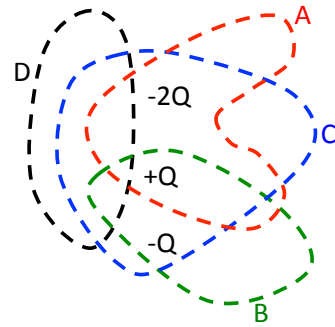


Problem 24.11

The four closed surfaces shown are labeled A, B, C and D. There is charge enclosed in some as shown. Determine the *electric flux* through each of the surfaces.



Sphere A:

$$\begin{aligned}\Phi_{E,A} &= \frac{q_{\text{enclosed}}}{\epsilon_0} = \frac{-2Q + Q}{\epsilon_0} \\ &= \frac{-Q}{\epsilon_0}\end{aligned}$$

Sphere B:

$$\begin{aligned}\Phi_{E,B} &= \frac{q_{\text{enclosed}}}{\epsilon_0} = \frac{-Q + Q}{\epsilon_0} \\ &= 0\end{aligned}$$

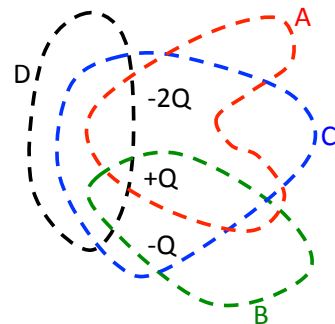
1.)

Sphere C:

$$\begin{aligned}\Phi_{E,C} &= \frac{q_{\text{enclosed}}}{\epsilon_0} = \frac{-2Q + Q - Q}{\epsilon_0} \\ &= \frac{-2Q}{\epsilon_0}\end{aligned}$$

Sphere D:

$$\begin{aligned}\Phi_{E,D} &= \frac{q_{\text{enclosed}}}{\epsilon_0} = \frac{0}{\epsilon_0} \\ &= 0\end{aligned}$$



2.)