( \Phi_S = \frac{3Q}{2\epsilon_0} \)

D) \( \Phi_S = 0 \)

E) \( \Phi_S = -\frac{Q}{\epsilon_0} \)

For an electrostatic case, inside of a conductor or in a conducting medium, \( e = 0 \). This implies that \( \Phi_S = \oint_S \vec{E} \cdot \vec{A} = 0 \).

Answer D.

24.03-01 Conducting Shell and Point Charge 2006-9-14