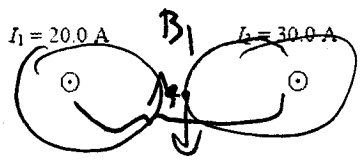
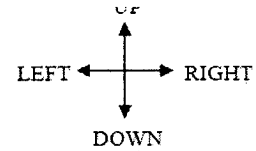
Quiz #7EC
Score /15

Name KEY
Section _____

The next two problems deal with two infinitely long, parallel, current-carrying wires with currents directed out of the page as shown. The wires are perpendicular to the plane of the page and are separated by a distance of 0.80 m.

1) The magnetic field at a point midway between the wires is closest to:





A. 2.0 x 10^{-5} T to the LEFT
B. 5.0 x 10^{-6} T UP
C. 2.0 x 10^{-5} T DOWN
D. 2.4 x 10^{-6} T to the LEFT
E. 5.0 x 10^{-6} T DOWN

Answer: E

$$B_1 = \frac{\mu_0 I_1}{2\pi a} = \frac{(4\pi\times10^{-7})(20.0A)}{2\pi(0.40m)}$$

$$= 1\times10^{-5}T$$

$$B_2 = \frac{\mu_0 I_2}{2\pi a} = \frac{(4\pi\times10^{-7})(30.0A)}{2\pi(0.40m)} = 1.5\times10^{-5}$$

$$B = B_1 - B_2 = -0.5\times10^{-5}\ T\ (\text{Down})$$

2) The force on a 2.5 m length of wire 1 due to wire 2 is closest to:

A. 3.8 x 10^{-4} N to the RIGHT
B. 1.2 x 10^{-4} N to the LEFT
C. 4.7 x 10^{-4} N to the RIGHT
D. 1.8 x 10^{-4} N to the LEFT
E. 7.5 x 10^{-4} N to the RIGHT

Answer: A

$$\frac{F}{l} = \frac{\mu_0 I_1 I_2}{2\pi a}$$

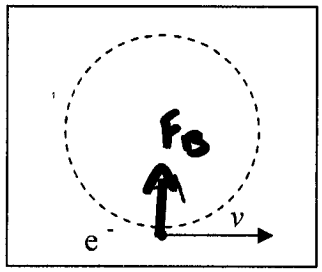
$$F = \frac{(4\pi\times10^{-7})(20.0A)(30.0A)(2.5m)}{2\pi(0.80m)}$$

$$F = 3.8\times10^{-4}\ N \quad \text{attract}$$

$F_1 = I_1 l B$

$B = \frac{\mu_0 I_2}{2\pi a}$

3) An electron moves in a circular path as shown in a region with a constant magnetic field. The direction of the magnetic field is



A. out of page
B. into page
C. to the right
D. to the left
E. towards the center of the circle

Answer: A

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

$\hat{F}_B = \hat{j}\,\hat{k}$

$q\hat{v} = \hat{i}$

$\hat{v} = -\hat{i}$

$-\hat{i} \times ? = \hat{k}$

$\hat{i} \times ? = -\hat{k}$

$\Rightarrow -\hat{j} \Rightarrow$ out of ~~the~~ page