

20-5 What is a series circuit?

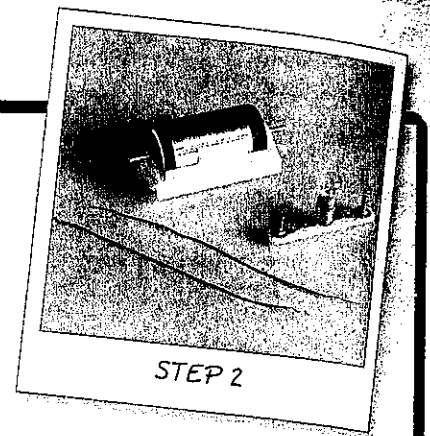
INVESTIGATE



Making an Electric Circuit HANDS-ON ACTIVITY

1. Obtain a dry-cell (size D) battery, two insulated wires, and one light bulb in a holder from your teacher.
2. Connect the light bulb holder to the battery by using the wires. You will know if you have connected everything properly when the light bulb lights up.

THINK ABOUT IT: What purpose do the wires serve? What are the three main parts to this setup?



Objectives

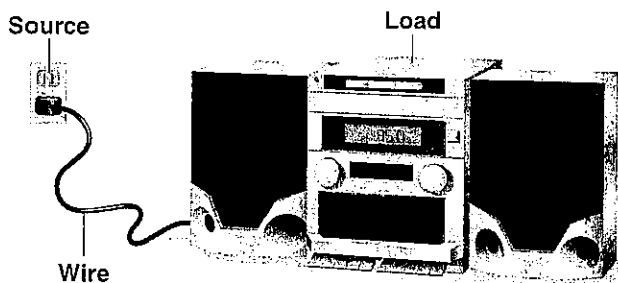
Explain how electricity flows through a closed circuit. Describe a series circuit.

Key Terms

electric circuit: path that an electric current follows

series circuit: circuit in which electric current follows only one path

Circuits An electric circuit is the path that an electric current follows. All electric circuits have three parts: a source of electric energy, a load or device that uses the electric energy, and wires. The source of the electric energy can be a battery or a wall outlet. The load can be a light bulb, an appliance, or some other electric device. Wires connect the source to the load.

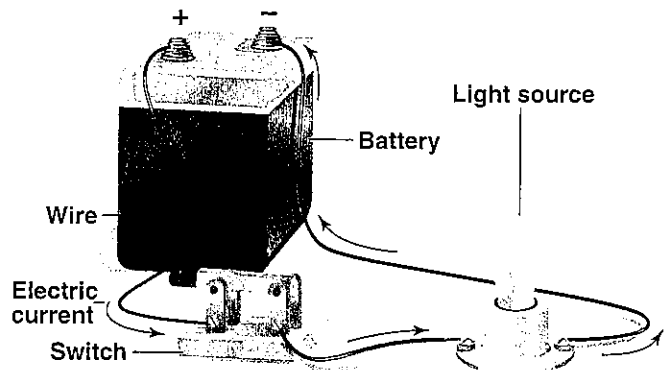


▲ **Figure 20-14** An electric circuit has three parts: a source, wires, and a load.

1 **DEFINE:** What is an electric circuit?

Open and Closed Circuits What would happen if the only bridge over a river was closed for repair? Vehicles using that bridge would not be able to cross the river. The path that connects both sides of the river would no longer be complete. The same situation occurs in an electric circuit. If the electric circuit is not complete, then the electric charges cannot flow. An electric circuit that is incomplete or has a break in the pathway is called an open circuit. Electric charges cannot flow through an open circuit. Electric charges can flow only through a complete or closed circuit. In a closed circuit, there are no breaks in the path.

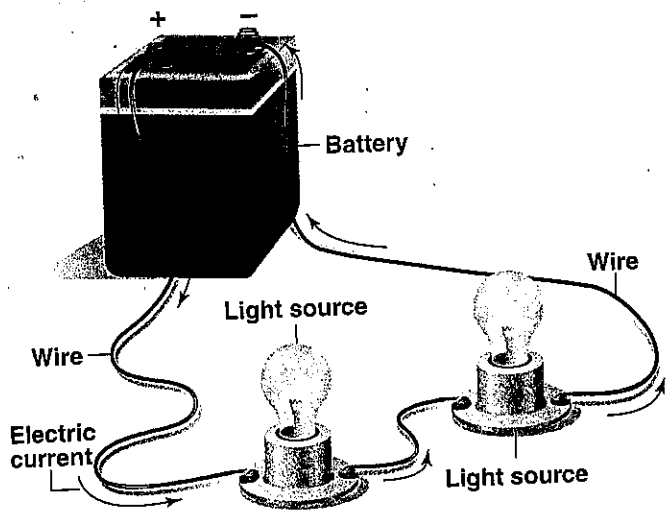
A switch is used to control (open and close) an electric circuit. When a switch is in the "off" position, the circuit is open. Electric charges will not flow when a switch is in the off position. When the switch is in the "on" position, the circuit is closed. Electric charges will flow when the switch is in the on position.



▲ **Figure 20-15** Electric charges flow when a switch is in the closed, or on, position.

2 **EXPLAIN:** Why is a switch used in an electric circuit?

Series Circuit The simplest type of electric circuit is called a **series circuit**. In a series circuit, the electric charges follow only one path through all elements of the circuit. Figure 20-16 shows a series circuit. In this circuit, a battery is connected to two light sources. The current goes through the first light, then through the second light, and then back to the battery.



▲ Figure 20-16 In a series circuit, electric current follows one path.

3 **DEFINE:** What is a series circuit?

✓ CHECKING CONCEPTS

1. What is the path that an electric current follows called?
2. What are the three parts of an electric circuit?
3. In what kind of electric circuit does electric current follow only one path?
4. In which position will a switch allow electric charges to flow?

💡 THINKING CRITICALLY

5. **HYPOTHESIZE:** In a series circuit with two lamps, what do you think would happen if one of the lamps was not working? Explain your answer.

INTERPRETING VISUALS

Use Figure 20-15 to answer the following questions.

6. **IDENTIFY:** Which object is the load?
7. **HYPOTHESIZE:** What would happen if the switch was in the off position? Explain your answer.



Science and Technology

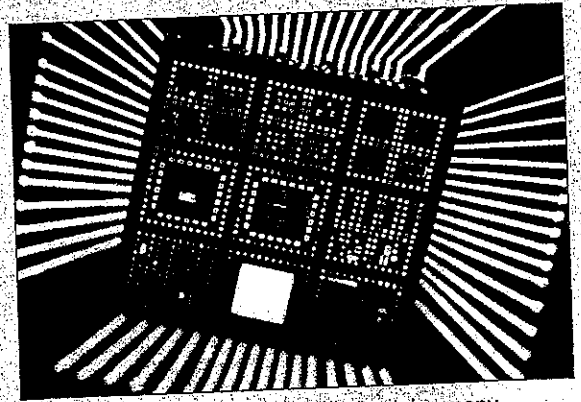
COMPUTER CHIPS – INTEGRATED CIRCUITS

Computers are all around us. Some computers are used on a desktop, and others are used to operate microwave ovens. The main functions of a computer are to store, process, and retrieve information.

Computers process information using computer chips. Computer chips are very small pieces of a semiconductor that contain many integrated circuits. They are like miniature electric mazes with many pathways. They can perform millions of different functions. A computer's central processing unit, or CPU, may have 10 million electronic parts all packed into a 3-cm² wafer. Electronic signals flow through integrated circuits on a computer chip at very high speeds.

Computer chips are extremely useful, inexpensive, and small. You can find powerful chips in computers and simpler ones in everything from key chains and electronic greeting cards to cars and stereos.

Thinking Critically Why do you think computer chips are used in so many different kinds of devices?



▲ Figure 20-17 A computer chip contains many integrated circuits.