High School VOC Worksheet Answers
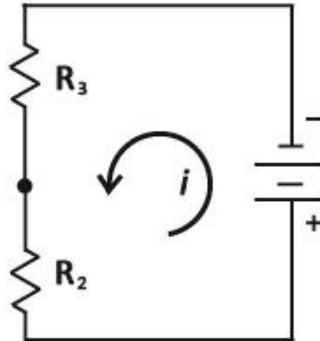

1. Given Equation 1, $V_{total} = iR_2 + iR_3$, and a total voltage of 10V, a current of 2A, and resistor 2 value of 2Ω, what is the value of resistor 3?

   <u>Answer:</u>
   $$V_{total} = iR_2 + iR_3$$
   $$10V = 2A*2\Omega + 2A*R_3$$
   $$10 = 4 + 2R_3$$
   $$6 = 2R_3$$
   $$R_3 = 3$$

2. If you increase the value of resistor 2 to 4Ω, what happens to the value of resistor 3?

   <u>Answer:</u> It decreases.
   $$V_{total} = iR_2 + iR_3$$
   $$10V = 2A*4\Omega + 2A*R_3$$
   $$10 = 8 + 2R_3$$
   $$2 = 2R_3$$
   $$R_3 = 1$$

3. What if you reduce the value of resistor 2 to 1Ω?

   <u>Answer:</u> It increases.

$$V_{total} = iR_2 + iR_3$$
$$10V = 2A * 1\Omega + 2A * R_3$$
$$10 = 2 + 2R_3$$
$$8 = 2R_3$$
$$R_3 = 4$$

4. If the value of R_2 increases, the value of R_3 _____. If R_2 decreases, R_3 _____. This relationship is called proportionality ($R_2 \propto R_3$).

   Answer: decreases; increases

5. Ohm's Law states that $V_{resistor} = iR_{resistor}$. Plug Ohm's Law into Equation 1 so that it contains only voltage values.

   Answer: $V_{total} = V_2 + V_3$

6. When VOCs come into contact with the surface of the sensor, a reaction occurs, and the resistance of resistor 2 decreases. Assume that you are testing a spray cleaner for VOCs. Before you spray the cleaner into your classroom, $V_{total} = 8V$, $i = 2A$, $R_2 = 2\Omega$, and $R_3 = 2\Omega$. You spray the cleaner, and R_2 changes from 2Ω to 1Ω. What happens to V_2 and V_3?

   Answer: V_2 goes down (from 4V to 2V) and V_3 goes up (from 4V to 6V)