Instructions

- You have 20 minutes to complete this test.
- You may write your answers directly in the test.
- You may use any notes or resources you have created or collected.
- You may use a calculator and scratch paper if necessary.
- Good Luck!

Test Questions

1. Which of the following is not a conductor?
   a. Aluminum
   b. Copper
   c. Distilled Water
   d. Sea Water

2. If you have four light bulbs all with different voltages and filaments of the same length, which one will have the thickest filament?
   a. 10-W
   b. 30-W
   c. 60-W
   d. 120-W

3. Which of the following is a unit of measure for resistance?
   a. Ampere
   b. Ohm
   c. Volt
   d. Watt
4. Which light bulb(s) in the image above are lit?
   a. Light Bulb A
   b. Light Bulb B
   c. Light Bulb C
   d. Light Bulb D

Use the following diagram to answer Question #5 - #7

5. What is the equivalent resistance?
   a. 2 Ω
   b. 4 Ω
   c. 8 Ω
   d. 16 Ω

6. What is the power supplied by the voltage source?
   a. 24 W
   b. 48 W
   c. 124 W
   d. 144 W

7. What is the current through the 3 Ω resistor?
   a. 1.2 A
   b. 3.0 A
   c. 9.0 A
   d. 12.0 A

8. Which of the following is a device used to measure current?
   a. Ammeter
   b. Ampmeter
   c. Potentiometer
   d. Voltmeter
Use the following diagram to answer Question #9 - #14

In the circuit below, assume the switch has been in position A for a long time and moves from A to B at t = 0s.

9. What is the voltage across Capacitor 1 at t < 0?
   a. 6 V
   b. 12 V
   c. 24 V
   d. 48 V

10. What is the voltage across Capacitor 2 at t < 0?
    a. 6 V
    b. 12 V
    c. 24 V
    d. 48 V

11. What is the steady state voltage across Capacitor 1 at t=1s?
    a. 20 V
    b. 40 V
    c. 80 V
    d. 160 V

12. What is the steady state voltage across Capacitor 2 at t=1s?
    a. 20 V
    b. 40 V
    c. 80 V
    d. 160 V

13. What is the energy added to Capacitor 1 from t=0 to t>>0?
    a. 0.00196 J
    b. 0.00256 J
    c. 0.01024 J
    d. 0.01983 J
14. What is the energy added to Capacitor 1 from \( t=0 \) to \( t>>0 \)?
   a. 0.00196 J  
   b. 0.00256 J  
   c. 0.01024 J  
   d. 0.01983 J

15. What is the source of all magnetism?
   a. tiny pieces of iron  
   b. ferromagnetic materials  
   c. moving electrical charge  
   d. tiny domains of aligned atoms

16. Which of the following is true for a bar magnet that has been cut in half?
   a. The pieces will no longer be magnetized.  
   b. Both pieces will be only the South Pole.  
   c. One piece will be the North Pole the other piece will be the South Pole.  
   d. Each piece will be a complete magnet with a North Pole and a South Pole.

Use the drawing below to answer questions #17-#20

![Electrical Circuit Diagram]

17. What is \( I_1 \)?
   a. 1.00 A  
   b. 3.00 A  
   c. 4.00 A  
   d. 7.00 A

18. What is \( V_1 \)?
   a. 4.00 V  
   b. 8.00 V  
   c. 16.00 V  
   d. 24.00 V

19. What is \( I_3 \)?
   a. 2.00 A  
   b. 3.00 A  
   c. 4.00 A  
   d. 7.00 A
20. What is $V_4$?
   a. 4.00 V
   b. 8.00 V
   c. 16.00 V
   d. 24.00 V

   Use the drawing below to answer questions #21-#25

   ![Circuit Diagram]

21. What is the current passing through Resistor $R_3$?
   a. 1.00 A
   b. 2.00 A
   c. 4.00 A
   d. 7.50 A

22. What is the voltage drop across Resistor $R_3$?
   a. 6.00 V
   b. 8.00 V
   c. 16.00 V
   d. 30.00 V

23. What is the current passing through the battery?
   a. 1.00 A
   b. 2.00 A
   c. 4.00 A
   d. 7.50 A

24. What is the voltage drop across resistor $R_1$?
   a. 6.00 V
   b. 8.00 V
   c. 16.00 V
   d. 30.00 V

25. What is the total resistance of the external circuit?
   a. 4.00 Ω
   b. 12.00 Ω
   c. 15.00 Ω
   d. 30.00 Ω
26. How many batteries are present in the above circuit?
   a. Zero
   b. One
   c. Two
   d. Three

27. If only Switch #1 is open, what will happen to the current in Bulb #1?
   a. Become Zero
   b. Decrease
   c. Become Greater
   d. Stay the same

28. If only Switch #1 is open, what will happen to the current in Bulb #2?
   a. Become Zero
   b. Decrease
   c. Become Greater
   d. Stay the same

29. If only Switch #1 is open, what will happen to the current in Bulb #3?
   a. Become Zero
   b. Decrease
   c. Become Greater
   d. Stay the same

30. If only Switch #2 is closed, what will happen to the brightness of Bulb #3?
   a. Become Brighter
   b. Become Dimmer
   c. Go Out
   d. Stay the same
ANSWER KEY

1. C  
2. D  
3. B  
4. B  
5. B  
6. D  
7. A  
8. A  
9. B  
10. D  
11. A  
12. C  
13. B  
14. B  
15. C  
16. D  
17. C  
18. C  
19. D  
20. B  
21. B  
22. B  
23. B  
24. A  
25. C  
26. C  
27. B  
28. A  
29. C  
30. C