Name: **Key**

## Notes – 20.2 Ohm's Law: Resistance and Simple Circuits

1. What drives current? We can think of various devices—such as batteries, generators, wall outlets, and so on—which are necessary to maintain a current. All such devices create a **potential** difference and are loosely referred to as voltage sources. When a voltage source is connected to a conductor, it applies a potential difference V that creates an **electric field**, which in turn exerts an **electric force** on the charges, causing a **current** to flow.

2. The current that flows through most substances is directly proportional to the **voltage** applied to it. This is known as **Ohm's** Law.

I *(graph with two lines from origin)* — low resistance

high resistance

V
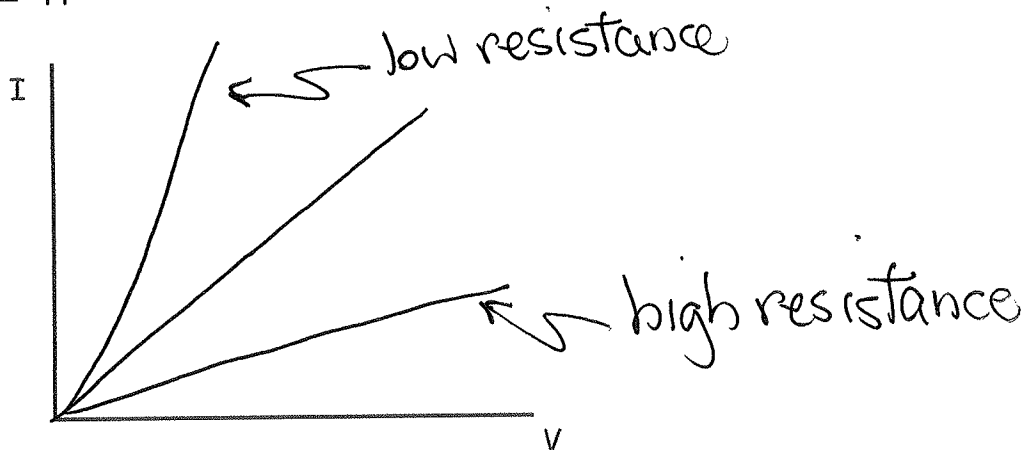
3. Write the equation for Ohm's Law: $I = \dfrac{V}{R}$ $\left(V = IR\right)$

4. The units for resistance are **ohms, Ω**.

5.

battery
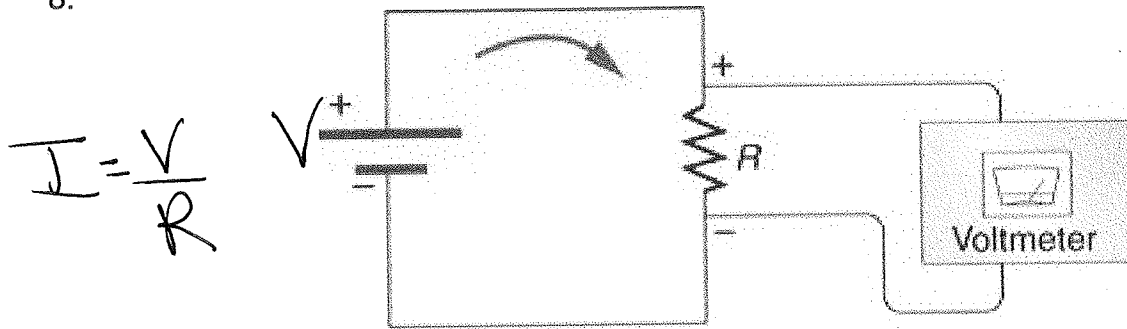
current

V $+$ $-$

R — resistor
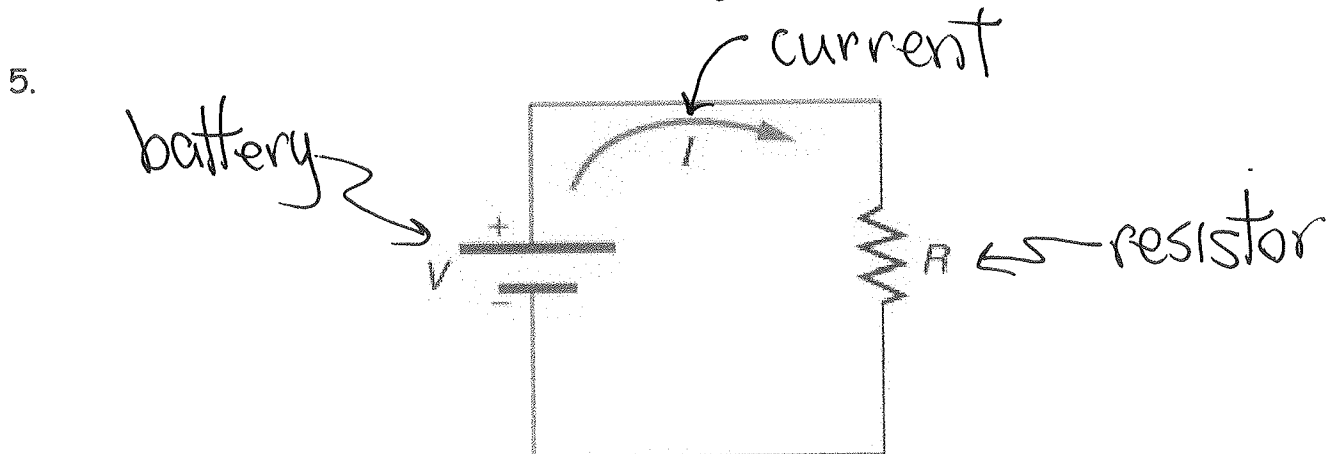
6. What is the resistance of an automobile headlight through which 2.50 A flows when 12.0 V is applied to it?

$$I = \frac{V}{R} \Rightarrow R = \frac{V}{I} = \frac{12.0V}{2.50A} = \boxed{4.80\,\Omega}$$

7. Resistances range over many orders of magnitude. Some ceramic insulators, such as those used to support power lines, have resistances of $\underline{10^{12}}$ Ω or more. A dry person may have a hand-to-foot resistance of $\underline{10^5}$ Ω, whereas the resistance of the human heart is about $\underline{10^3}$ Ω. A meter-long piece of large-diameter copper wire may have a resistance of $\underline{\quad 10^{-5}\,\Omega \quad}$, and superconductors have $\underline{\quad 0 \quad}$ resistance at all.

8.

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