

63. (a) We are given $\vec{B} = B_x \hat{i} = 6 \times 10^{-5} \hat{i}$ T, so that $\vec{v} \times \vec{B} = -v_y B_x \hat{k}$ where $v_y = 4 \times 10^4$ m/s. We note that the magnetic force on the electron is $(-e)(-v_y B_x \hat{k})$ and therefore points in the $+\hat{k}$ direction, at the instant the electron enters the field-filled region. In these terms, Eq. 29-16 becomes

$$r = \frac{m_e v_y}{e B_x} = 0.0038 \text{ m} .$$

- (b) One revolution takes $T = 2\pi r/v_y = 0.60 \mu\text{s}$, and during that time the “drift” of the electron in the x direction (which is the *pitch* of the helix) is $\Delta x = v_x T = 0.019$ m where $v_x = 32 \times 10^3$ m/s.
- (c) Returning to our observation of force direction made in part (a), we consider how this is perceived by an observer at some point on the $-x$ axis. As the electron moves away from him, he sees it enter the region with positive v_y (which he might call “upward”) but “pushed” in the $+z$ direction (to his right). Hence, he describes the electron’s spiral as clockwise.