

Closed book. No calculators are to be used for this quiz.

Quiz duration: 15 minutes

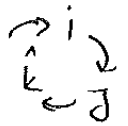
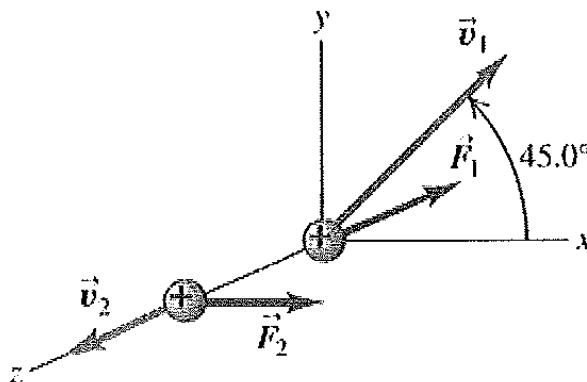
Name:

Student ID:

Signature:

When a particle of charge $q > 0$ moves with a velocity of \vec{v}_1 at 45° from the x axis in the xy-plane, a uniform magnetic field exerts a force \vec{F}_1 along the $-z$ -axis as shown in the figure. When the same particle moves with a velocity \vec{v}_2 with the same magnitude as \vec{v}_1 but along the $+z$ -axis, a force \vec{F}_2 of magnitude F_2 is exerted along the $+x$ -axis.

- What are the magnitude (in terms of q , v , and F_2) and direction of the magnetic field?
- What is the magnitude of \vec{F}_1 in terms of F_2 ?



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A particle with charge q is moving with speed v in the $-y$ -direction. It is moving in a uniform magnetic field $\vec{B} = B_x \hat{i} + B_y \hat{j} + B_z \hat{k}$.

- What are the components of the force \vec{F} exerted on the particle by the magnetic field?
- If $q > 0$, what must the signs of the components of \vec{B} if the components of \vec{F} are all nonnegative?
- If $q < 0$, and $B_x = B_y = B_z > 0$, find the direction of \vec{F} and find the magnitude of \vec{F} in terms of $|q|$, v , B_x

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A particle with charge q and initial velocity $\vec{v}_0 = v_{x0}\hat{i} + v_{y0}\hat{j}$ enters a region of uniform electric and magnetic fields. The magnetic field in the region is $\vec{B} = B_x\hat{i} + B_z\hat{k}$. Calculate the magnitude and direction of the electric field in the region if the particle is to pass through undeflected.

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An open plastic soda bottle with an opening diameter of 3 cm is placed on a table. A uniform 2.25 T magnetic field directed upward and oriented 37° from vertical encompasses the bottle.

What is the total magnetic flux through the plastic of the soda bottle?

($\cos 37^\circ = 0.8$, $\sin 37^\circ = 0.6$. Take $\pi=3$)