

During this interactive you are going to explore how to analyze complex circuits.

1. Explain Kirchoff's loop rule.

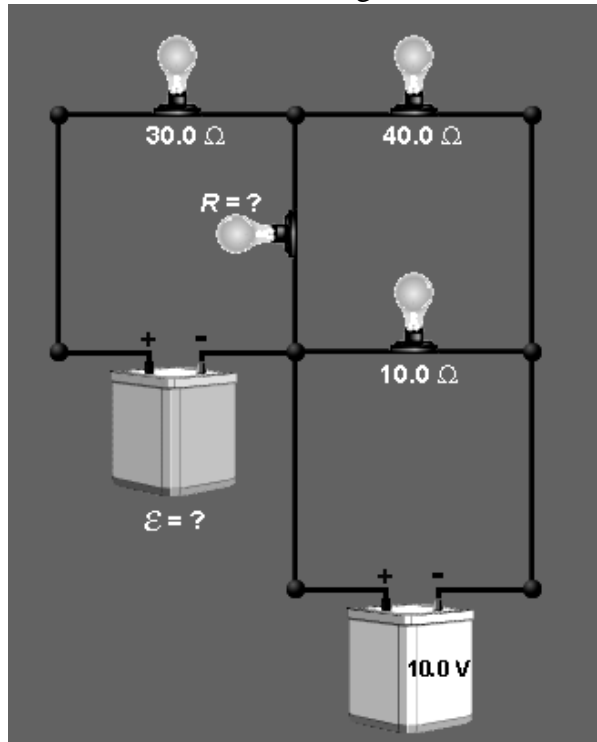
Analyze this circuit to determine the resistance of the middle light bulb and the emf of the battery on the left. The only tools you have to investigate this circuit are an ammeter and your understanding of the circuit.

Open the shortcut **IL Com Cir A** on one of the lab stations.

Open the simulation contained in this section. **Do Not follow the directions in the simulation follow the following instructions.**

2. Use the ammeter to find all the currents in the circuit. Label them in the diagram here.

3. Calculate the voltage across each bulb. **Show all work and equations including substitution with units.**



4. Using what you know now calculate the resistance of the unknown bulb and the emf of the unknown battery. **Show all work and equations including substitution with units.**

Try the values you calculated in question 4 in the simulation. Press CHECK to see if your answers are correct. You can try again by entering new values and pressing CHECK again. If your values work great! If they do not work recalculate them here. **Show all work and equations including substitution with units.**

5. What is the voltage across the unknown bulb? **Show all work and equations including substitution with units.**

6. Explain Kirchhoff's junction rule.

7. Explain why it is possible for two bulbs that have different resistances to dissipate the same amount of power.

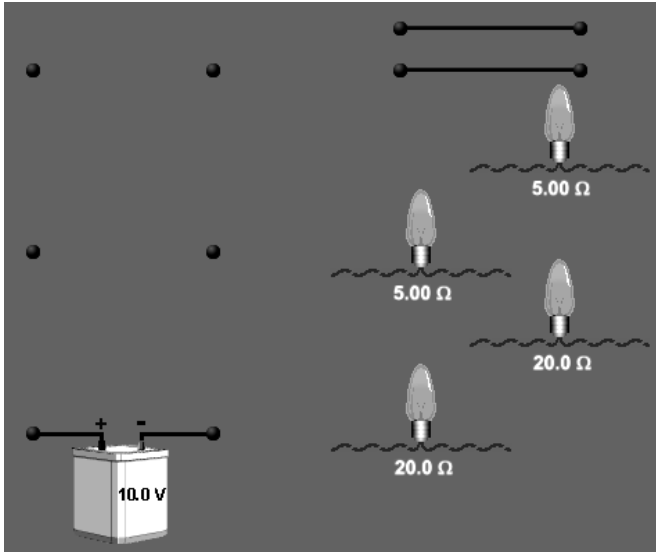
In this interactive, you have four bulbs for a strand of holiday lights. Two of the bulbs have a resistance of $20\ \Omega$, and two have a resistance of $5\ \Omega$. Put them in the circuit so they all glow equally brightly. Put another way, determine a way to wire the four bulbs together so that each is supplied with the same amount of power. The brightness of a light bulb is proportional to the power supplied to it.

You can build a circuit by dragging the wires and components into place on the grid on the screen. The simulation also comes with an ammeter and voltmeter. If the bulbs are not all the same brightness, you can use the ammeter and voltmeter to try to determine where you went wrong. If at any time you believe you have wired the bulbs correctly, press CHECK. A text message will say whether the bulbs are arranged correctly or not.

Open the shortcut **IL Com Cir B** on one of the lab stations.

Open the simulation contained in this section. **Do Not follow the directions in the simulation follow the following instructions.**

8. Try different arrangements until you find an arrangement that supplies the same power to all the bulbs. Draw your final arrangement on the picture here.



9. Prove that your arrangement works by finding the power dissipated by each bulb. Show the current through and the voltage across each of the bulbs. **Show all work and equations including substitution with units.**

10. If the battery has a rating of 5.5 amp-hours how long will the battery last running this circuit? **Show all work and equations including substitution with units.**