Tutorial 01

(1) Two coins lie 1.5 m apart on a table. They carry identical charges. Approximately how large is the charge on each if a coin experiences a force of 2 N?

(2) A helium nucleus has charge $+2e$, and a neon nucleus $+10e$, where e is the quantum of charge, 1.60×10^{-19} C. Find the repulsive force exerted on one by the other when they are 3.0 nanometers ($1 \text{ nm} = 10^{-9}$ m) apart. Assume the system to be in vacuum.

(3) Three point charges are placed on the x-axis as shown in Fig. 24-1. Find the net force on the $-5\ \mu$C charge due to the two other charges.

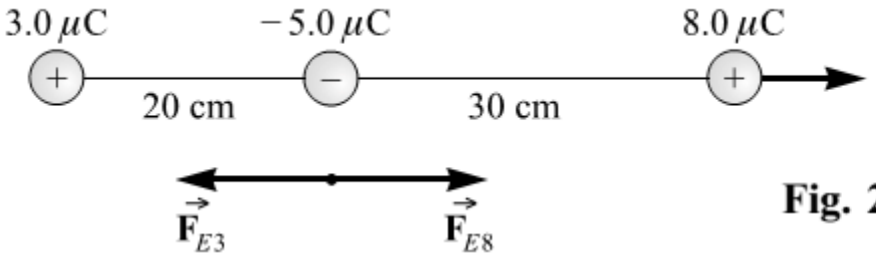

Fig. 24-1

(4) As shown in Fig. 24-2, two identical balls, each of mass 0.10 g, carry identical charges and are suspended by two threads of equal length. At equilibrium they position themselves as shown. Find the charge on either ball.

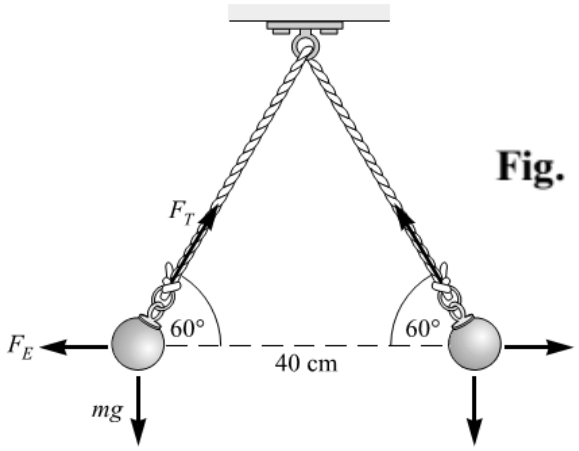

Fig. 24-2

(5) Three charges are placed on three corners of a square, as shown in Fig. 24-6. Each side of the square is 30.0 cm. Compute $\vec{\mathbf{E}}$ at the fourth corner. What would be the force on a 6.00 μC charge placed at the vacant corner?

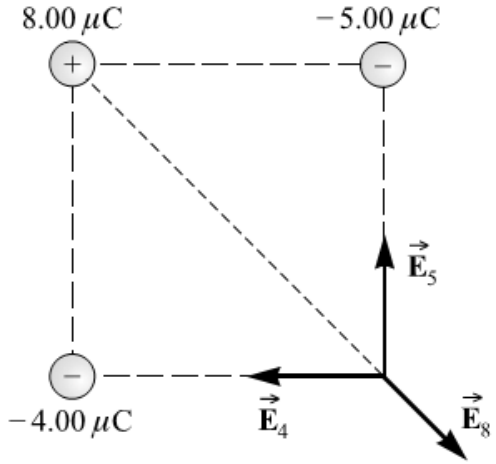

Fig. 24-6

(6) Two charged metal plates in vacuum are 15 cm apart as shown in Fig. 24-7. The electric field between the plates is uniform and has a strength of $E = 3000$ N/C. An electron ($q = -e$, $m_e = 9.1 \times 10^{-31}$ kg) is released from rest at point P just outside the negative plate. (*a*) How long will it take to reach the other plate? (*b*) How fast will it be going just before it hits?

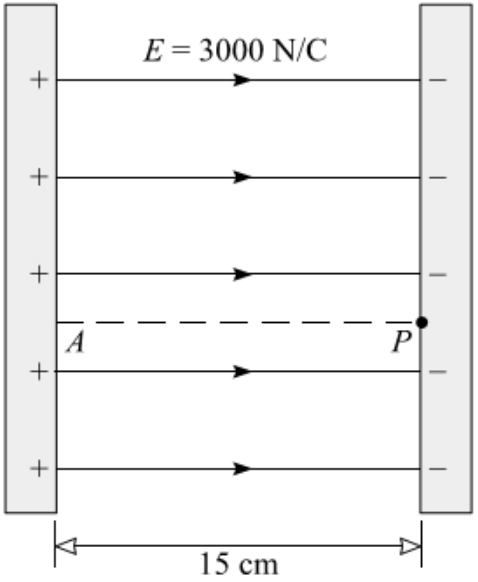

Fig. 24-7

(7) Suppose in Fig. 24-7 an electron is shot straight upward from point P with a speed of 5.0×10^6 m/s. How far above A will it strike the positive plate?

(8) Two 2.00-μC point charges are located on the x axis. One is at $x = 1.00$ m, and the other is at $x = -1.00$ m. (a) Determine the electric field on the y axis at $y = 0.500$ m. (b) Calculate the electric force on a -3.00-μC charge placed on the y axis at $y = 0.500$ m.