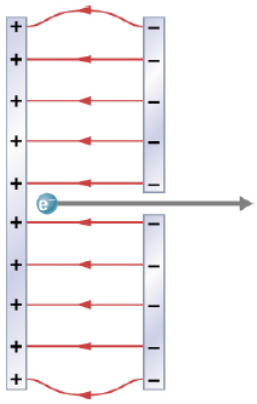
**Chapter 7 Problem 70** †



**Given**
$E = 2.50 \times 10^4\ N/C$
$m_e = 9.11 \times 10^{-31}\ kg$
$q_e = 1.60 \times 10^{-19}\ C$

**Solution**
a) Find the acceleration between the two plates.

The electric force on the electron is

$$F = qE$$

From Newton's 2nd law

$$F = ma$$

Therefore, the acceleration of the electron is

$$a = \frac{F}{m} = \frac{qE}{m}$$

Substituting in the appropriate values gives

$$a = \frac{(1.60 \times 10^{-19}\ C)(2.50 \times 10^4\ N/C)}{9.11 \times 10^{-31}\ kg} = 4.40 \times 10^{15}\ m/s^2$$

b) Why won't the electron be pulled back to the positive plate.

Once the electron moves through the hole past the positive plate, it will no longer experience an electric field. The charge on the negative plate is equal and opposite of that on the positive plate. Therefore, all of the electric field is limited to the space between the plates.

**Note:** There is an error in the diagram. The sign of the charge on the plates should be interchanged. If you are accelerating an electron to the right, then the left plate needs to be negative and the right plate needs to be positive. Also, the electric field lines should be going from positive charges to negative charges.

†Problem from Univesity Physics by Ling, Sanny and Moebs (OpenStax)