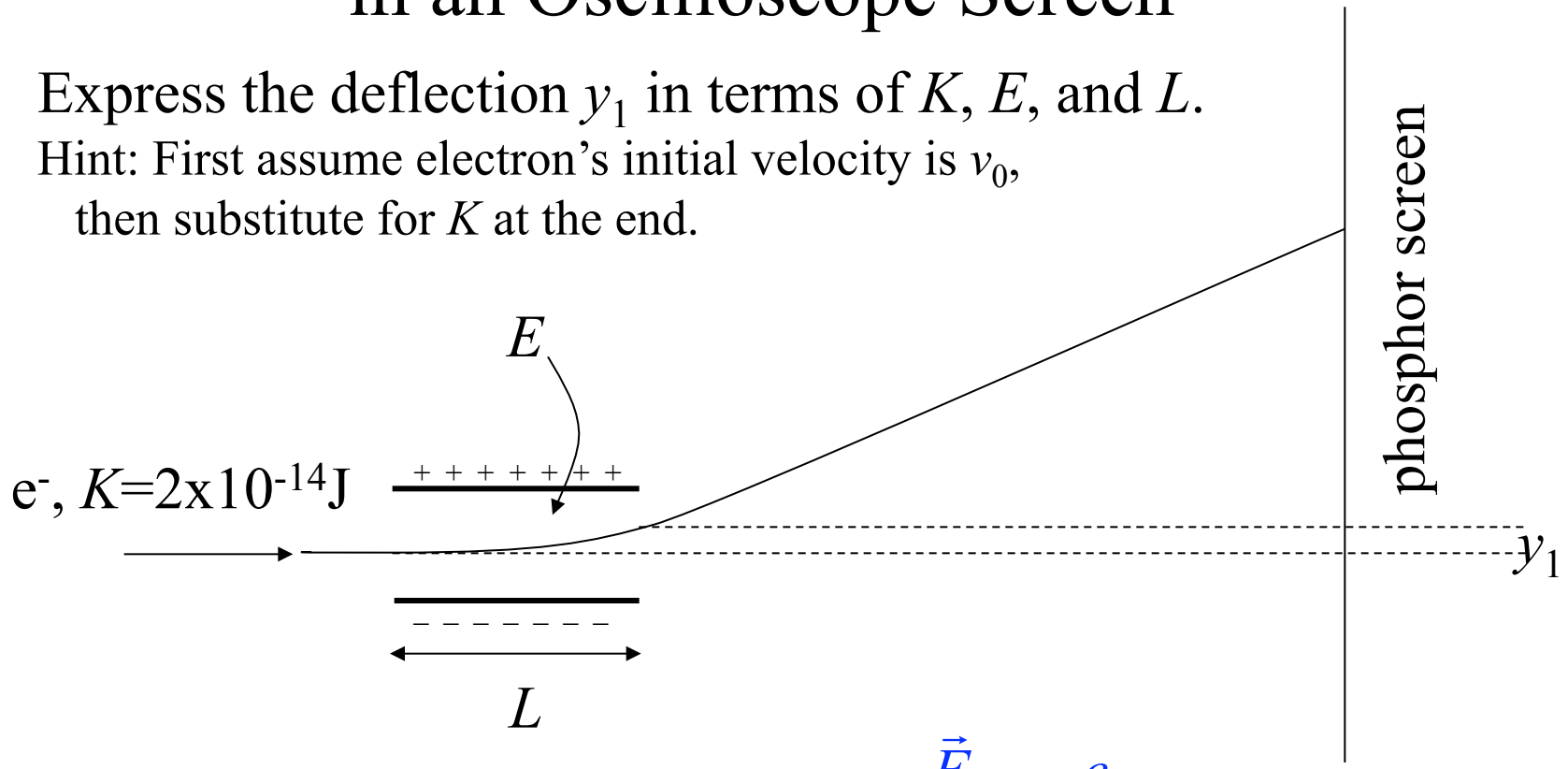
Electrostatic Deflection of Electrons in an Oscilloscope Screen

Express the deflection y_1 in terms of K, E, and L.

Hint: First assume electron's initial velocity is v_0, then substitute for K at the end.



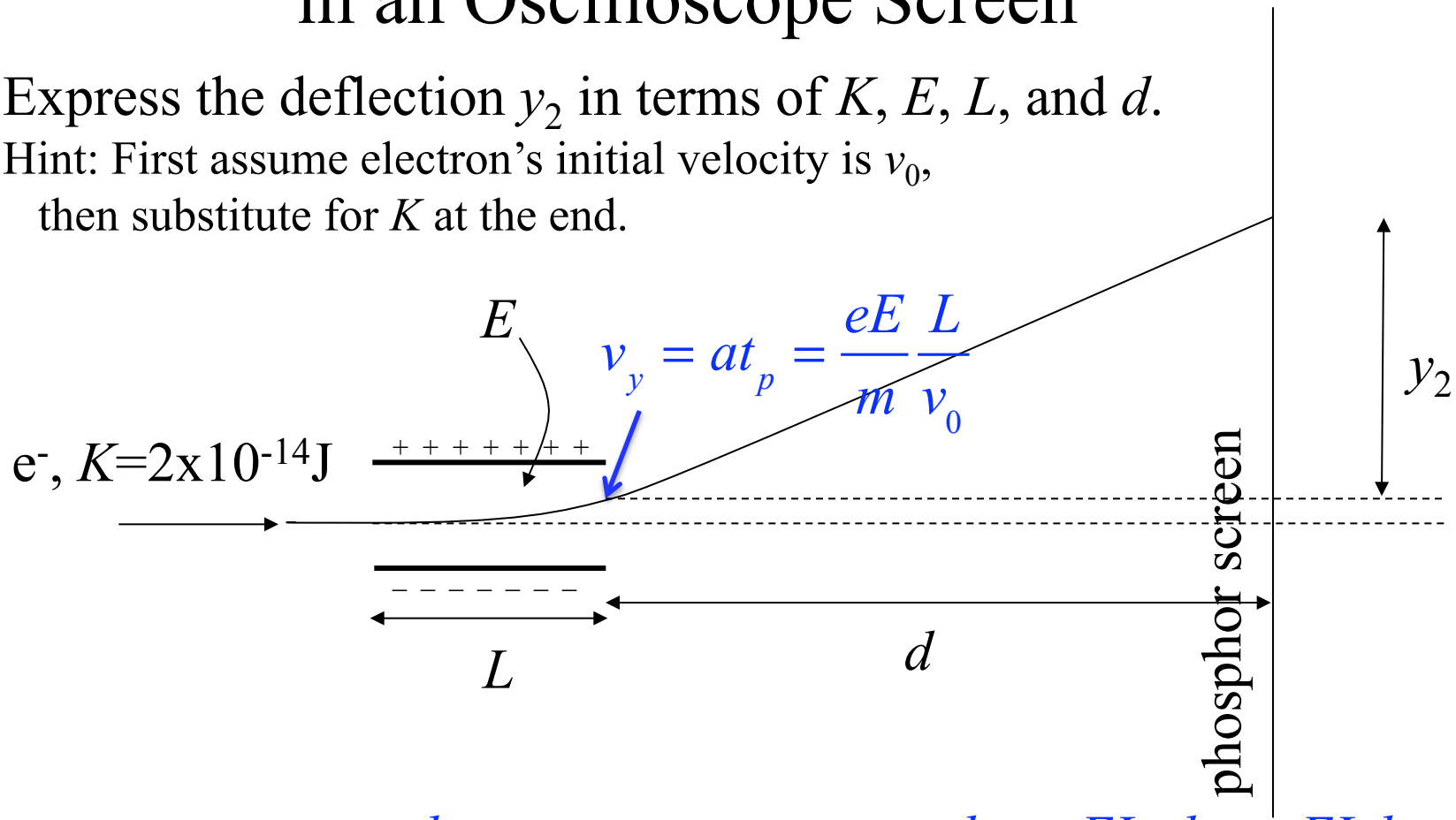
Spends t_p in plates, during which $\vec{a} = \frac{\vec{F}}{m} = \frac{-e}{m}\vec{E}$

horizontal: $t_p = \frac{L}{v_0}$ vertical: $y_1 = \frac{1}{2} a_y t_p^2 = \frac{1}{2} \frac{eE}{m} \frac{L^2}{v_0^2} = \frac{1}{2} \frac{eEL^2}{2K}$

Electrostatic Deflection of Electrons in an Oscilloscope Screen

Express the deflection y_2 in terms of K, E, L, and d.

Hint: First assume electron's initial velocity is v_0, then substitute for K at the end.



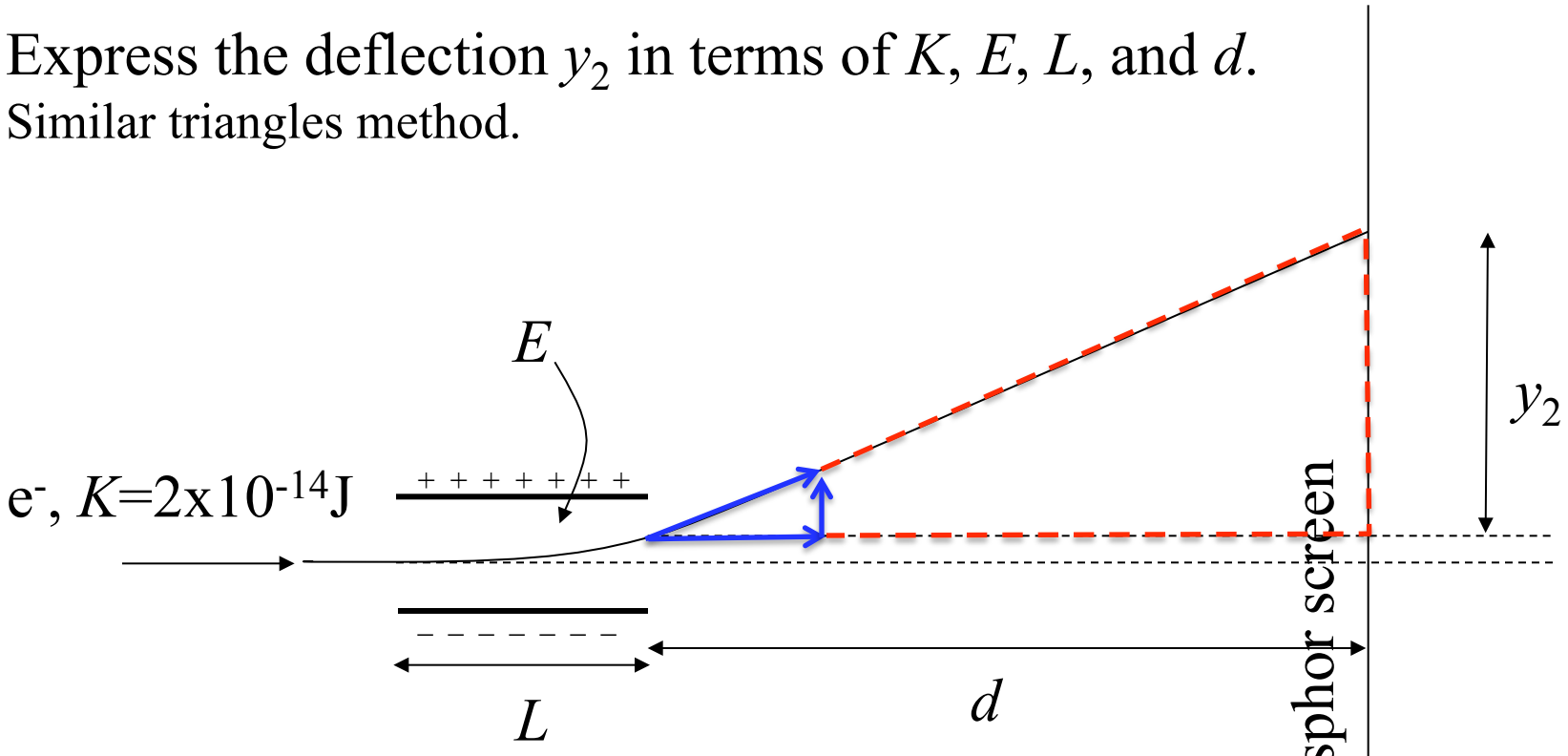
horizontal: $t_d = \frac{d}{v_0}$

vertical: $y_2 = v_y \frac{d}{v_0} = \frac{eEL}{mv_0}\frac{d}{v_0} = \frac{eELd}{2K}$

Electrostatic Deflection of Electrons in an Oscilloscope Screen

Express the deflection y_2 in terms of K, E, L, and d.

Similar triangles method.



$$\frac{y_2}{d} = \frac{\text{vert}}{\text{hyp}} = \frac{v_y}{v_0} \quad \Rightarrow \quad y_2 = d\frac{v_y}{v_0} = d\frac{eE}{m}\frac{L}{v_0^2} = \frac{eELd}{2K}$$