CONDUCTIVITY TEST KIT

Purpose of the Activity:
To identify the components of a simple electrical circuit and their functions, to design a product that operates with an electrical circuit, and to test conductive and non-conductive materials using the constructed circuit.

Unit / Theme:
Simple Electrical Circuits

CURIOUS BOX

CONDUCTIVITY TEST KIT

Let's Arouse Curiosity

Before the activity, students are asked the following questions:

- We need a plug to operate a television. How do you think the electricity that powers the TV reaches the outlet?
- When sliding down at the playground, we see our hair move. What do you think causes this?

Then it is explained:

"Electricity is a fundamental energy source that illuminates and powers many aspects of our lives. Today, thanks to electrical circuits, we can operate many technological devices. But how do electrical circuits work, and what components do they consist of? We are setting out to answer these questions by creating a simple electrical circuit and designing a device that works with electricity. Let's see what we will do in today's activity!"

Students are then asked to take out and examine the activity materials.

Let's Start Discovering!

The activity video is watched by pausing at certain points. Before starting the activity, the kit contents are checked. All lid-opening and package-opening steps are carried out simultaneously with the students.

Content Of The Set

- [ ] Conductivity Test Kit Card
- [ ] Plastic Rod
- [ ] Paper Clip
- [ ] Aluminum
- [ ] Toothpick
- [ ] 5 Conductive Fabric Tapes
- [ ] LED Bulb
- [ ] Flat Battery
- [ ] Scissors (not included in the kit)
- [ ] "Get to Know the Circuit Components!" activity sheet

CURIOUS BOX

How Do We Do It?

1. Write your name on the Conductivity Test Kit Card.
2. Place the plastic rod, paper clip, aluminum, and toothpick into the appropriate compartments in the pocket on the left side.
3. Examine the long and short legs of the LED bulb.
4. To check if the LED works, place the long leg of the LED on the (+) side of the flat battery and the short leg on the (-) side.
5. Place the LED in the designated spot on the card so that the long leg is on the left and the short leg is on the right. (If the legs are not oriented correctly, the circuit will not complete.)
6. Attach the long fabric tape to the long leg of the LED on the left side, making sure it does not cover the LED itself.
7. Place the second long fabric tape directly over the first tape, folding it toward the battery section as if making double-sided tape.
8. Attach the flat battery on top so that the (+) terminal faces downward. (If the + terminal is not facing down, the circuit will not complete.)
9. Attach the remaining three short fabric tapes to the remaining gray areas on the card.
10. Cut the tabs in the section labeled "Switch."
11. Close the switch over the flat battery.
12. Test the conductivity of the items in the left pocket (plastic rod, paper clip, aluminum, and toothpick) by placing them one at a time in the "Test Conductivity" section to see if the LED lights up. (Make sure the switch is closed while testing.)

What Should Future Science People Discover?

Students are asked the following questions:

- Do aluminum and plastic conduct electricity?
- Why are electrical wires covered with plastic insulation?

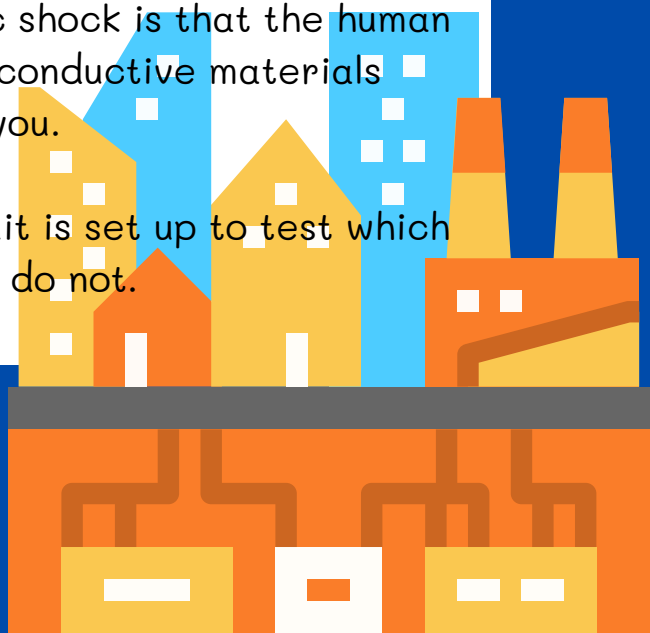
Most technological devices operate using electrical energy and require a strong supply of it. In today's world, electricity has become an indispensable part of our lives. But have you ever thought about how the electricity needed to run these devices reaches our rooms?

For example, many devices such as light bulbs, televisions, and ovens require electrical energy. This energy is transmitted by taking advantage of the ability of certain materials to conduct electricity.

Places where electrical energy is generated are called power plants. The electricity produced in power plants is carried to our homes through cables. The main cable distributes electricity to rooms via thinner wires, which are connected through walls to outlets and switches. This is how electricity reaches our homes.

Some materials conduct electricity while others block it. For example, iron, aluminum, and copper conduct electricity, while wood, plastic, and paper do not. The reason people are told to touch wood or plastic during an electric shock is that the human body conducts electricity, so using non-conductive materials prevents the electricity from reaching you.

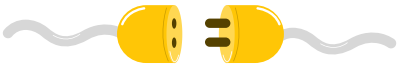
In this activity, a simple electrical circuit is set up to test which materials conduct electricity and which do not.



CURIOUS BOX

Bulb (Lamp):
A bulb is a circuit component that converts the energy it receives from batteries into light and heat energy. Bulbs can come in different sizes and types, such as fluorescent lamps and LED lamps.

Connecting Wire:
A wire allows electrical energy to flow to the components in a circuit. Wires are made of conductive metals that can carry electricity.



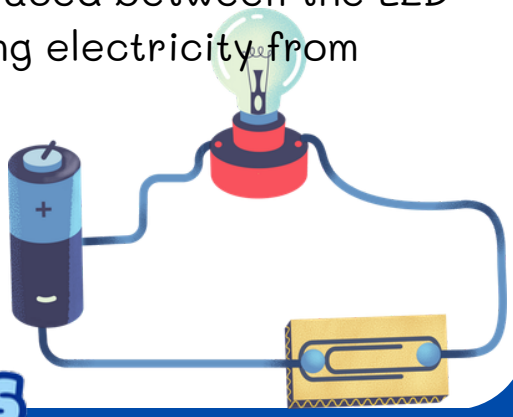
Switch:
A switch is a circuit component that allows us to control the flow of electricity in a circuit. When the switch is open, electricity does not flow, and the bulb does not light up. When the switch is closed, electricity flows through the circuit, and the bulb lights up.

In the activity, we use an LED bulb for the lamp, a flat battery for the battery, fabric tape for the connecting wires, and the uncut piece of fabric tape as the switch.
The long leg of the LED represents the (+) terminal, and the short leg represents the (-) terminal. When the LED's long leg is connected to the battery's (+) terminal and the short leg to the (-) terminal, the circuit is complete, and the LED lights up.
To test conductivity, we place the materials we want to investigate in the "Test Area" and close the switch. If the LED lights up, electricity flows through the material, which means the material is conductive.

When Does the Bulb Not Light Up?

The LED bulb will not light up in the following situations:

- The legs of the LED are not in full contact with the battery.
- The battery has run out of energy.
- The bulb is broken.
- A non-conductive material is placed between the LED legs and the battery, preventing electricity from flowing.



CURIOUS BOX

Scientific Explanation For The Curious

Students are asked the following questions:

- What are the properties of materials that conduct electricity?
- Although gold and silver are good conductors, copper and aluminum are used in electrical cables. Why do you think that is?

Electrical energy is transmitted by taking advantage of the ability of materials to conduct electricity. Materials that allow electricity to pass through them are called conductors. Examples include a metal spoon, an iron screw, a gold bracelet, and a copper wire.

The wires that bring electricity to our homes can carry electricity to our rooms because they are made of conductive materials. But if cables conduct electricity, why don't we feel electricity when we touch the plastic coating around them?

This is because non-conductive materials are used alongside conductive ones while electricity is transmitted to our homes and workplaces. For example, the copper wire inside a television cable conducts electricity, while the plastic outer coating does not.

Why is this necessary? Because the human body also conducts electricity. If we touched the copper wire directly, electricity could flow into our body and cause an electric shock. Non-conductive plastic coatings are used to eliminate this danger.

Conductive Materials

Insulating Materials

Ways to Protect Against Electric Shock

Many electronic devices we use in daily life contain both conductive and non-conductive materials. This ensures that while electricity is conducted, it does not harm living beings. In this way, precautions are taken against electric shocks.

To protect ourselves from electric shocks:

- Do not insert conductive materials such as metal spoons, knives, or forks into outlets or electronic devices.
- Keep electrical cables away from water and fire.
- Do not use damaged electronic devices without having them repaired.
- Do not use devices with exposed wires or visible conductive wires.
- Do not perform experiments with electricity at home on your own.

We use electrical energy not only to operate devices such as phones, televisions, and refrigerators but also to produce heat and light. All of these devices contain electrical circuits. In a simple electrical circuit, there is a battery, wire, and bulb. Some simple circuits may also include a switch.

What Else Can We Do?

Students are asked:
"Today, we explored the conductive and insulating properties of materials. We built a simple electrical circuit and discussed how electricity reaches our homes. You can also test the conductivity of materials you are curious about using your Conductivity Test Kit. How did doing this activity make you feel?"
Then, students complete the "Get to Know the Circuit Components!" activity sheet.

Warm Up Before The Activity

Dear Teacher,
You tested conductive and non-conductive materials by building an electrical circuit with the scientists of the future. You can encourage them to test objects around them whose conductivity they are curious about. Additionally, you can create an Olympic Torch in which an electrical circuit can be built.

Olympic Torch

Materials:

- Aluminum foil
- Battery
- Battery holder
- LED bulb
- Black cardboard
- Colored electrical tapes
- Colored craft papers

Instructions:

1. Insert the batteries into the battery holder.
2. Connect the battery holder to the LED bulb and check if it works.
3. Wrap the LED and wires with electrical tape, paying attention to the (—) and (+) terminals.
4. To prepare the torch, cut black cardboard into a 36x36 cm square.
5. Cover 1/3 of the square with aluminum foil and secure it with electrical tape.
6. Place the prepared electrical circuit on this foil-covered area.
7. Fix the battery at the bottom using electrical tape.
8. Roll the cardboard into a tube and secure it with black electrical tape.
9. Decorate the roll with electrical tape of the desired colors.
10. Finally, use craft papers to give the Olympic Torch its final shape.

Note: It will glow more beautifully in a dark room.

Olympic Torch

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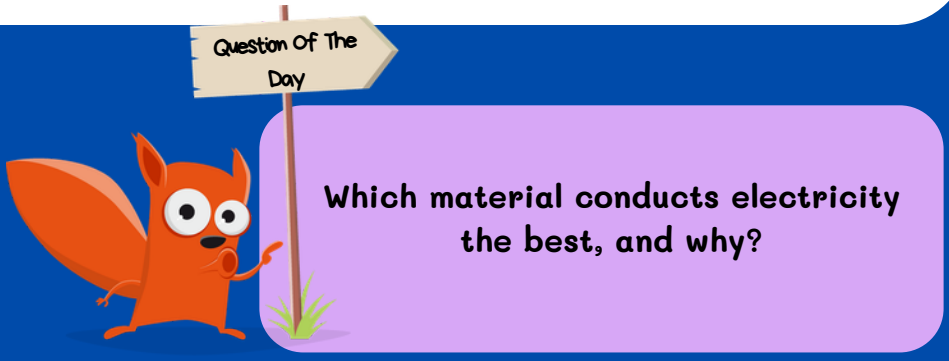

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