40. We assume there are no forces or force-components along the x direction. We combine Eq. 23-28 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 $\vec{a} = \frac{q\vec{E}}{m} = -\left(\frac{e}{m}\right)\vec{E}$ which leads to

$$\vec{a} = -\left(\frac{1.60 \times 10^{-19}\,\mathrm{C}}{9.11 \times 10^{-31}\,\mathrm{kg}}\right)\left(120\;\frac{\mathrm{N}}{\mathrm{C}}\right)\hat{\jmath} = -2.1 \times 10^{13}\,\mathrm{m/s^2}\;\hat{\jmath}\;.$$

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

$$\begin{aligned} t &= \frac{\Delta x}{v_{0x}} = \frac{0.020\,\mathrm{m}}{1.5 \times 10^5\,\mathrm{m/s}} = 1.3 \times 10^{-7}\;\mathrm{s} \\ v_y &= v_{0y} + a_y t = 3.0 \times 10^3\,\mathrm{m/s} + \left(-2.1 \times 10^{13}\,\mathrm{m/s^2}\right)\left(1.3 \times 10^{-7}\,\mathrm{s}\right) \end{aligned}$$

which leads to $v_y = -2.8 \times 10^6$ m/s. Therefore, in unit vector notation (with SI units understood) the final velocity is

$$\vec{v} = 1.5 \times 10^5\,\hat{\imath} - 2.8 \times 10^6\,\hat{\jmath}\;.$$