

2. (a) The largest value of force occurs if the velocity vector is perpendicular to the field. Using Eq. 29-3,

$$F_{B, \max} = |q|vB \sin(90^\circ) = evB = (1.60 \times 10^{-19} \text{ C})(7.20 \times 10^6 \text{ m/s})(83.0 \times 10^{-3} \text{ T}) = 9.56 \times 10^{-14} \text{ N} .$$

The smallest value occurs if they are parallel: $F_{B, \min} = |q|vB \sin(0) = 0$.

- (b) By Newton's second law, $a = F_B/m_e = |q|vB \sin \theta/m_e$, so the angle θ between \vec{v} and \vec{B} is

$$\theta = \sin^{-1} \left(\frac{m_e a}{|q|vB} \right) = \sin^{-1} \left[\frac{(9.11 \times 10^{-31} \text{ kg})(4.90 \times 10^{14} \text{ m/s}^2)}{(1.60 \times 10^{-16} \text{ C})(7.20 \times 10^6 \text{ m/s})(83.0 \times 10^{-3} \text{ T})} \right] = 0.267^\circ .$$