Physics 112
March 31, 1999
Test 2

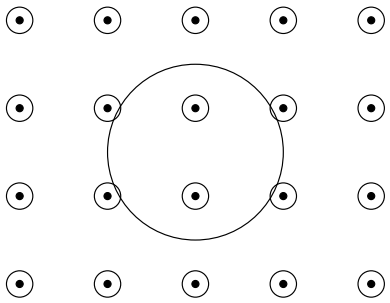
Name: _____

Be sure to show your work **clearly** and **draw a box around your answer**. Partial credit may be given for work *if* it can be understood. All answers must have the correct units. If any question is unclear, *please* ask immediately.

1. (20 pts.) A spatially uniform magnetic field is pointing out of the page The field is perpendicular to a circular loop of radius 0.2 m and resistance 50Ω. At time t=0s, the field is 3T. At time t=2s, the field is 1.6T.

   a. (5 pts.) What is the **direction** of the induced current in the loop? Indicate it clearly on the diagram.

   b. (15 pts.) What is the **magnitude** of the induced current?



Physics 112
March 31, 1999
Test 2

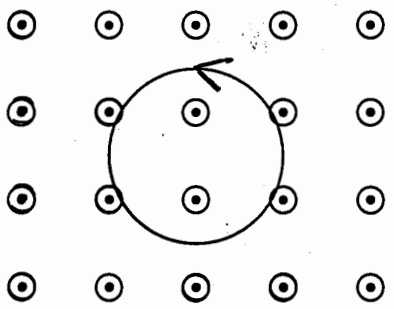
Name: SOLUTIONS

Be sure to show your work **clearly** and **draw a box around your answer.** Partial credit may be given for work *if* it can be understood. All answers must have the correct units. If any question is unclear, *please* ask immediately.

1. (20 pts.) A spatially uniform magnetic field is pointing out of the page The field is **perpendicular** to a circular loop of radius 0.2 m and resistance 50Ω. At time t=0s, the field is 3T. At time t=2s, the field is 1.6T.

   a. (5 pts.) What is the **direction** of the induced current in the loop? Indicate it clearly on the diagram. Counter-clockwise, to counter the decrease in flux.

   b. (15 pts.) What is the **magnitude** of the induced current?



$$\mathcal{E} = -\frac{\Delta\Phi}{\Delta t}$$

at $t=0$ $\Phi = BA = B\pi r^2$

$\Phi = (3)(\pi)(0.2m)^2 =$

$\Phi_M = 0.377\ Tm^2$

at $t=2$ $\Phi = BA = (1.6)(\pi)(0.2)^2$

$\Phi = 0.201\ Tm^2$

$$\mathcal{E} = -\frac{\Delta\Phi}{\Delta t} = -\frac{[\Phi(2s) - \Phi(0s)]}{2s} = -\frac{[0.201 - 0.377]}{2}$$

$\mathcal{E} = 0.08796V$

$I = \mathcal{E}/R = \frac{0.08796V}{50\Omega} = \boxed{0.00176A = 1.76\,mA}$

[See ch. 21 #12]