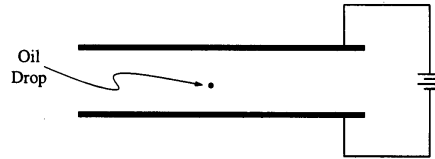


HW 13.3 – Millikan’s Oil Drop

Name:

1. (10 marks)



Robert Millikan received a Nobel Prize for determining the charge on the electron. To do this, he set up a potential difference between two horizontal parallel metal plates. He then sprayed drops of oil between the plates and adjusted the potential difference until drops of a certain size remained suspended at rest between the plates, as shown above. Suppose that when the potential difference between the plates is adjusted until the electric field is $10,000 \text{ N/C}$ downward, a certain drop with a mass of $3.27 \times 10^{-6} \text{ kg}$ remains suspended.

a. What is the magnitude of the charge on this drop?

b. The electric field is downward, but the electric force on the drop is upward. Explain why.

c. If the distance between the plates is 0.01 m, what is the potential difference between the plates?

d. The oil in the drop slowly evaporates while the drop is being observed, but the charge on the drop remains the same. Indicate whether the drop remains at rest, moves upward, or moves downward. Explain briefly.