

Quiz 7

Provide a concise answer to each question.

(1) Suppose the only force a particle feels is a magnetic force. Choose and answer and explain.

a. Does the speed of the particle change?  Never  Sometimes  Always

The magnetic force  $\vec{F}_B \perp \vec{v}$  can never do work on the particle.

b. Does the direction of motion of the particle change?  Never  Sometimes  Always

The magnetic force is always perpendicular to  $\vec{v}$ , and therefore so is  $\vec{a}$ .

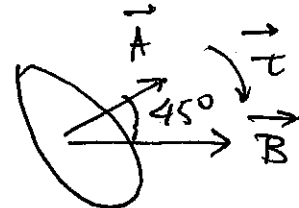
(2) A circular loop of wire of radius  $r$  has a current  $I$  flowing through it, and is placed in a magnetic field  $B$ ; the loop makes a  $45^\circ$  angle with the magnetic field. (You may want to include a drawing.)

a. What is the net force the loop feels?

$\vec{F}_{net} = 0$ . all contributions cancel

b. What is the torque the loop feels?

$\vec{\tau}_{net} = \vec{\mu} \times \vec{B}$       $\vec{\mu} = IA\vec{n}$



The magnitude is  $\tau = \mu B \sin \theta = IAB \sin 45^\circ$  and the direction makes the loop turn clockwise

(3) Explain in words, and possibly a drawing, why the Hall effect can be used to tell whether current inside a conductor is carried by electrons or by protons.

