

Series and Parallel Simulations

Directions:

1. Log on to your computer
2. Go to the following website:
<http://phet.colorado.edu/en/simulation/circuit-construction-kit-dc-virtual-lab>
3. Click "Run now."

You now have the raw material to create a circuit. Take a moment to look over the site and find all the different materials. To build a circuit you will need several wires, a light bulb, a voltage source, a voltmeter, and a **non – contact ammeter**. Play with it to see how to grab and manipulate these materials.

Q1. What does the ammeter measure? _____

Q2 .Do the contact points on the light bulb make sense? Explain your logic.

Mission 1: Series Circuits

Build a simple series circuit that consists of wires, 1 light bulb, and 1 battery and 1 ammeter.

(In order to complete the circuit, the red circles at the end of each must overlap. Please note that the light bulb also has TWO circles. Your circuit is complete and working when the light comes on and the blue dots begin moving.)

Q3. Draw a picture of your circuit using appropriate symbols.

Exchange the ammeter for more wire in your drawing.

Q4. What is the reading on the ammeter? _____

Q5. What do you think that the moving blue dots represent? _____

Q6. Use the tools at the side to get a voltmeter. Put the red tab at one end of the battery and the black at the other. What is the voltage of this battery? _____

Note 1: Use the right button to play with the internal resistance and voltage of the battery. Make observations on how this changes the readings on the voltmeter and ammeter.

Q7 Click the advanced tab and alter the resistance of the wire. What happens to the flow of electrons as you increase the resistance of the wire.

Mission 2

Parallel Circuits Vs. Series

During this simulation you will be building series and parallel and comparing how changing the resistance affects the current of the circuit.

Lab Setup:

1. When you set up each circuit connect the ammeter to the **NEGATIVE** end of the battery (silver side). All circuits **MUST** run through the ammeter.

2. Keep the voltage at 30 volts for all simulations in Mission 2.

Part 1: Build a series circuit with an ammeter connected to the battery and determine the total resistance in the circuit.



Number of lights in series	Voltage (Volts)	Current (Amps) (from ammeter)	Total resistance (Ohms)
1	30		
2	30		
3	30		
4	30		

Q8. Based on your calculations, how much resistance does each light bulb add?

Part 2: Build a circuit with one light. Continue to add 1 light at a time in parallel.

Number of lights in parallel	Voltage (Volts)	Current (Amps) (from ammeter)	Total resistance (ohms)
1	30		
2	30		
3	30		
4	30		

Q9. How does increasing the number of lights affect the current in the parallel circuit?

Q10. What happens to the battery when you add the 4th light in the circuit? Why does this happen?

Mission 3: Switches

Reset or build a parallel circuit with wires, 5 lights, a 20volt battery, one switch , ammeter and voltmeter with the following conditions:

Q11.

Condition	Circuit diagram
place the switch so that only one bulb will turn off	
place the switch so that three bulbs will turn off	

Q12 Why do we use parallel circuit arrangement for home wiring?

Q13. What is the advantage of having switches in a parallel circuit? Think of what you learned at the end of the last exploration and explain the reasoning for having a circuit breaker in your home.