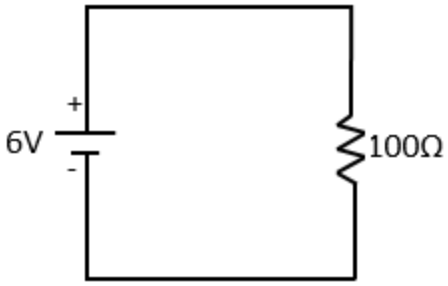
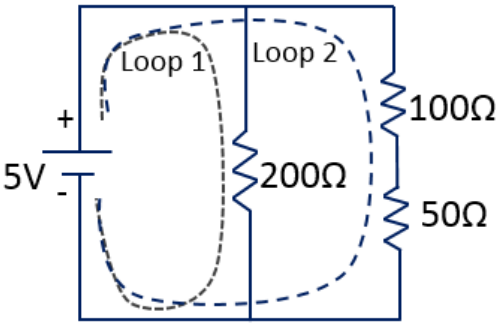
ENGR 120 **Homework 4**

NOTE: Use engineering format for problems 1 through 4. Use non-engineering format for problems 5 and 6. This is an individual assignment.

1. Suppose the net number of electrons that leave the negative side of the voltage source is 3.21×10^{21}. If the voltage source is 6V and the resistor is 100Ω, then how long was this circuit in operation? time = 2.38hr

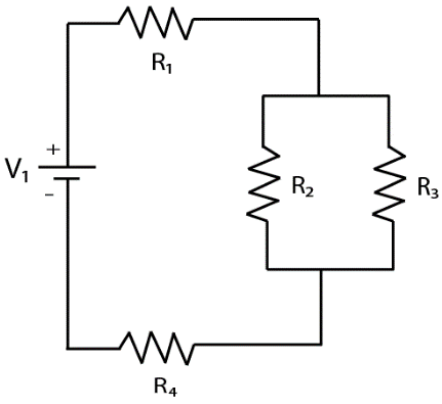


2. Consider the circuit given.
   a. What is the overall voltage drop over the resistor in Loop1? 5V
   b. What is the overall voltage drop over the resistors in Loop 2? 5V
   c. Using Ohm's law, what is the current that passes through the 200Ω resistor? 25mA
   d. Looking at the resistors in Loop 2, do you think the voltage drop for the 100Ω resistor will be greater than or less than the 50Ω resistor? Can you predict by how much more or less?
   e. What is the equivalent resistance of the resistors in Loop 2? 150Ω
   f. Find the current passing through the resistors in Loop 2 (Hint: use Ohm's Law and the R_{eq} of the two resistors in the loop). 33mA

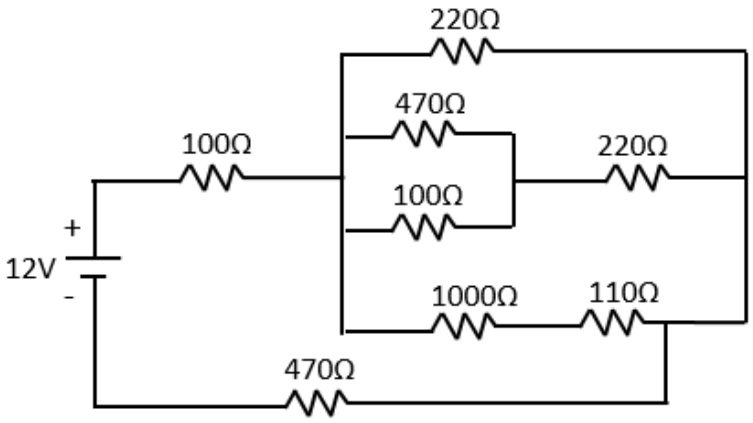


   g. Find the voltage drop across the 100Ω and the 50Ω resistor (Hint: current stays the same through both resistors). $\Delta V_{100\Omega}$=3.3V & $\Delta V_{50\Omega}$=1.7V
   h. Compare your answers from part g to your predictions in part d. Were your predictions accurate? Do the calculated answers make sense? Explain.

3. Consider the circuit given where V_1= 9V, R_1=470Ω, R_2=220Ω, R_3=1000Ω, and R_4=100Ω.
   a. Compute the equivalent resistance for the entire circuit. 750.3Ω
   b. If the current that passes through R_1 is the same as the current leaving the power source, then what current passes through R_1? 12mA
   c. What is the voltage drop across R_1? 5.64V
   d. If the current that passes through R_4 is the same as the current leaving the power source, then what is the voltage drop across R_4? 1.20V
   e. Does R_2 and R_3 have the same voltage drop?
   f. Using KVL and your knowledge of the voltage drop for R1 and R4, determine the voltage drop across R_2 and R_3. 2.16V
   g. Current is different for R_2 than it is for R_1 and R_4, find the current that passes through R_2. 9.8mA
   h. Find the current that passes through R_3. 2.2mA



4. Find the equivalent resistance for the given circuit. Req = 684.25Ω



5. Install two LED/resistor pairs on your breadboard that are driven by a digital input/output pins 11 and 12. Use "for loops" to make your Arduino cause the two LEDs to blink in the following pattern:
   a. LED1=on and LED2=off for 200 ms
   b. LED1=off and LED2=on for 200 ms
   c. Repeat parts (a) and (b) a total of 12 times
   d. Both LEDs off for ¾ of a second
   e. LED1=on and LED2=on for 500 ms
   f. LED1=off and LED2=off for 500 ms
   g. repeat parts (e) and (f) a total of 6 times
   h. Both LEDS off for 1 second
   i. Repeat the entire pattern above indefinitely

   Your program should have two for loops, one for parts (a) and (b) and another one for parts (e) and (f). Provide a screen shot of your sketch with your homework. Bring your Arduino to class ready to demonstrate your implementation of this problem.

   Note: **Have your Arduino/Blinking LED circuit out on your table with the program running so that your instructor or class assistant can quickly check your work. Do not turn your homework in at the front; have it ready so that the instructor / assistant can grade your blinking LED activity.**

6. Refer to the connecting a switch presentation found in class 4. Wire and connect the switch to your Arduino chassis following the instruction found on the presentation. Note: The wires that are connected to the terminals on the switch should be long enough to connect to the breadboard. However, you do not have to connect the wires to the breadboard at this time.