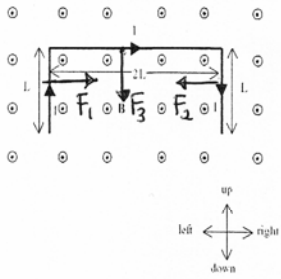
KING FAHD UNIVERSITY OF PERTOLEUM & MINERALS
PHYSICS DEPARTMENT
QUIZ #10- CHAPTER 28

NAME: Key ID# SECTION#

A wire of total length 4L (L = 1.0m) and carrying a current I = 2.0 A is placed in a uniform magnetic field B = 0.1 T directed out of the page as shown in the figure. Determine the net magnetic force on the wire.



F_1 and F_2 cancel each other.

$$F_3 = i\vec{\ell} \times \vec{B} = i\ell B \sin 90^\circ$$

$$= i(2L)B \sin 90^\circ$$

$$= 2 \times 2 \times 0.1 = 0.4 \text{ N}$$

direction as shown in the figure (down)

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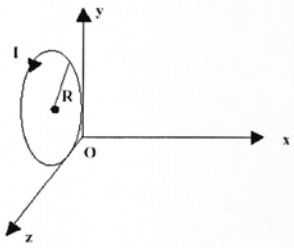
A current of 17 mA is maintained in a circular loop of 2 m circumference which is parallel to the y-z plane as shown in the figure. A magnetic field B = (– 0.8 k) T is applied. Calculate the torque exerted on the loop by the magnetic field. (i, j and k are the unit vectors in x, y and z directions, respectively).



circumference $= 2\pi R = 2\ m$

$\Rightarrow R = \frac{1}{\pi}\ m$

$\vec{\mu} = i\vec{A} = i(\pi R^2)\hat{i}$

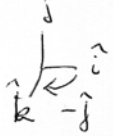
$= 17\times10^{-3}\left(\pi \frac{1}{\pi^2}\right)\hat{i}$

$= 5.4\times10^{-3}\ \hat{i}\ \ (A\cdot m^2)$

$\vec{B} = -0.8\hat{k}\ (T)$

$\vec{\tau} = \vec{\mu}\times\vec{B} = (5.4\times10^{-3})\hat{i}\times(-0.8)\hat{k}$

$\boxed{\vec{\tau} = 4.3\times10^{-3}\hat{j}}$



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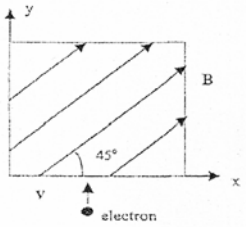
NAME: Key ID# SECTION# 18

What is the magnitude and direction of the magnetic force on the electron moving with a speed v = 4.0 x 10^4 m/s in the +y direction as it enters the magnetic field of magnitude 0.1 T directed as shown in the figure?

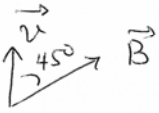


$\vec{F} = q(\vec{v} \times \vec{B})$

$q = (-1.6 \times 10^{-19} C)$

$\vec{v} = (4 \times 10^4 m/s)\,\hat{j}$

$\vec{B} = 0.1\ T$ as shown in the figure



magnitude:

$F = q v B \sin 45°$

$= 1.6 \times 10^{-19} \times 4 \times 10^4 \times 0.1 \times \sin 45° = 4.5 \times 10^{-16}\ N$

direction: right hand rule outside the page

or $+\hat{k}$

$\vec{F} = (+\ 4.5 \times 10^{-16}\ N)\,\hat{k}$