

Goals

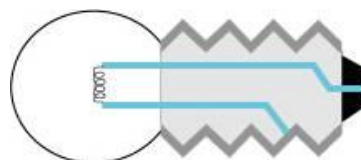
1. To understand the basics of electricity.
2. To experiment with electric circuits.
3. To practice calculations.

Equipment:

Notebook (draw diagrams directly inside), batteries, wires, light bulbs (round and long), sockets

Setting up a circuit

- Grab a battery, a round bulb (no socket), and some connecting wires.
- Using only these items, make the bulb light up.
- In your lab notebook:
 - draw this circuit
 - Copy this cutaway sketch of the bulb and label the important parts and connections, indicating which parts you think are metal conductors and which are insulators
- Recreate the circuit with two batteries and the bulb in the socket.
- What happens if you flip the direction of the connection to the bulb?



Different bulbs

- Closely examine the long bulb and the round bulb. The tungsten filaments in both are about the same length, but perhaps you can see even with the naked eye that the filament in the long bulb is extremely thin – thinner than the filament in the round bulb. Through which bulb would you guess it would be easier to push electric current, through a thin filament or a thick filament? Why?
- Connect two batteries in series (using the holders) and connect a round bulb in a socket. Remove one battery (but complete the circuit), what happens to the brightness of the bulb?
- Using both batteries, compare the brightness of the round bulb to the long bulb. Why is one brighter? Be specific.

Multiple bulbs

- Connect the two bulbs in series. Remove one bulb from the socket. What happens? Why?
- Connect the two bulbs in parallel. Remove one bulb from the socket. What happens? Why?

Power, resistance, and energy

Resistance is measured in ohms (Ω), voltage in volts (V), and current in amps (A). Ohm's law ($V=IR$) tells us the relationship between these quantities. The power dissipated in a resistor is given by $P=I^2R$, and power is the energy used per unit time.

- Using algebra, find a formula for the voltage in terms of the power and resistance.
- The movie states that spectromagic uses 10 W bulbs. A common 10 W bulb has a resistance of 14.4 ohms. How much voltage must be supplied to the circuit by the battery?

- From your memory of the movie, estimate how many lights are on a single float.
- Assuming one kilowatt-hour of electrical energy costs very roughly \$0.10 (a typical price for commercial use in Florida) and that the parade lasts 30 minutes, how much does it cost to power the electricity on a single float? What about for the entire parade?
- If the parade runs every day during the summer and only on weekends the rest of the year, how much electricity is used and how much does it cost?

Rides

- Small world, Finding Nemo