

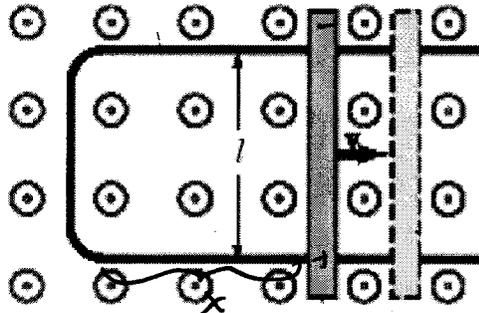
Fri AM

SP212 R Quiz Faraday's Law
Score /15

Name KEY
Section _____

1) A U-shaped conductor of width $l = 0.064$ m is connected by a conducting bar as shown. A uniform magnetic field of magnitude 0.15 T exists everywhere in the region and is directed out of the page. If the bar is moved to the right at a constant speed of 2.0 m/s, what is the magnitude and direction of the induced current through the bar if the resistance of the circuit is 2.0Ω ?

- A. 9.6 mA UP
- B. 19.6 mA DOWN
- C. 14 mA UP
- D. 14 mA DOWN
- E. 9.6 mA DOWN



Answer: E

$$\mathcal{E} = - \frac{d\Phi_B}{dt} = - \frac{d(BA)}{dt} = - \frac{d(B \times l)}{dt} = -Bl \frac{dx}{dt} = -Blv$$

$$\Rightarrow |\mathcal{E}| = (0.15\text{T})(0.064\text{m})(2.0\text{m/s}) = 0.019\text{V induced}$$

$$\Rightarrow \mathcal{E} = IR \Rightarrow I = \frac{1.9 \times 10^{-2}\text{V}}{2.0\Omega} = 9.6 \times 10^{-3}\text{A}$$

2) The magnetic flux through a loop of wire is given by $(0.60 + 0.30t^2)$ Tm². The emf induced in the loop at $t = 3.0$ s is closest to

- A. 1.8 V
- B. -0.60 V
- C. -4.2 V
- D. -3.3 V
- E. -2.4 V

$$\mathcal{E} = - \frac{d\Phi}{dt}$$

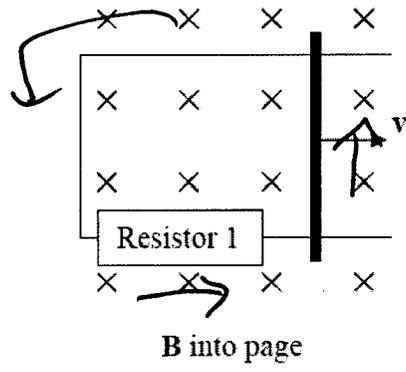
$$\mathcal{E}(t) = - 0.60t \text{ V}$$

$$\mathcal{E}(3.0\text{s}) = - 0.60(3.0\text{s}) \text{ V}$$

$$\mathcal{E} = -1.8\text{V}$$

Answer: A

3) The following situations are separate. In the scenario on the left, there is a bar in contact with metal rails. The bar, metal rails and resistor 1 form a circuit. The system is in a constant magnetic field into the page and the bar is moving to the right. In the scenario on the right, a magnet is moving away from a circuit as shown. The row in the following table that correctly gives the direction (or status) of both the current in resistor 1 and the current in resistor 2 is



B into page
 $\Phi_{B \text{ in}} \uparrow \Rightarrow \Phi_{B \text{ out}} \uparrow$

Row	Direction of the Current in Resistor 1	Direction of the Current in Resistor 2
A		
B		
C		
D		
E	The current is zero.	The current is zero.

Answer: C

