PHYSICS 122 QUIZ 6 3/14/2018

NAME: SECTION:

**1.** A wire of length $L$ carries a current $\boldsymbol{I} = I(\hat{\boldsymbol{z}} - \hat{\boldsymbol{y}})$ within magnetic field $\boldsymbol{B} = B\hat{\boldsymbol{x}}$. What is $\boldsymbol{F}$?

**a)** $ILB(\hat{\boldsymbol{x}} + \hat{\boldsymbol{y}})$

**b)** $ILB(\hat{\boldsymbol{x}} + \hat{\boldsymbol{y}} + \hat{\boldsymbol{z}})$

**c)** $ILB(\hat{\boldsymbol{y}} + \hat{\boldsymbol{z}})$

**d)** $ILB(-\hat{\boldsymbol{y}} - \hat{\boldsymbol{z}})$

**e)** $ILB(-\hat{\boldsymbol{x}} - \hat{\boldsymbol{y}})$

**2.** A magnetic field decreases in intensity from 3T to 1T over the course of two seconds. A loop of radius $1m$ perpendicular to the field experiences what EMF in Volts?

**a)** 1

**b)** $\pi$

**c)** 0.12

**d)** 0

**e)** 3

**3.** If the loop were instead held at an angle of 45° to the field, what would be the EMF?

**a)** 0.5

**b)** $\pi/2$

**c)** $\sqrt{2}/2$

**d)** $\pi\sqrt{2}/2$

**e)** 0

**4.** Two parallel wires of length $L$ separated by a distance $d$ carry current $I$. What is the magnetic field at the location of one of the wires?

**a)** $\frac{\mu_0 I}{2\pi d}$

**b)** $\frac{\mu_0 I^2}{2\pi d}$

**c)** $0$

**d)** $\frac{\mu_0 I}{2\pi d^2}$

**e)** $\mu_0 I$

**5)** What is the force of one wire on the other if they: carry current in the same direction; carry current in opposite directions?

**a)** $0; \frac{\mu_0 I^2}{2\pi d} L$

**b)** $\frac{\mu_0 I^2}{2\pi d} L; 0$

**c)** $0; 0$

**d)** $\frac{\mu_0 I^2}{2\pi d} L; -\frac{\mu_0 I^2}{2\pi d} L$

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NAME: Key SECTION:

1. A wire of length $L$ carries a current $\boldsymbol{I} = I(\hat{\boldsymbol{z}} - \hat{\boldsymbol{y}})$ within magnetic field $\boldsymbol{B} = B\hat{\boldsymbol{x}}$. What is $\boldsymbol{F}$?

$\vec{F} = L\vec{I} \times \vec{B} = ILB[(\hat{z}-\hat{y}) \times (\hat{x})]$

$= ILB[\hat{z}\times\hat{x} - \hat{y}\times\hat{x}]$

$= ILB(\hat{y} + \hat{z})$

a) $ILB(\hat{\boldsymbol{x}} + \hat{\boldsymbol{y}})$

b) $ILB(\hat{\boldsymbol{x}} + \hat{\boldsymbol{y}} + \hat{\boldsymbol{z}})$

● $ILB(\hat{\boldsymbol{y}} + \hat{\boldsymbol{z}})$

d) $ILB(-\hat{\boldsymbol{y}} - \hat{\boldsymbol{z}})$

e) $ILB(-\hat{\boldsymbol{x}} - \hat{\boldsymbol{y}})$

2. A magnetic field decreases in intensity from 3T to 1T over the course of two seconds. A loop of radius $1m$ perpendicular to the field experiences what EMF in Volts?

$\mathcal{E} = -\frac{\Delta\Phi}{\Delta t} = -\frac{A\,\Delta B}{\Delta t} = -\frac{\pi r^2 (B_2 - B_1)}{\Delta t}$

$= \frac{\pi (1m)^2 (3T - 1T|}{2s}$

$= \pi\, m^2 \frac{T}{s} = \pi\, V$

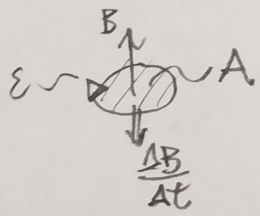
a) 1

● $\pi$

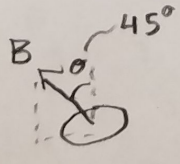
c) 0.12

d) 0

e) 3




3. If the loop were instead held at an angle of 45° to the field, what would be the EMF?




$B\cos\theta = \frac{\sqrt{2}}{2} B$

$\mathcal{E} = \frac{\sqrt{2}}{2}\pi \quad V$

a) 0.5

b) $\pi/2$

c) $\sqrt{2}/2$

● $\pi\sqrt{2}/2$

e) 0

**4.** Two parallel wires of length $L$ separated by a distance $d$ carry current $I$. What is the magnetic field at the location of one of the wires?

- (a) $\frac{\mu_0 I}{2\pi d}$
- b) $\frac{\mu_0 I^2}{2\pi d}$
- c) 0
- d) $\frac{\mu_0 I}{2\pi d^2}$
- e) $\mu_0 I$


$B \Delta \ell = 2\pi d\, B = \mu_0 I$

$B = \frac{\mu_0 I}{2\pi d}$

**5)** What is the force of one wire on the other if they: carry current in the same direction; carry current in opposite directions?

- a) $0; \frac{\mu_0 I^2}{2\pi d} L$
- b) $\frac{\mu_0 I^2}{2\pi d} L; 0$
- c) $0; 0$
- (d) $\frac{\mu_0 I^2}{2\pi d} L; \frac{\mu_0 I^2}{2\pi d} L$

See soln to previous wksht