

Instructor: *P. Kumar*

## PHYSICS DEPARTMENT

PHY 2049

Exam II

June 18, 2008

Name (print, last first): \_\_\_\_\_ Signature: \_\_\_\_\_

*On my honor, I have neither given nor received unauthorized aid on this examination.***YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.****DIRECTIONS**

- (1) **Code your test number on your green answer sheet (use 76–80 for the 5-digit number).** Code your name on your answer sheet. **Darken circles completely (errors can occur if too light).** Code your student number on your answer sheet.
- (2) **Blacken the circle of your intended answer completely, using a number 2 pencil.** Do not make any stray marks or the answer sheet may not read properly.
- (3) The answers are rounded off. Choose the closest to exact. There is no penalty for guessing.

>>>>>>>**WHEN YOU FINISH**<<<<<<<<<  
Hand in the green answer sheet separately.

1. A potential difference of 1.2 V will be applied to a 33.0 m length of a 18-gauge copper wire (diameter 0.0400 in). Calculate the rate at which thermal energy will appear in the wire, if the resistivity of copper is known to be  $1.69 \times 10^{-8} \Omega\cdot\text{m}$ .

- (1) 2.1 W                      (2) 69 W                      (3) 35 W                      (4) 12 W                      (5) None of these

2. Three identical light bulbs A, B and C are connected in series to a constant voltage source. A wire is then connected across B. What is the brightness of A relative to its former brightness?

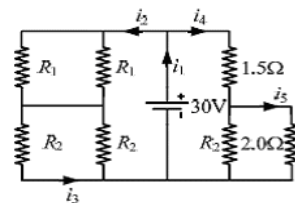
- (1) 2.25                      (2) 4                      (3) 1.5                      (4) 0.67                      (5) none of these

3. A cylindrical copper rod has resistance R. It is reformed to twice its original length with no change of volume. Its new resistance is:

- (1) 4R                      (2) 2R                      (3) R                      (4) 8R                      (5) R/2

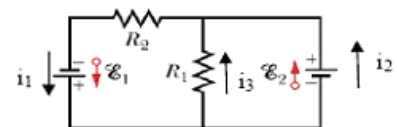
4. Consider the circuit shown in the accompanying figure, where  $R_1 = 13.0 \Omega$  and  $R_2 = 7.5 \Omega$ . What is the current  $i_3$  in A?

- (1) 1.46  
(2) 2.93  
(3) 9.74  
(4) 7.69  
(5) 12.2

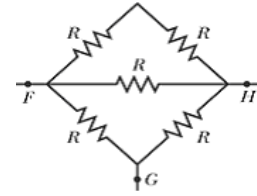


5. In the circuit shown, what is the magnitude of the current (in Amperes) flowing through the battery with potential difference  $\epsilon_1$ ? Consider  $\epsilon_1 = 10\text{V}$ ,  $\epsilon_2 = 5\text{V}$ ,  $R_1 = 35 \Omega$  and  $R_2 = 5 \Omega$ .

- (1) 3                      (2) 2.3                      (3) 5                      (4) 10                      (5) none of these



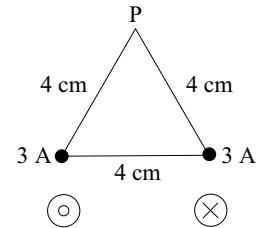
6. Five  $4.00\Omega$  resistors have been arranged in the figure. Find the equivalent resistance (in  $\Omega$ ) between points  $F$  and  $G$ .



- (1) 2.5                      (2) 6.25                      (3) 2.0                      (4) 3.125                      (5) none of these
7. In a uniform magnetic field, an electron undergoes a circular motion with a kinetic energy of  $6.4 \times 10^{-17}\text{J}$ . The radius of the orbit is 5.0 mm. What is the magnetic field in T?
- (1)  $1.35 \times 10^{-2}$                       (2)  $3.20 \times 10^{-4}$                       (3)  $1.28 \times 10^{-7}$                       (4)  $3.52 \times 10^{-5}$                       (5)  $2.96 \times 10^{-3}$
8. At one instant an electron (charge =  $-1.6 \times 10^{-19}\text{C}$ ) is moving in the xy plane, the components of its velocity being  $v_x = 5 \times 10^5\text{m/s}$  and  $v_y = 3 \times 10^5\text{m/s}$ . A magnetic field of 0.8 T is in the positive x direction. At that instant the magnitude of the magnetic force on the electron is:
- (1)  $3.8 \times 10^{-14}\text{N}$                       (2)  $2.6 \times 10^{-14}\text{N}$                       (3) 0                      (4)  $6.4 \times 10^{-14}\text{N}$                       (5)  $1.0 \times 10^{-13}\text{N}$
9. A loop of wire carrying a current of 2.0 A is in the shape of a right triangle with two equal sides, each 15 cm long. A 0.7 T uniform magnetic field is in the plane of the triangle and is perpendicular to the hypotenuse. The magnetic force on either of the two equal sides has a magnitude of:

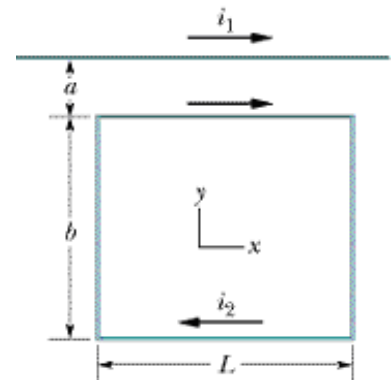
- (1) 0.15 N                      (2) 0.105 N                      (3) 0                      (4) 0.21 N                      (5) 0.25 N

10. Two long straight wires pierce the plane of the paper at vertices of an equilateral triangle as shown. They each carry 3A but in the opposite direction. The wire on the left has the current coming out of the paper while the wire on the right carries the current going into the paper. The magnetic field at the third vertex (P) has the magnitude and direction (North is up):



- (1)  $15\mu\text{T}$ , north                      (2)  $17\mu\text{T}$ , west                      (3)  $20\mu\text{T}$ , east                      (4)  $26\mu\text{T}$ , south                      (5) none of these

11. In the figure, a long straight wire carries a current  $i_1 = 39.7\text{ A}$  and a rectangular loop carries current  $i_2 = 25.1\text{ A}$ . Take  $a = 1.19\text{ cm}$ ,  $b = 9.23\text{ cm}$ , and  $L = 35.0\text{ cm}$ . What is the magnitude of the net force on the wire due to the loop?



- (1) 0.005 N  
 (2) 0.001 N  
 (3) 0.012 N  
 (4) 0.02 N  
 (5) none of these