H.W # 7.

PHYS 1304

P29.1 (a) up

(b) out of the page, since the charge is negative.

(c) no deflection

(d) into the page

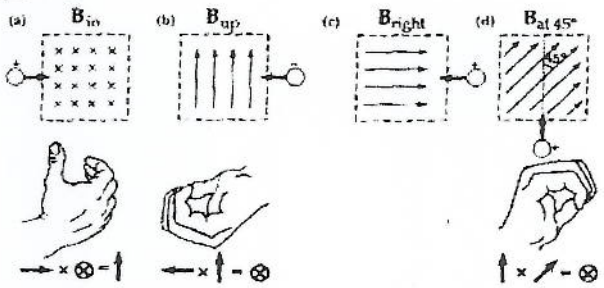

FIG. P29.1

P 29.3 $\vec{F} = q\vec{v}\times\vec{B} \Rightarrow m\vec{a} = q\vec{v}\times\vec{B} \Rightarrow ma\hat{x} = qv\hat{z}\times\vec{B}$

$\rightarrow \vec{B} = \frac{mq}{qv}(-\hat{y}) = \frac{(1.67\times10^{-27})\cdot(2\times10^{13})}{(1.6\times10^{-19})\times(1\times10^{7})} = \boxed{-20.9\ mT\,\hat{y} = \vec{B}}$

P29.7 $\vec{F} = q\vec{v}\times\vec{B}$

$$\vec{v}\times\vec{B} = \begin{vmatrix} i & j & k \\ 2 & -4 & 1 \\ 1 & 2 & -3 \end{vmatrix} = 10\hat{i} - 7\hat{j} + 8\hat{k} \Rightarrow |\vec{v}\times\vec{B}| = 14.59$$

$$|F| = q|\vec{v}\times\vec{B}| = (1.6\times10^{-19})\times(14.59) = 23.55\times10^{-19}\ N$$

P29.11 $F_B = ILB\sin\theta$ with $F_B = F_g = mg$

$mg = ILB\sin\theta$ so $\frac{m}{L}g = IB\sin\theta$

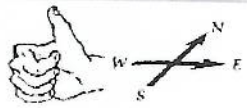

FIG. P29.11

$I = 2.00$ A and $\frac{m}{L} = (0.500\ \text{g/cm})\left(\frac{100\ \text{cm/m}}{1000\ \text{g/kg}}\right) = 5.00\times10^{-2}$ kg/m.

Thus $(5.00\times10^{-2})(9.80) = (2.00)B\sin 90.0°$

$B = \boxed{0.245\ \text{Tesla}}$ with the direction given by right-hand rule: $\boxed{\text{eastward}}$.

P29.13 (a) $F_B = ILB\sin\theta = (5.00\ \text{A})(2.80\ \text{m})(0.390\ \text{T})\sin 60.0° = \boxed{4.73\ \text{N}}$

(b) $F_B = (5.00\ \text{A})(2.80\ \text{m})(0.390\ \text{T})\sin 90.0° = \boxed{5.46\ \text{N}}$

(c) $F_B = (5.00\ \text{A})(2.80\ \text{m})(0.390\ \text{T})\sin 120° = \boxed{4.73\ \text{N}}$

P 29.38 a) $\vec{\tau} = \vec{\mu}\times\vec{B}$, $\vec{\mu} = I\vec{A} \Rightarrow \vec{\tau} = I\vec{A}\times\vec{B}$

For max τ, $\vec{A}\perp\vec{B} \rightarrow \tau = IAB$

$\tau = (5)(\pi\cdot0.1^2)(3\times10^{-3}) = \boxed{4.71\times10^{-4}\ N\cdot m}$