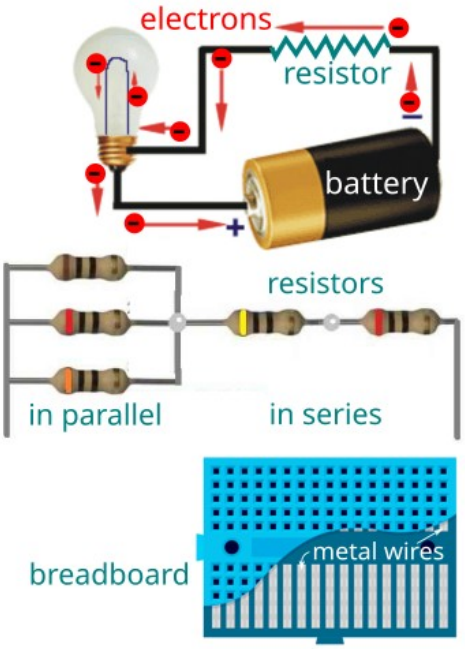
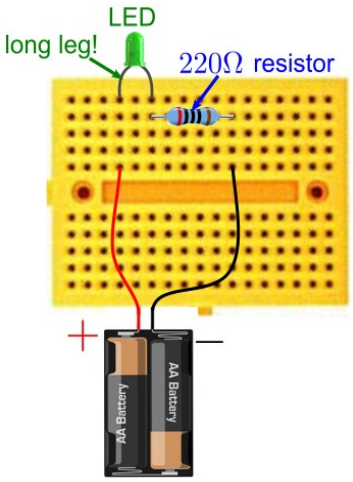
Combining Resistors in Electric Circuits

- An LED lights up when electric current flows through it in a complete **circuit**.
- A **resistor** in an electric circuit slows down (decreases) the current. Resistance is measured in Ohms (Ω) – more Ohms means more resistance and less current. The colored lines on the resistor are a code for the number of Ohms.
- Resistors can be combined **in series** or **in parallel** to control how much current flows through the circuit.
- A "breadboard" is a special device for building circuits: it has metal wires connecting each column. Components plugged into the same column are connected!



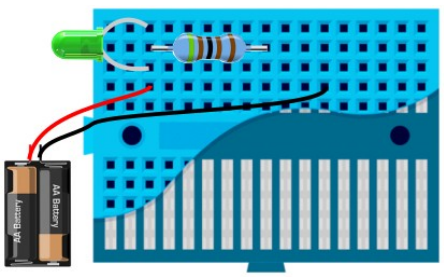
Part 1: Build a Basic Circuit



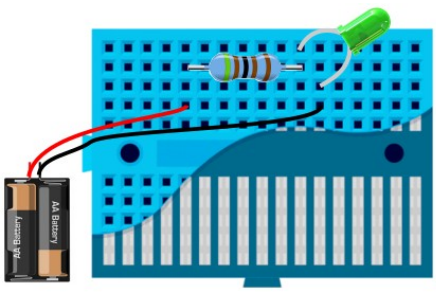
1. Snap two batteries into your battery holder.
2. Place the LED into your breadboard, as shown in the diagram. Make sure the long leg is to your left!
3. Place a 220-ohm resistor (red-red-black-black-brown) as shown in the diagram. Make sure one of its legs is in the same column as the short LED leg.
4. Place the battery holder wires in the breadboard holes as shown. Make sure the red wire goes on the left! Check to make sure the wires are lined up in the columns of the breadboard.

Can you make your LED light up? _____

5. Try some circuit puzzles! For each, make a prediction, then test it (if you have time)!



Will it light up? Yes / No



Will it light up? Yes / No

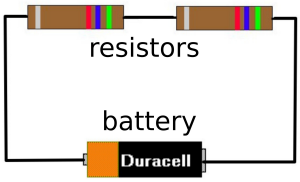
5. What will happen if you replace the 220-ohm resistor (red-red-black-black-brown) with a 5100-ohm resistor (green-brown-black-brown-brown)?

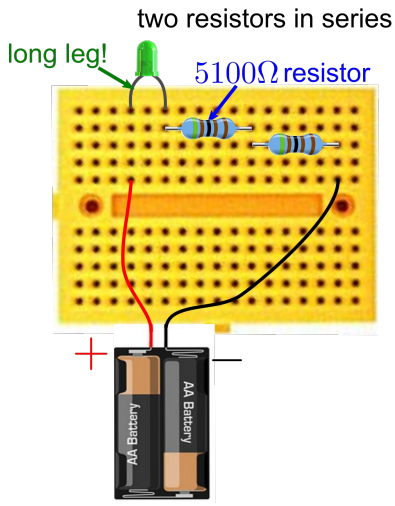
Make a prediction. The LED will glow: brighter / less bright

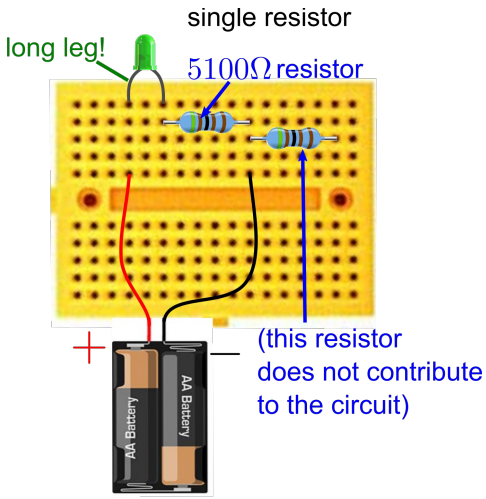
Try it and see. The LED glowed: brighter / less bright

Part 2: Combining Resistors in Series

When two resistors are connected **in series**, electrons flow through one then the other. We will compare a circuit with two resistors connected in series to a circuit with only one resistor.







1. Make a prediction: The LED will grow brighter in the circuit with … (circle one)

two resistors in series single 5100-ohm resistor

2. Build the circuit as shown. You can quickly switch between the two circuits by moving where the negative (black) wire of the battery is connected.

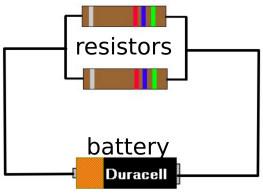
Was your prediction correct? _____

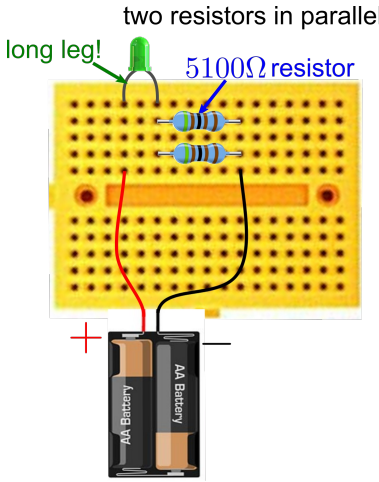
Does adding a resistor in series make more or less current flow through the circuit?

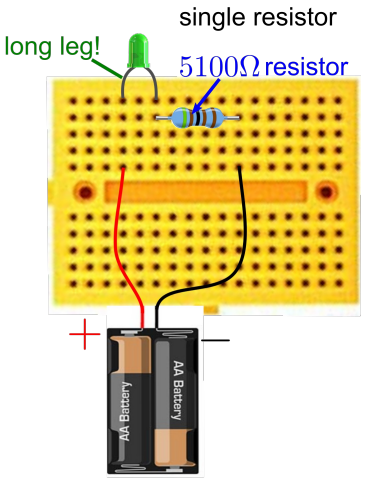
_____

Part 3: Combining Resistors in Parallel

When two resistors are connected **in parallel**, electrons can choose to flow through one or the other.







1. Make a prediction: The LED will grow brighter in the circuit with … (circle one)

single 5100-ohm resistor two resistors in parallel

2. Build the circuit as shown. You can quickly switch between the two circuits by removing the extra resistor and plugging it back in.

Was your prediction correct? _____

Does adding a resistor in parallel make more or less current flow through the circuit?

_____