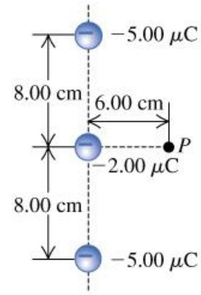
D1

Three negative point charges lie along a line as shown in the figure



Find the **magnitude** and the **direction** of the electric field this combination of charges produces at point *P*, which lies 6.00 cm from the −2.00 μC charge measured perpendicular to the line connecting the three charges.

D2

It was shown in Example 21.11 (Section 21.5) in the textbook that the electric field due to an infinite line of charge is perpendicular to the line and has magnitude $E=\lambda/2\pi\epsilon_0 r$. Consider an imaginary cylinder with a radius of r = 0.170 m and a length of l = 0.450 m that has an infinite line of positive charge running along its axis. The charge per unit length on the line is λ = 4.45 μC/m.

Part A

What is the electric flux through the cylinder due to this infinite line of charge?

Part B

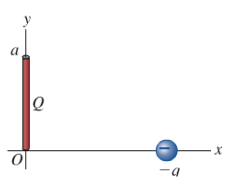
What is the flux through the cylinder if its radius is increased to r = 0.595 m ?

Part C

What is the flux through the cylinder if its length is increased to l = 0.760 m ?

21.90 •• **CALC** Positive charge Q is distributed uniformly along the positive y-axis between $y = 0$ and $y = a$. A negative point charge $-q$ lies on the positive x-axis, a distance x from the origin (Fig. P21.90). (a) Calculate the x- and y-components of the electric field produced by the charge distribution Q at points on the positive x-axis. (b) Calculate the x- and y-components of the force that the charge distribution Q exerts on q. (c) Show that if $x \gg a$, $F_x \cong -Qq/4\pi\epsilon_0 x^2$ and $F_y \cong +Qqa/8\pi\epsilon_0 x^3$. Explain why this result is obtained.

Figure **P21.90**



22.6 • The cube in Fig. E22.6 has sides of length L = 10.0 cm. The electric field is uniform, has magnitude $E = 4.00 \times 10^3$ N/C, and is parallel to the xy-plane at an angle of 53.1° measured from the $+x$-axis toward the $+y$-axis. (a) What is the electric flux through each of the six cube faces S_1, S_2, S_3, S_4, S_5, and S_6? (b) What is the total electric flux through all faces of the cube?

Figure **E22.6**