The point is that the acceleration takes place only while the electron is between the plates; hence the appearance of $l$. After that, $v_y$ remains constant.

[3 POINTS] b) Ignore the small displacement of the electrons in the short field region, and consider only their displacement in the field-free region of length $L$. Then use geometry to relate $v_x$, $v_y$, $L$, and $y$ of the displaced beam. From this derive the ratio $e/m$ in terms of $l$, $V$, $d$, $v_x$, $L$, and $y$.

$$y = v_y T$$

where

$$L = v_y T.$$ 

So

$$y = \frac{e}{m} \frac{V}{d} \frac{L}{v_x}.$$ 

or

$$\frac{e}{m} = \frac{y d v_x^2}{V IL}.$$ 

This ignores the $y$-displacement acquired while traversing the plates, allowed because $l \ll L$.

[4 POINTS] c) The only unknown in the result of part b) is $v_x$. This can be measured in the following clever way. Increase the crossed $B$-field from zero until the electron beam returns to its original, undeflected location. Derive $v_x$ from the resulting measured values of $B$, $V$, and $d$, and use this to write an equation for $e/m$ that involves only the known values $l$, $V$, $d$, $L$, $y$, and $B$.

$B$ is such that $F_{\text{total}} = 0$, i.e., $ev_x B = eE = e\frac{V}{d}$. Thus

$$\frac{e}{m} = \frac{d V^2}{V IL B^2} = \frac{V}{ILB^2}.$$