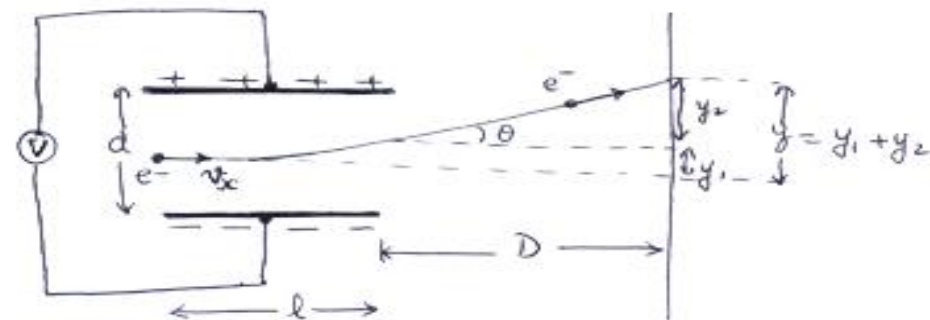


Homework Solution

Chapter 3

4.



$$y = y_1 + y_2$$

$$y_1 = \frac{1}{2} a_y t_1^2 = \frac{1}{2} \left(\frac{F}{m_e} \right) \left(\frac{l}{v_x} \right)^2 \quad \left[\text{because } a_y = \frac{F}{m_e} \text{ and } t_1 = \frac{l}{v_x} \right]$$

$$y_1 = \frac{1}{2} \frac{E e}{m_e} \frac{l^2}{v_x^2} = \frac{1}{2} \frac{V(e)}{d(m_e)} \frac{l^2}{v_x^2} \quad \left[\text{because } E = \frac{V}{d} \right] \quad \text{--- (1)}$$

$$y_2 = D \tan \theta = D \frac{v_y}{v_x} = D \frac{a_y t_1}{v_x} = D \frac{E e}{m_e} \frac{l}{v_x^2}$$

$$y_2 = D \frac{V}{d} \left(\frac{e}{m_e} \right) \frac{l}{v_x^2} \quad \text{--- (2)}$$

add (1) + (2) \Rightarrow

$$y_1 + y_2 = y = \left(\frac{e}{m_e} \right) \left[\frac{V}{2d} \frac{l^2}{v_x^2} + D \frac{V}{d} \frac{l}{v_x^2} \right] = \left(\frac{e}{m_e} \right) \frac{Vl}{d v_x^2} \left(\frac{l}{2} + D \right)$$

$$\Rightarrow \boxed{\frac{e}{m_e} = \frac{y d v_x^2}{V l \left(\frac{l}{2} + D \right)}}$$