44. We assume there are no forces or force-components along the $x$ direction. We combine Eq. 22-28 with Newton’s second law, then use Eq. 4-21 to determine time $t$ followed by Eq. 4-23 to determine the final velocity (with $-g$ replaced by the $a_y$ of this problem); for these purposes, the velocity components given in the problem statement are re-labeled as $v_{0x}$ and $v_{0y}$ respectively.

(a) We have $\ddot{a} = \frac{qE}{m} = -\left(\frac{e}{m}\right)E$ which leads to

$$\ddot{a} = -\left(\frac{1.60 \times 10^{-19} \text{C}}{9.11 \times 10^{-31} \text{kg}}\right) \left(\frac{120 \text{ N}}{C}\right) \hat{j} = -(2.1 \times 10^{13} \text{ m/s}^2) \hat{j}.$$

(b) Since $v_x = v_{0x}$ in this problem (that is, $a_x = 0$), we obtain

$$t = \frac{\Delta x}{v_{0x}} = \frac{0.020 \text{ m}}{1.5 \times 10^5 \text{ m/s}} = 1.3 \times 10^{-7} \text{s}$$

$$v_y = v_{0y} + a_y t = 3.0 \times 10^3 \text{ m/s} + \left(-2.1 \times 10^{13} \text{ m/s}^2\right)(1.3 \times 10^{-7} \text{s})$$

which leads to $v_y = -2.8 \times 10^6 \text{ m/s}$. Therefore, the final velocity is

$$\vec{v} = (1.5 \times 10^5 \text{ m/s}) \hat{i} - (2.8 \times 10^6 \text{ m/s}) \hat{j}.$$