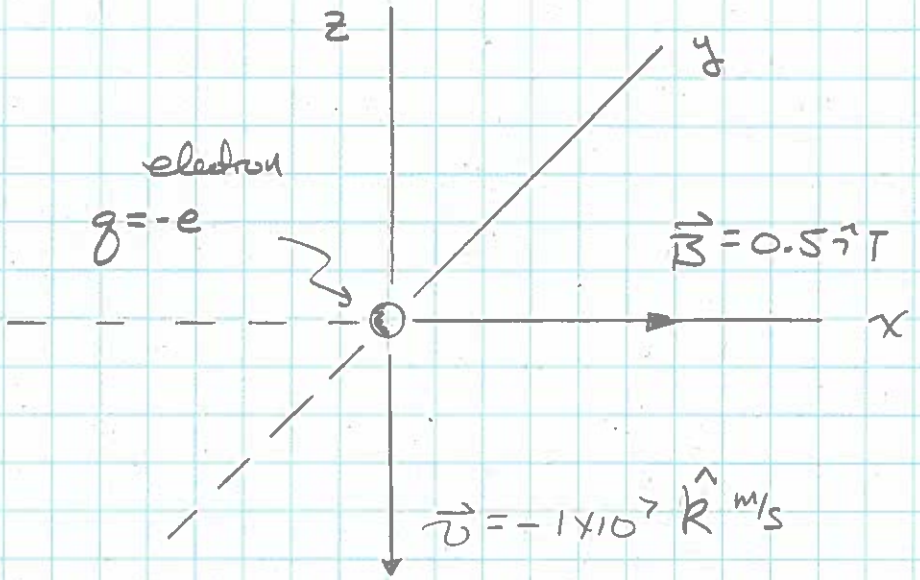
a.)



$$\vec{F} = q\vec{v}\times\vec{B} = -e\vec{v}\times\vec{B}$$

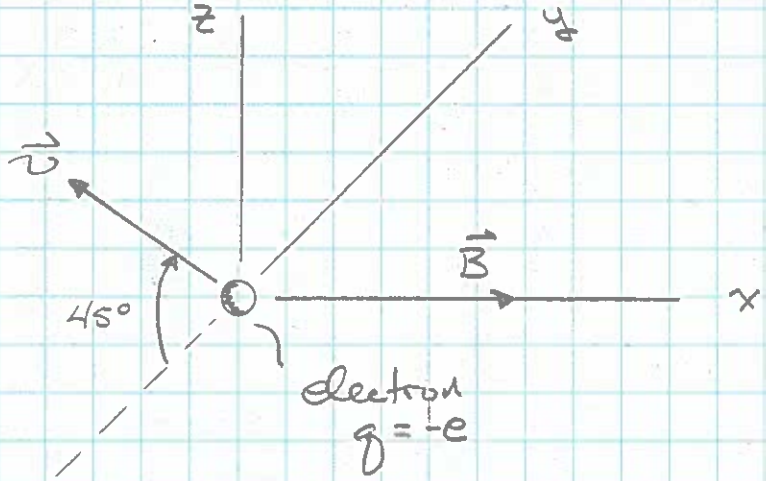
$$|\vec{F}| = evB = 8\times10^{-13}\ N$$

Direction, RHR $\Rightarrow \vec{v}\times\vec{B}$ is in $-y$

So $\vec{F} = -e\vec{v}\times\vec{B}$ is in $+y$.

$$\therefore\ \vec{F} = 8\times10^{-13}\,\hat{j}\ N$$

b.)



The easiest thing here is to work with components:

$$\vec{B} = 0.5\hat{i}\,T = B\hat{i}$$

$$\vec{v} = -v\cos45°\,\hat{j} + v\sin45°\,\hat{k}$$

$$= -\frac{v}{\sqrt{2}}\,\hat{j} + \frac{v}{\sqrt{2}}\,\hat{k}$$

Now,

$$\vec{F} = q\vec{v}\times\vec{B}$$

$$= -e\vec{v}\times\vec{B} = -e\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & -\frac{v}{\sqrt{2}} & \frac{v}{\sqrt{2}} \\ B & 0 & 0 \end{vmatrix}$$

$$= -e\left\{\hat{i}(0) - \hat{j}\left(0 - \frac{Bv}{\sqrt{2}}\right) + \hat{k}\left(0 + \frac{Bv}{\sqrt{2}}\right)\right\}$$

$$= -\frac{eBv}{\sqrt{2}}\hat{j} - \frac{eBv}{\sqrt{2}}\hat{k}$$

So, $\vec{F} = -5.657\times10^{-13}\hat{j} - 5.657\times10^{-13}\hat{k}$ N