

Physics 4700 HOMEWORK 1  
Due January 23

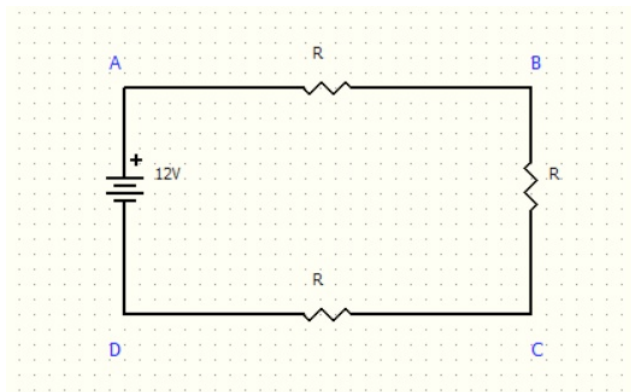
**1. Simpson Page 47 #4**

Calculate how many electrons flow per second past a fixed point in a wire carrying 10mA of current. If the current moves from left to right, which way do the electrons move?

**2. Simpson Page 47 #11**

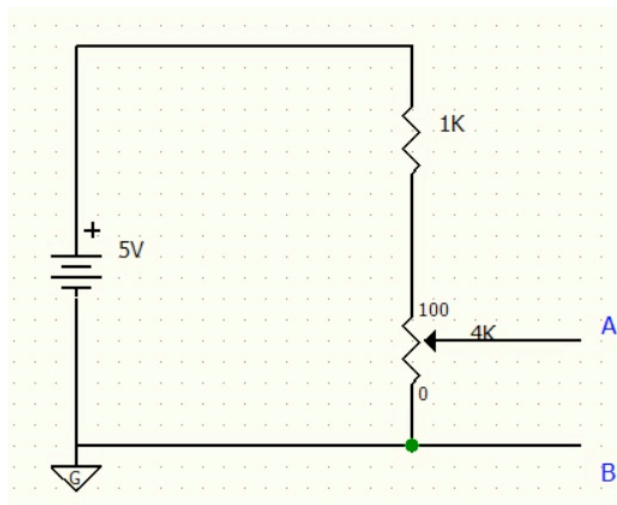
Calculate the voltage at points A, B, and C, if

- A is grounded
- B is grounded
- C is grounded



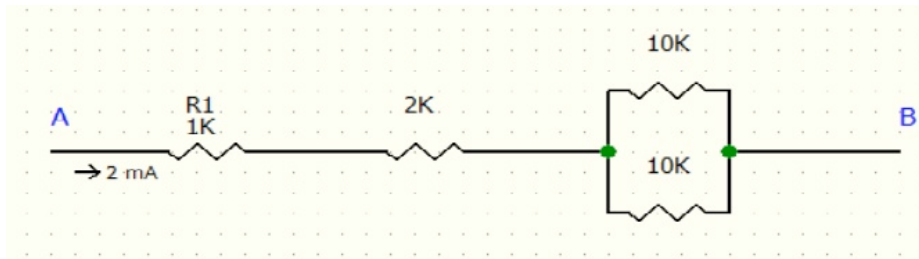
**3. Simpson Page 48 #14**

A fixed  $1.0\text{ k}\Omega$  resistor and a  $4.0\text{ k}\Omega$  potentiometer are connected in series across a 5 V battery of negligible internal resistance. Calculate the maximum and minimum values of  $V_{AB}$  as the potentiometer shaft is rotated.



**4. Simpson Page 49 #17**

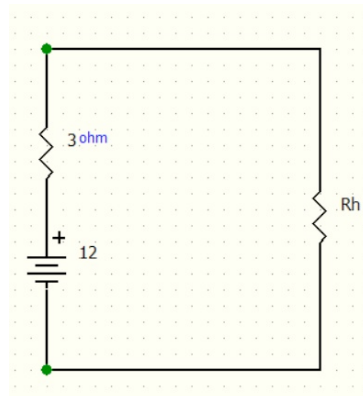
Calculate the voltage between A and B. What is the polarity of  $V_{AB}$ ?

**5. Simpson Page 50 #28**

An automobile battery has a terminal voltage of 12.8 V with no load. When the starter motor (which draws 90 A) is being turned over by the battery, the terminal voltage drops to 11 V. Calculate the internal resistance of the battery.

**6. Simpson Page 50 #30**

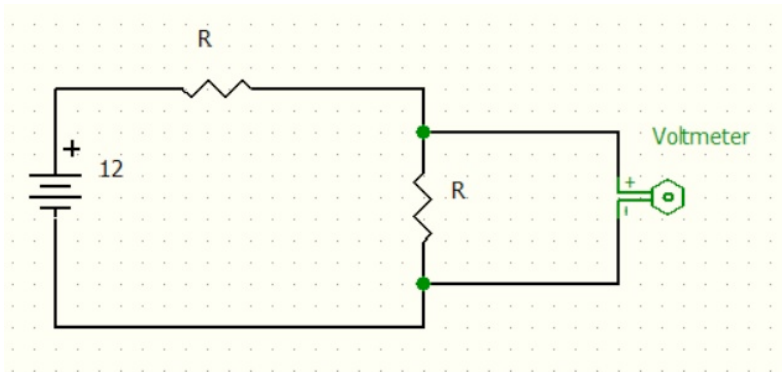
How large should the heater resistance  $R_h$  be to draw maximum power from a 12 V battery with an internal resistance of 3  $\Omega$ ? Calculate the power dissipated in the heater and in the battery under such conditions.

**7. Simpson Page 52 #42**

Calculate the voltmeter reading for

- a.  $R = 1 \text{ k}\Omega$
- b.  $R = 1 \text{ M}\Omega$

You may assume the voltmeter is an oscilloscope with a 1  $\text{M}\Omega$  input resistance. What's the largest value  $R$  can be if we want the voltmeter to always be within 10% of the correct voltage?



8. Find the current going through each resistor and the voltage drop across each resistor. The resistor values are in Ohms.

