<u>Test Review</u>

Concepts

1. Define electric current. Include the symbols, formula and the SI unit.
2. Define electrical potential (voltage). Include the symbols, formula and synonyms.
3. Define electrical resistance and include its units and symbols. What does it have to do with conductors and insulators?
4. What is Ohm's law? Use both words and the math formula
5. How does resistance change with the length of a wire? With the width of a wire?
6. Using complete sentences and correct units and symbols explain the difference between electric power and electric energy. Which quantity can be measured in kilowatt-hours?
7. What is the difference between direct current and alternating current? What is the usual source for each?
8. What are the rules for series circuits?
9. What are the rules for parallel circuits?
10. Identify schematic symbols, series, parallel, and complex circuits.

Review Problems:

11. A 4.5V battery is connected to a bulb whose resistance is 1.6 ohms. How many electrons leave the battery per minute? **(1.05 E21 electrons)**
12. A hair dryer draws 13A when plugged into a 120V line.
    a. What is its resistance? **(9.23Ω)**
    b. How much charge (in Coulombs) passes through it in 15 *min*? **(1.17 E4 C)**
13. A resistance of 60 Ω has a current of 0.40 A through it when it is connected to the terminals of a battery. What is the voltage of the battery? **(24V)**
14. What voltage will push a 0.21A current through a 3000 ohm resistor? **(630V)**
15. A 4000W clothes dryer is connected to a 220V circuit. How much current does the dryer draw? **(18.18 A)**
16. What is the resistance of a toaster if 110V produces a current of 3.1A? **(35.48 Ω)**
17. The current through a toaster connected to a 120V source is 8.0 A. What power is dissipated by the toaster? **(960W)**
18. A 12V automobile battery is connected to an electric starter motor. The current through the motor is 210 A.
    a. What power, in watts, does the motor use? **(2.52 E3 W)**
    b. How many joules of energy does the battery deliver to the motor each second? **(2.52 E3 J)**
19. A lamp draws 0.50 A from a 120V generator.
    a. How much power does the generator deliver? **(60W)**
    b. How much energy does the lamp use in 5.0 min? **(1.80 E4 J)**
20. If a 12V battery pushes a current of 0.50 A through a resistor, how many joules of energy does the resistor use in a minute? **(360 J)**
21. A flashlight bulb is connected across a 3.0V difference in potential. The current through the lamp is 1.5 A.
    a. What is the power rating of the lamp? **(4.5 W)**
    b. How much electric energy does the lamp convert in 11 min? **(2.97 E3 J)**
22. A color TV draws 2A when operated on a 120V outlet.
    a. What is its power? **240W**
    b. If it is operated 7.0 hr/day, what energy in kWh does it consume in 30 days? **5.04kWh**
    c. If electricity costs $0.15/kWh what is the cost of operating the TV per month? **$75.60**

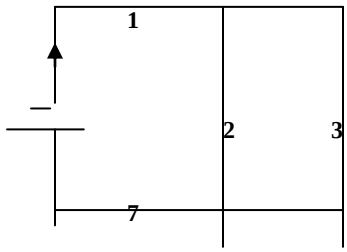
Circuit Problems: Draw the schematic for each problem

23. A 20.0-Ω lamp and a 5.0-Ω lamp are connected in series and placed across a potential difference of 50 V. What is
    a. the equivalent (total) resistance of the circuit? **(25Ω)**
    b. the total current in the circuit? **(2A)**
    c. the voltage drop across *each* lamp? **(40V, 10 V)**
    d. the power dissipated in each lamp? **(80 W, 20 W)**
24. Three *identical* lamps are connected in series to a 6.0-V battery. What is the voltage drop across each lamp? **(2V/bulb)**
25. Three resistors (2, 8, and 12 ohm) are connected in *series* across 9V.
    a. What is the total current in the circuit? **(0.41A)**
    b. What is the voltage drop across each of the resistors? **(0.82V, 3.28 V, 4.92 V)**
    c. What is the power dissipated in each resistor? **(0.34 W, 1.34 W, 2.02 W)**
26. The load across a 12-V battery consists of a *series* combination of three resistors of 15 Ω, 21 Ω, and 24 Ω.
    a. What is the total current in the circuit? **(0.2 A)**
    b. What is the voltage drop across each resistor? **(3V, 4.2 V, 4.8V)**
    c. What is the power dissipated in each resistor? **(0.6 W, 0.84 W, 0.96 W)**

27. The load across a battery consists of two resistors, with values of 15 Ω and 45 Ω connected in parallel.
    a. What is the total resistance of the load? **(11.25Ω)**
    b. What is the voltage of the battery if the total current in the circuit if 0.10 A? **(1.13 V)**
28. A 16.0-Ω and a 20.0-Ω resistor are connected in *parallel* across the terminals of a 40.0 V power supply is applied to the combination.
    a. What is the equivalent resistance of the parallel circuit. **(8.89Ω)**
    b. What is the total current in the circuit? **(4.50A)**
    c. How large is the current through *each* of the resistors? (**2.50A, 2.0A)**
29. A circuit contains six 240-Ω bulbs and a 10.0-Ω heater connected in *parallel*. The voltage across the circuit is 120 V. What is the *current* in the circuit
    a. when only four bulbs are turned on? **(2.0A)**
    b. when all bulbs are on? **(3.0A)**
    c. if six bulbs and the heater are operating? **(15A)**
    d. if the circuit has a fuse rated at 12 A, will it melt if everything is on?

<u>Combo</u>

Use the following diagram to answer the following questions:



1. A 14-Ω coffee maker and a 16-Ω frying pan are connected in series with each other (in Branch 2) across a 120-V source of voltage. A 23-Ω bread maker is also connected across the 120-V source and is in parallel with the series combination (in Branch 3). Find
    a. The total resistance of the circuit. **(13.02Ω)**
    b. the total current supplied by the source of voltage. **(9.22A)**
    c. The power of each device. **(224 W, 256 W, 621.92 W)**
2. A 60.0-Ω resistor (on Branch 2) is connected in parallel with a 120.0-Ω resistor (on Branch 3). This parallel group is connected in series with a 20.0-Ω resistor (Location 1). The total combination is connected across a 15.0-V battery. Find the current through, the voltage drop of, and the power of all three resistors. **(20Ω: 0.25 A, 5 V, 1.25 W) (60Ω: 0.17 A, 10V, 1.7 W) (120Ω: 0.08A, 10V, 0.80 W)**
3. A 5Ω and a 2Ω resistor are in series with each other (in Branch 2). These two resistors are in parallel with two other resistors in series with each other (a 4 Ω and a 7Ω, in Branch 3). This four-resistor parallel group is in series with 2 more resistors that are in series with each other (a 3Ω at Location 1, and an 8Ω at Location 7). The whole circuit is across 120V. Determine the power dissipated in each of the resistors. **(3Ω: 184.87 W, 8Ω: 492.98 W, 5Ω: 115.2 W, 2Ω: 46.08 W, 4Ω: 37.21 W, 7Ω: 65.12 W)**