27.20 a) $8e^-$ $\xrightarrow{500\times10^3\ m/s}$

(x) $F = 0.0032\times10^{-9}\ N = qvB$

$B = \dfrac{3.2\times10^{-12}}{8\cdot1.6\times10^{-19}\cdot5\times10^5} = 5\ T.$ South.

If B field has component up, down, east, west, it could be larger.

b) e^- ← B, e^- ↓ v

Force up. $F = qvB = 4.6\times10^{-12}$

$v = \dfrac{F}{eB} = 1.37\times10^7\ m/s.$

If v has components other than north, it could be greater

27.44 a) In plane, torque = force = 0. Opposite sides cancel

b) rotated up, Force = 0, but $\tau = \vec{\mu}\times\vec{B} = I\vec{A}\times\vec{B}$

$= 1.4\ A\cdot(0.35\times0.22)\ m^2\cdot1.5\ T\cdot\sin30^\circ = 0.08\ Nm.$

Can also calculated from force diagram.

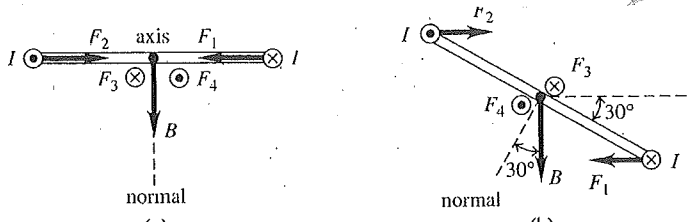

Figure 27.44

27.72 Rail Gun. a) $F = ILB$

b) $F\cdot d = \frac{1}{2}mv^2$, $d = \dfrac{\frac{1}{2}mv^2}{ILB}$

c) $B = 0.5\ T$ $I = 2\times10^3\ A$

$m = 25\ kg$ $L = 0.5\ m$

$v = 11.2\times10^3\ m/s.$

$d = 3.136\times10^6\ m.$

$= 3136\ km$