Answer on Question #59423 - Physics – Electromagnetism

An electron has a velocity of 6.0 ? 106 m/s in the positive x direction at a point where the magnetic field has the components Bx = 3.0 T, By = 1.5 T, and Bz = 2.0 T. What is the magnitude of the acceleration of the electron at this point?

Solution

$$\bar{a} = \frac{\bar{F}_B}{m_e} = \frac{e(\bar{v} \times \bar{B})}{m_e} = -1.6 \cdot 10^{-19} \frac{\left(6.0 \cdot 10^6 \bar{\imath} \times \left(3\bar{\imath} + 1.5\bar{\jmath} + 2\bar{k}\right)\right)}{9.1 \cdot 10^{-31}} = \frac{-1.6 \cdot 10^{-19} 6.0 \cdot 10^6}{9.1 \cdot 10^{-31}} \left(1.5\bar{k} - 2\bar{\jmath}\right)$$
$$= -1.05 \cdot 10^{18} \left(1.5\bar{k} - 2\bar{\jmath}\right)$$

$$|\bar{a}| = 1.05 \cdot 10^{18} \sqrt{1.5^2 + (-2)^2} = 2.65 \cdot 10^{18} \frac{m}{s^2}.$$