# Physics 201   Name _____

Exam 2 – Circuits   March 1, 2007

This is a closed book examination. However, you may use a 4x5 index you have created on this exam. There is extra scratch paper available. Please <u>explain your answers</u>. Your explanation is worth 3/4 of the points on multiple-choice questions.

1) [4 PTS] Two light bulbs are connected to a battery as shown in the diagram to the right. Bulb A is brighter than bulb B. What happens to the brightness when you switch the location of bulb A and bulb B?
   a) Bulb A is still brighter
   b) Bulb B is now brighter
   c) Depends on direction of current
   d) Bulb B and Bulb A are now the same brightness
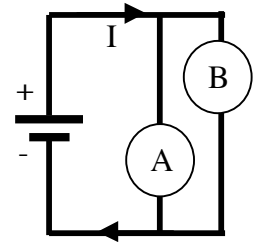
2) [4 PTS] In the circuit to the right the capacitor is initially uncharged. If you want a light bulb to light when you throw the switch, where should you place it?
   a) Insert the light bulb at A.
   b) Insert the light bulb at B.
   c) Either position A or B will light the bulb.
   d) Bulb will not light in this circuit. Neither position A or B will light the bulb.
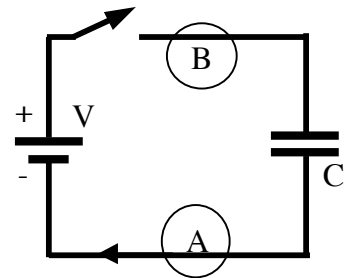
3) [4 PTS] You connect three resistors to a battery as shown in the diagram to the right. The current through each resistor
   a) is the same.
   b) is different.
   c) is zero.
   d) depends on the polarity of the battery.
   e) depends on which resistor is the smallest.
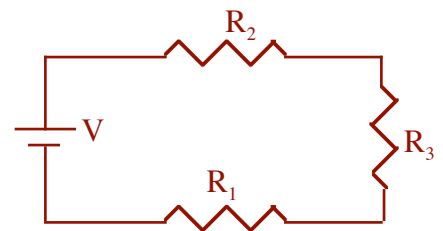
4) [4 PTS] A wire with a resistance, R_1, is replaced by a new wire that is made out of the same material and is the same length but has twice the cross-sectional radius. What is the resistance of this new wire, R_2?
   a) Smaller, $R_2 = \frac{1}{4}R_1$.
   b) Smaller, $R_2 = \frac{1}{2}R_1$.
   c) The same, $R_2 = R_1$.
   d) Larger, $R_2 = 2R_1$.
   e) Larger, $R_2 = 4R_1$.

5) [4 PTS] You connect three resistors to a battery as shown in the diagram to the right. The current through each resistor
   a) is the same.
   b) is different.
   c) is zero.
   d) depends on the polarity of the battery.
   e) depends on where the smallest resistor is located.
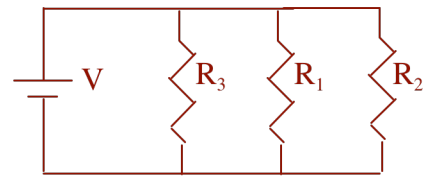
6) [4 PTS] For the above circuit diagram (problem #5) $R_1 < R_2 < R_3$. What is the total resistance for the circuit?
   a) $R_2 > R_{total} > R_1$
   b) $R_3 > R_{total} > R_2$
   c) $R_{total} > R_3$
   d) $R_1 > R_{total}$
   e) None of the above

7) [4 PTS] For the above circuit (problem #5) $R_1 = 40\Omega$, $R_2 = 90\Omega$ and $R_3 = 10\Omega$. The voltage across R_1
   a) is greater than the voltage across R_2.
   b) is less than the voltage across R_3.
   c) is less than V.
   d) depends on the current through R_2 and R_3.
   e) is equal to V.

8) [12 PTS] You construct the following circuit with $R_1 = 50\Omega$, $R_2 = 500\Omega$, $R_3 = 350\Omega$, $C_1 = 400\mu F$, $C_2 = 500\mu F$ and V=9Volts. The capacitors are initially uncharged.
   a) What is the time constant for the entire circuit?
   b) Which resistor has the largest voltage drop across it?
   c) Graph the voltage across C_2 as a function of time.
   d) Graph the voltage across R_3 as a function of time.
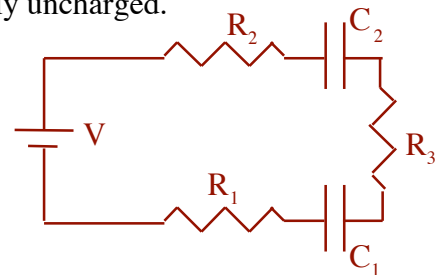
9) [8 PTS] You put together the follow circuit consisting of two batteries and four resistors. Solve for the unknown voltage and the power delivered by the unknown battery in the circuit diagram below. The current through R_1 is 1 Ampere while $R_1 = 9\ \Omega$, $R_2 = 3\ \Omega$ and $R_3 = 1\ \Omega$. NOTE: A correct setup is worth 6 PTS.

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