1. A 60.0 cm metal wire draws 0.185 A from a 36.0 V battery. Will the current increase or decrease when the following changes are performed? Explain whether the change is due to a change in resistance, a change in potential difference, or other reasons.

   a. The wire is cut into four pieces, and only one segment is used.

   b. The wire is bent to form an \( M \) shape.

   c. The wire is heated to 500\(^\circ\)C.

   d. The 36.0 V battery is replaced by a 24.0 V battery.

2. A 25 \( \Omega \) resistance heater is connected to a potential difference of 120 V for 5.00 h.

   a. How much current does the heater draw?

   b. How much electric charge travels through the heating element during this time?

   c. What is the power consumption of the heater?

   d. Use the power and time to calculate how much energy was consumed.
3. The label on a three-way light bulb package specifies 100 W, 150 W, 250 W, 120 V.
   
   a. How much current does the light bulb draw in each of the three ways? (Assume three significant figures in each of these measurements.)

   
   
   
   b. What is the bulb’s resistance in each way?

   
   
   
   c. Compare the cost of using the light bulb for 100.0 h in each way. (Assume that the price is 7.00 ¢/kWh.)

   
   
   

4. An electric hot plate draws 6.00 A of current when its resistance is 24.0 Ω.
   
   a. What is the voltage across the hot plate’s heating element?

   
   
   
   b. How much power does it consume?

   
   
   
   c. For what length of time should it be kept on in order to supply $9 \times 10^4$ J to a coffeepot? (Assume that all electrical energy is transferred to the coffeepot by heat.)
1. Consider the circuit shown below.

![Circuit Diagram]

a. Do any of the bulbs have a complete circuit when all the switches are open? Which one(s)? ________________________________

b. Do any of the switches cause a short circuit when closed? Which one(s)? ________________________________

c. Which switches should be kept open, and which should be closed for the following to occur?

- only bulbs $A$ and $B$ are off ________________________________
- only bulbs $A$ and $C$ are off ________________________________
- only bulbs $B$ and $C$ are off ________________________________

2. A light bulb of unknown resistance is connected in series with a $9.0 \ \Omega$ resistor to a $12.0 \ \text{V}$ battery. The current in the bulb is $0.80 \ \text{A}$.

a. In the space below, sketch a schematic diagram of the circuit.

![Diagram of Circuit]

b. Find the equivalent resistance of the circuit.

______________________________

c. Find the resistance of the light bulb.

______________________________
3. A light bulb of unknown resistance is connected in parallel to a 48.0 Ω resistor and to a 12.0 V battery. The current through the battery is 2.50 A.

   a. In the space below, sketch a schematic diagram of the circuit.

   __________________________________________________________________________

   b. Find the potential difference across the resistor and across the bulb.

   __________________________________________________________________________

   c. Find the current in the resistor and in the bulb.

   __________________________________________________________________________

   d. Find the resistance of the light bulb.

   __________________________________________________________________________

4. In the circuit below, find the equivalent resistance for the following situations.

   __________________________________________________________________________

   a. \( R_a = R_b = R_c = R_d = R_e = R_f = 10.0 \ \Omega \)

   __________________________________________________________________________

   b. \( R_a = 10.0 \ \Omega; \ R_b = 20.0 \ \Omega; \ R_c = 30.0 \ \Omega; \ R_d = 40.0 \ \Omega; \ R_e = 50.0 \ \Omega; \ R_f = 60.0 \ \Omega \)

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