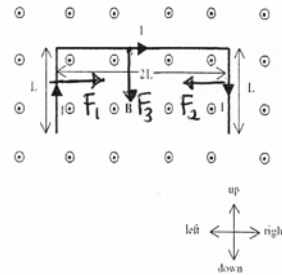


KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
 PHYSICS DEPARTMENT
 QUIZ #10- CHAPTER 28

NAME: Key ID# _____ SECTION# _____

A wire of total length $4L$ ($L = 1.0\text{m}$) and carrying a current $I = 2.0\text{ A}$ is placed in a uniform magnetic field $B = 0.1\text{ T}$ 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.

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

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

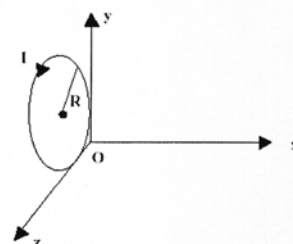
$$= 2 \times 2 \times 0.1 = 0.4\text{ N}$$

direction as shown in the figure (down)

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

NAME: Key ID# _____ SECTION# 17

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 $\vec{B} = (-0.8 \hat{k})$ T is applied. Calculate the torque exerted on the loop by the magnetic field. (\hat{i} , \hat{j} and \hat{k} are the unit vectors in x, y and z directions, respectively).



$$\text{circumference} = 2\pi R = 2 \text{ m}$$

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

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

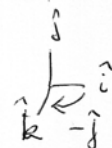
$$= 17 \times 10^{-3} \left(\pi \frac{1}{\pi^2} \right) \hat{i}$$

$$= 5.4 \times 10^{-3} \hat{i} \text{ (A}\cdot\text{m}^2)$$

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

$$\vec{\tau} = \vec{\mu} \times \vec{B} = (5.4 \times 10^{-3}) \hat{i} \times (-0.8) \hat{k}$$

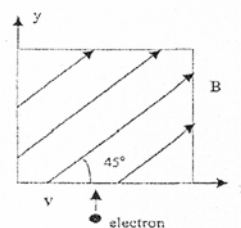
$$\vec{\tau} = 4.3 \times 10^{-3} \hat{j}$$



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

NAME: Key ID# _____ SECTION# 18

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



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

$$\uparrow$$

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

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

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

Magnitude:

$$F = q v B \sin 45^\circ$$

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

direction: right hand rule outside the page

or \hat{k}

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