Exam 2--PHYS 102--S12

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Which of these equations is correct?

a. \(14 - 4I_1 + 6 = 0\) 

b. \(I_1 + I_3 = I_2\)

c. \(14 + 4I_1 + 10 + 6I_2 = 0\)

d. \(10 + 6I_2 + 6 = 0\)

____ 2. What does a circuit breaker do?

a. turns off if the current exceeds a certain amount

b. turns off if the input current exceeds the output current

c. provides an alternate ground

d. creates a parallel circuit in your house

____ 3. What value is constant for all household devices?

a. voltage

b. power

c. charge

d. current
4. On a circuit breaker, you have a 1200 W heater and a 720 W fan. When you add a 240 W blender, the circuit breaker turns off. Assume all the devices operate at 120 V. Which of these is the maximum allowed current for the breaker?

a. 19 A  
b. 8 A  
c. 13 A  
d. 17 A

5. The wires in this junction have currents as labeled. What is the unknown current (labeled I=?)?

![Wiring Diagram]

a. 2 A  
b. 10 A  
c. 14 A  
d. 6 A

6. If the switch S is closed, what happens to the potential across $R_1$?

![Circuit Diagram]

a. stays the same  
b. increases  
c. decreases  
d. not enough information
7. In a circuit with resistors in parallel, what happens to the equivalent resistance as you add more resistors in parallel?

a. \( R_{eq} \) increases  
b. \( R_{eq} \) decreases  
c. \( R_{eq} \) stays the same  
d. It depends on the value of the added resistance

8. How are natural magnets created?

a. iron mixes with magnetic particles to create a stronger magnet  
b. ferromagnetic materials undergo very high pressure and temperature  
c. fossilized dinosaurs are magnetic  
d. molten metal solidifies in the presence of a magnetic field

9. Which of these statements is true?

a. magnetic monopoles do not exist  
b. opposite poles of a magnet attract  
c. all permanent magnets are ferromagnetic  
d. all of these are true

10. The Earth’s magnetic field plays a role in which of these atmospheric phenomena:

a. high-energy particle showers  
b. mirages  
c. aurora borealis  
d. atmospheric refraction

11. A negatively charged particle enters a magnetic field as shown. What is the force acting on the particle?

a.  
b.  
c.  
d.
12. I pass a wire through a magnetic field as shown. What is the direction of the current in the wire?

- to the left
- to the right
- no current

13. A current travels through a wire as shown. What is the direction of the force on the wire?

- into the page
- down
- to the left
- up
- to the right
14. A coil of copper wire, which is allowed to rotate about the axis shown with the dashed line, has a current going through it as shown. What is the initial direction of rotation for the coil?

- a. Counterclockwise
- b. Clockwise
- c. It remains stationary

15. This figure shows the path of a charged particle. What is the charge of the particle?

- a. negative
- b. positive
- c. neutral
- d. not enough information
Problem

16. (20 pts) What are the currents in each of the branches of this circuit? Give the magnitude and direction. (4 extra pts if you give the matrix solution to the system of equations)
17. (15 pts) Give the current and potential for each of the resistors in this circuit:

<table>
<thead>
<tr>
<th>$I_1 =$</th>
<th>$V_1 =$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_2 =$</td>
<td>$V_2 =$</td>
</tr>
<tr>
<td>$I_3 =$</td>
<td>$V_3 =$</td>
</tr>
<tr>
<td>$I_4 =$</td>
<td>$V_4 =$</td>
</tr>
<tr>
<td>$I_5 =$</td>
<td>$V_5 =$</td>
</tr>
</tbody>
</table>
18. (15 pts) A particle carrying a -3.0 C charge moves with velocity $v = 2j - 1k$ m/s through a uniform magnetic field $B = 4i + 3j$ T. What is the force, in vector notation, on the charged particle?
19. (10 pts) Find the radius of the circular path described by an electron moving at 32 km/s in a plane perpendicular to a 3.2 T magnetic field.
20. (10 pts) A wire of negligible resistance is bent into a rectangle as in this figure, and a battery and resistor are connected as shown. The right-hand side of the circuit extends into a region containing a uniform magnetic field of 2 T pointing to the right as shown. Find the magnitude and direction of the net force on the circuit.
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Answer Section

MULTIPLE CHOICE

1. ANS: A  PTS: 1
2. ANS: A  PTS: 1
3. ANS: A  PTS: 1
4. ANS: D  PTS: 1
5. ANS: C  PTS: 1
6. ANS: B  PTS: 1
7. ANS: B  PTS: 1
8. ANS: D  PTS: 1
9. ANS: D  PTS: 1
10. ANS: C  PTS: 1
11. ANS: C  PTS: 1
12. ANS: A  PTS: 1
13. ANS: C  PTS: 1
14. ANS: B  PTS: 1
15. ANS: A  PTS: 1

PROBLEM

16. ANS:
   
   PTS: 1
17. ANS:
   
   PTS: 1
18. ANS:
   
   PTS: 1
19. ANS:
   
   PTS: 1
20. ANS:
   
   PTS: 1