Name: ID:

General Physics II (152)

Discussion Questions #4

Electric Flux and Potential

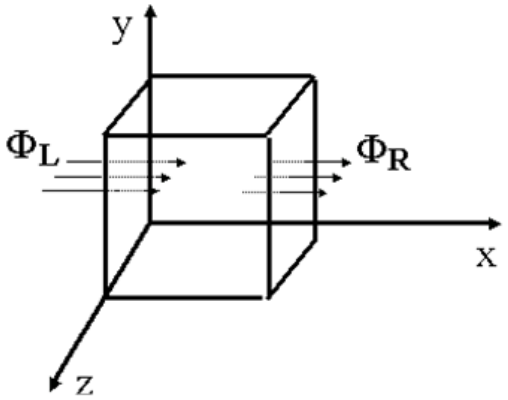
1. Electric Flux through a Cubic Box

Consider a cubic box located in a region of space with an electric field parallel to *x*-axis.

Flux from left side $\Phi_L = -2\ \mathrm{Nm^2/C}$

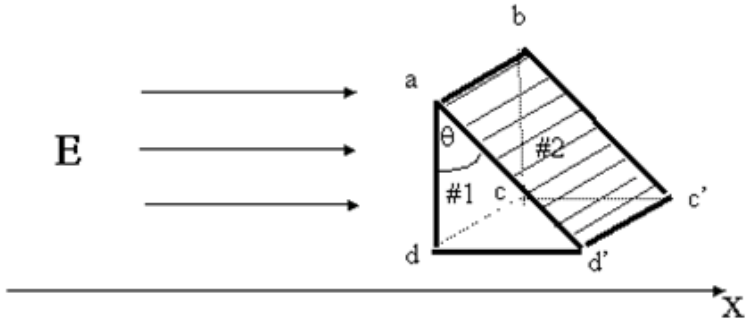
Flux leaving right $\Phi_R = +1\ \mathrm{Nm^2/C}$

What is Q_{enclosed}, the net charge enclosed by the box?



2. Electric Flux through a Slanted Area

Given a constant electric field **E** along the *x*-direction. The field passes through a wedge shape as shown. First **E** passes through the rectangular face *abcd*, which has an area A_1 and is perpendicular to **E**. Leaving the wedge, the field passes through a second rectangle $abc'd'$, which has an area A_2 and is inclined with an angle $\angle dad' = \theta$ as shown.



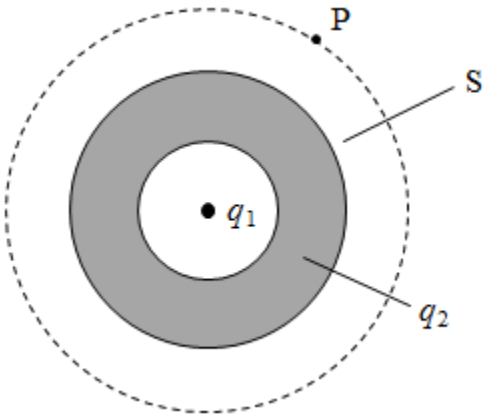
a) What is Φ_2, the electric flux due to the field **E** through the second rectangle, $abc'd'$? Express your answer in terms of A_2 and θ.

(Hints: Flux can be thought of as $\Phi = EA_{\perp}$.)

b) What is the flux through the rectangle, $dcc'd'$?

3. Conducting Shell and Point Charge

Consider an electrostatic situation. A point charge q_1 is located at the center of a thick spherical conducting shell (the dark shaded region). The net charge on the shell is q_2.

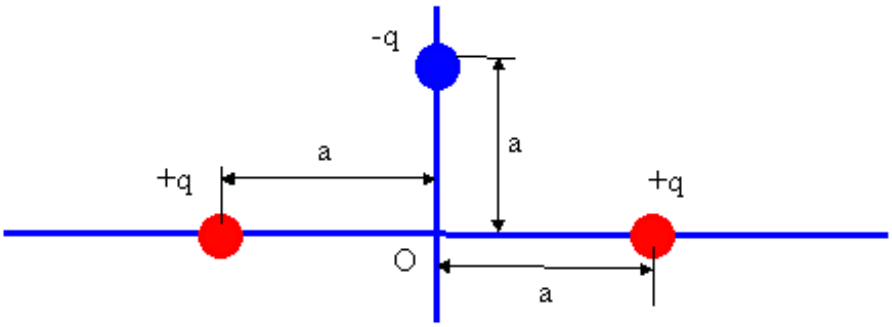


a) What is E_P, the magnitude of the radial electric field vector at P, which is at a distance r from the center?

b) What is the charge on the outer surface S of the spherical shell?

4. V Due to Three Point Charges

Three point charges are placed at equal distance a from O.



a) What is the potential at O?

b) What work is done if a charge q_1 is brought to point O from a point very far away?