Name: _____ Date: _____ Period: **B**

Graded problems are worth 2 points. This assignment is graded out of **24** points.

You may consider the resistance in wires to be zero for the purposes of these problems.

1) The voltage across a light bulb is 120 V. The resistance of the bulb is 240 Ω. How much current flows through the bulb? Use significant figures.

2) **Graded.** In Japan, the voltage used to light a bulb is 120 V. If the resistance of the bulb is 240 Ω, how much current flows through the bulb in Japan? Use significant figures.

3) **Graded.** The standard light bulb in the USA has 240 Ω of resistance and will light up if there is 0.45 A of current. (If there is less than 0.45 A, the current still flows, but the bulb doesn't light up.) Will a light bulb made in the USA light up if placed into a light socket in Japan, where the voltage is 110 V?

A laptop computer operates when the current is between 3.4 and 3.6 amperes. The resistance offered by the laptop is 34.3 Ω. Use this information for questions 4) and 5). Use significant figures.

4) **Graded.** What is the minimum voltage necessary to make the laptop work?

5) **Graded.** What is the maximum voltage that the laptop can accommodate?

6) A fuse will blow out (melt) when more than 4.5 A of current flows through it. What resistance is needed to prevent the fuse from blowing out if the voltage of the current is 120 V? Use significant figures.

A radio plugged into a current source of 120 V (standard wall outlet in the USA) offers 64.0 Ω of resistance. Use this information to answer questions 7) through 9).

7) **Graded.** If the radio requires 1.65 A of current to work, will it work in Japan?

8) **Graded.** How much current is flowing through the radio? Use significant figures.

9) **Graded.** The radio breaks inside (because it's dropped) and suddenly offers only 17.25 Ω of resistance. How much current is now flowing through it? Use significant figures.

10) A voltage of 12 V (standard car batteries are 12 V batteries) is sufficient to move $3.3 \times 10^4\ A$ of current through a wire. How much resistance does the wire offer? Use significant figures.

11) **Graded.** A voltage of 9 V is sufficient to move 2.1 A through a smoke detector. How much resistance does the smoke detector offer? Use significant figures.

12) **Graded.** A voltage of 9 V moves only $5.0 \times 10^{-4}\ A$ of current through Kenny's hand. How much resistance does Kenny's skin offer? Use significant figures.

13) **Graded.** Saliva (spit) reduces the resistance offered by skin. If Kenny puts a 9 V battery on his tongue, he feels the $8.3 \times 10^{-4}\ A$ of current that flows over his tongue. What is the resistance of his wet tongue? Use significant figures.

14) An LED (Light Emitting Diode… a type of high-efficiency bulb) with a resistance of 0.65 Ω lights up when 0.133 A of current flows through it. What is the voltage needed to light the LED?

15) **Graded**. A light bulb in Europe will light if there is 0.5 A of current running through it. In Europe, the light bulbs have 440 Ω of resistance. What is the voltage used in Europe? Use significant figures.

16) **Graded**. The resistance of air to electricity is 1.2×10^{8} Ω. If a "static shock" from your finger to your cat's ear is 0.0038 A of current. What is the voltage between your finger and the cat's ear?

Selected Answers

1) The voltage across a light bulb is 120 V. The resistance of the bulb is 240 Ω. How much current flows through the bulb? Use significant figures.

$$I = \frac{V}{R}$$

$$I = \frac{120\ V}{240\ \Omega} = 0.5\ A$$

We can use scientific notation to increase the number of significant figures in our answer:

$$0.5\ A = 5.0 \times 10^{-1}\ A$$

6) A fuse will blow out (melt) when more than 4.5 A of current flows through it. What resistance is needed to prevent the fuse from blowing out if the voltage of the current is 120 V? Use significant figures.

$$R = \frac{V}{I} = \frac{120\ V}{4.5\ A} = 27\ \Omega$$

Any resistance that is greater than 27 Ω will ensure that the current remains at or below 4.5 A.

10) A voltage of 12 V (standard car batteries are 12 V batteries) is sufficient to move $3.3 \times 10^4\ A$ of current through a wire. How much resistance does the wire offer? Use significant figures.

$$R = \frac{V}{I} = \frac{12\ V}{3.3 \times 10^4\ A} = 3.6 \times 10^{-4}\ \Omega$$

14) An LED (Light Emitting Diode… a type of high-efficiency bulb) with a resistance of 0.65 Ω lights up when 0.133 A of current flows through it. What is the voltage needed to light the LED?

$$V = IR$$

$$V = 0.133\ A \times 0.65\ \Omega$$

$$V = 0.086\ V \text{ or } 8.6 \times 10^{-2}\ V$$

The minimum voltage necessary is 0.086 V. If the voltage is greater, then there will still be enough current to light the LED.