

Honors Physics – Ch 19 Practice Answers

1) $B = 45 \text{ T}$
 $v = 7.5 \times 10^6 \text{ m/s}$
 $q = e = 1.60 \times 10^{-19} \text{ C}$
 $m_e = 9.109 \times 10^{-31} \text{ kg}$

$$F_{\text{magnetic}} = qvB$$
$$F_{\text{magnetic}} = (1.60 \times 10^{-19} \text{ C})(7.5 \times 10^6 \text{ m/s})(45 \text{ T})$$
$$F_{\text{magnetic}} = \boxed{5.4 \times 10^{-11} \text{ N}}$$

2) $v = 2.60 \times 10^2 \text{ km/h}$
 $F_{\text{magnetic}} = 3.0 \times 10^{-17} \text{ N}$
 $q = 1.60 \times 10^{-19} \text{ C}$

$$F_{\text{magnetic}} = qvB$$
$$B = \frac{F_{\text{magnetic}}}{qv}$$
$$B = \frac{(3.0 \times 10^{-17} \text{ N})}{(1.60 \times 10^{-19} \text{ C})(2.60 \times 10^2 \text{ km/h})\left(\frac{1 \text{ h}}{3600 \text{ s}}\right)\left(\frac{10^3 \text{ m}}{1 \text{ km}}\right)}$$
$$B = \boxed{2.6 \text{ T}}$$

3) $q = 88 \times 10^{-9} \text{ C}$
 $B = 0.32 \text{ T}$
 $F_{\text{magnetic}} = 1.25 \times 10^{-6} \text{ N}$

$$F_{\text{magnetic}} = qvB$$
$$v = \frac{F_{\text{magnetic}}}{qB}$$
$$v = \frac{(1.25 \times 10^{-6} \text{ N})}{(88 \times 10^{-9} \text{ C})(0.32 \text{ T})}$$
$$v = \boxed{44 \text{ m/s} = 160 \text{ km/h}}$$

4) $q = 1.60 \times 10^{-19} \text{ C}$
 $r = 1.0 \text{ km} = 1.0 \times 10^3 \text{ m}$
 $m = 1.67 \times 10^{-27} \text{ kg}$
 $B = 3.3 \text{ T}$

$$\frac{mv^2}{r} = qvB$$
$$v = \frac{qrB}{m} = \frac{(1.60 \times 10^{-19} \text{ C})(1.0 \times 10^3 \text{ m})(3.3 \text{ T})}{1.67 \times 10^{-27} \text{ kg}} = \boxed{3.2 \times 10^{11} \text{ m/s}}$$

5)

$$\ell = 1066 \text{ m}$$

$$F_{\text{magnetic}} = 6.3 \times 10^{-2} \text{ N}$$

$$I = 0.80 \text{ A}$$

$$F_{\text{magnetic}} = BI\ell$$

$$B = \frac{F_{\text{magnetic}}}{I\ell}$$

$$B = \frac{(6.3 \times 10^{-2} \text{ N})}{(0.80 \text{ A})(1066 \text{ m})}$$

$$B = \boxed{7.4 \times 10^{-5} \text{ T}}$$

6)

$$B = 2.5 \times 10^{-4} \text{ T}$$

$$\ell = 4.5 \times 10^{-2} \text{ m}$$

$$F_{\text{magnetic}} = 3.6 \times 10^{-7} \text{ N}$$

$$F_{\text{magnetic}} = BI\ell$$

$$I = \frac{F_{\text{magnetic}}}{B\ell}$$

$$I = \frac{(3.6 \times 10^{-7} \text{ N})}{(2.5 \times 10^{-4} \text{ T})(4.5 \times 10^{-2} \text{ m})}$$

$$I = \boxed{3.2 \times 10^{-2} \text{ A}}$$

7)

$$B = 38 \text{ T}$$

$$\ell = 2.0 \text{ m}$$

$$m = 75 \text{ kg}$$

$$g = 9.81 \text{ m/s}^2$$

$$F_{\text{magnetic}} = BI\ell$$

$$F_g = mg$$

$$F_{\text{magnetic}} = F_g$$

$$BI\ell = mg$$

$$I = \frac{mg}{B\ell}$$

$$I = \frac{(75 \text{ kg})(9.81 \text{ m/s}^2)}{(38 \text{ T})(2.0 \text{ m})}$$

$$I = \boxed{9.7 \text{ A}}$$