簡易英語科技叢書

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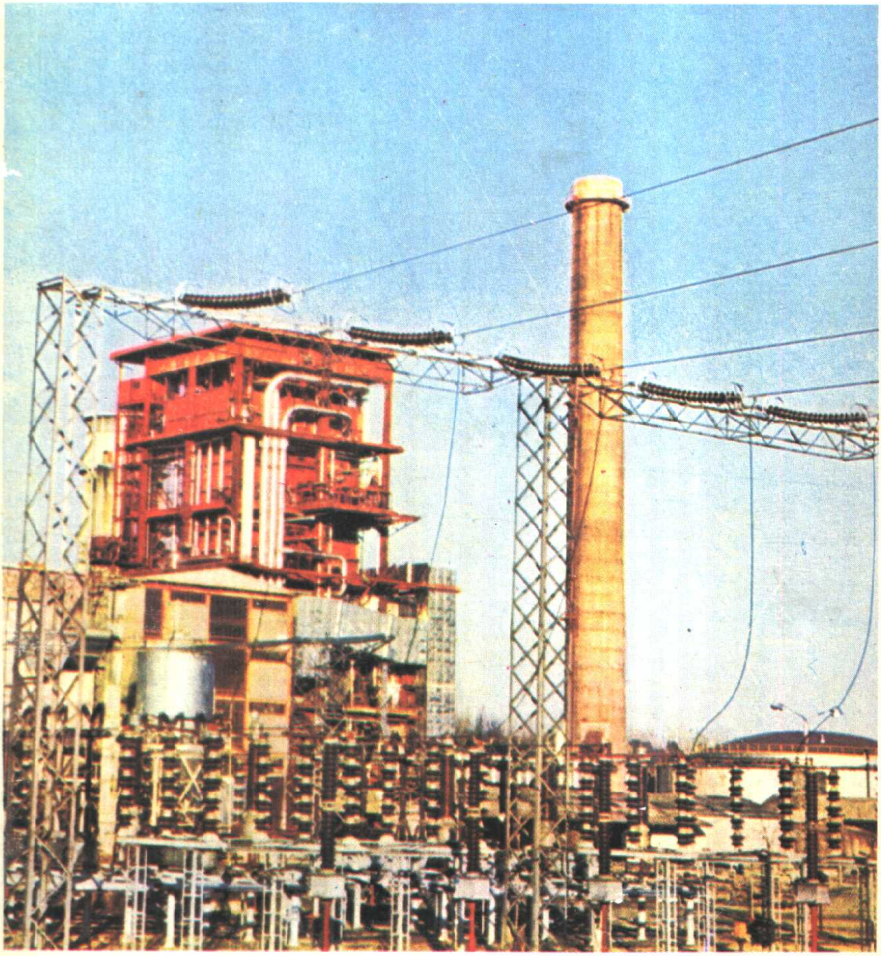

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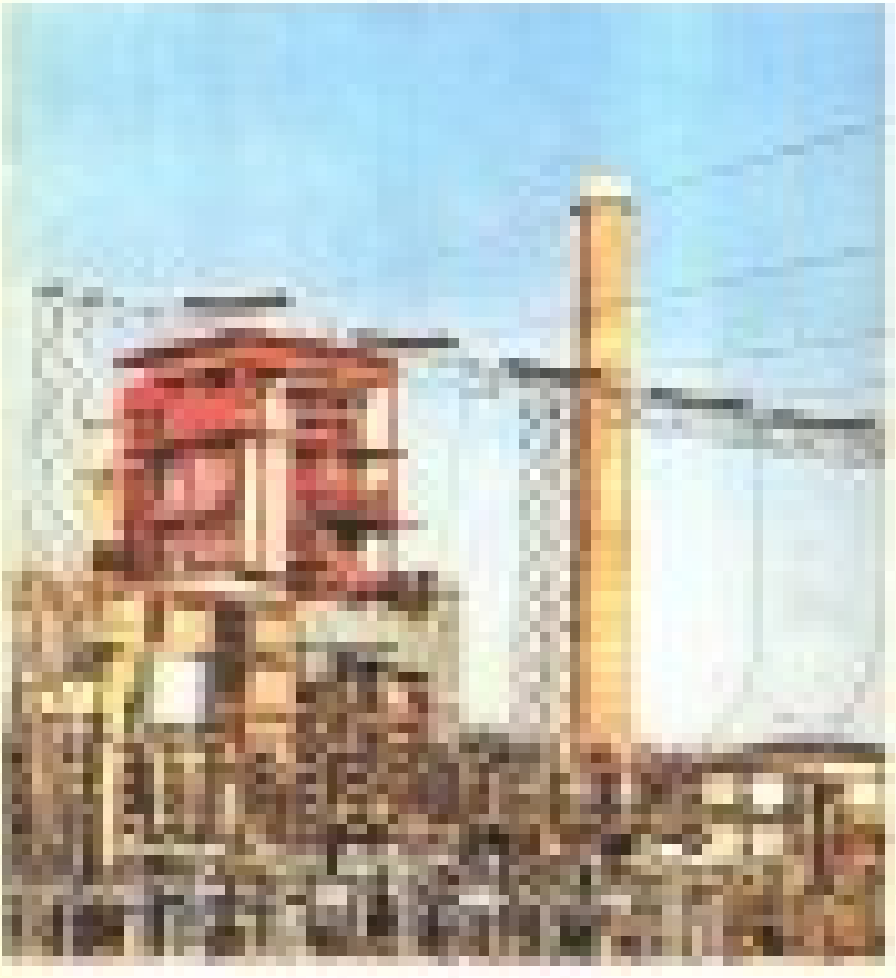

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出版說明

《簡易英語科技叢書》是爲初學英語的中國青年學生提供一套閱讀英語科技書藉資料的參考讀物。

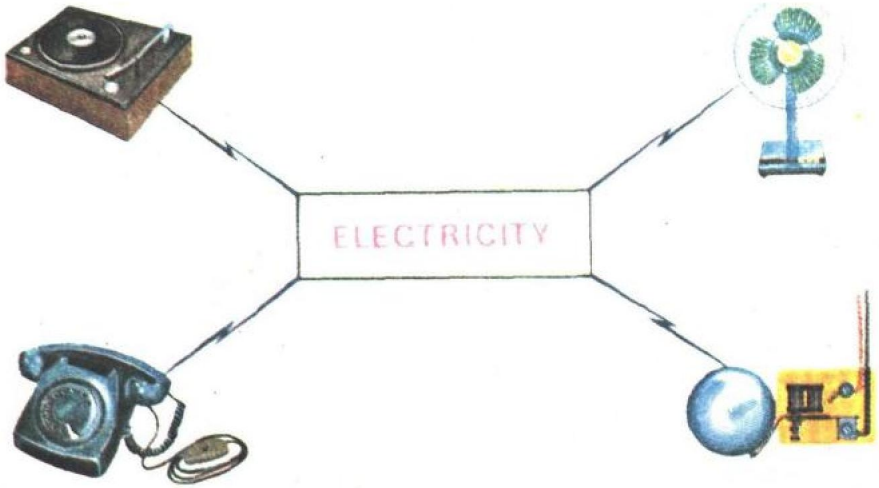
本叢書包括十六個科學課題，分爲十六册出版。每一課題構成一個完整的知識讀物。這十六個課題把目前國外學校教學中的基礎科學內容都包括進去了。

爲提高讀者科學知識和閱讀興趣，每一分册均附有生動的彩色插圖，英語文字力求淺顯，使一般初學英語的中國青年學生都能接受。

CONTENTS

INTRODUCTION

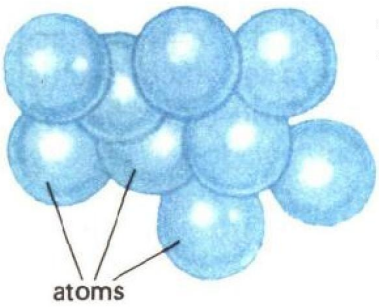
If you look up at the ceiling in your house or classroom, you will find bulbs in a lamp shade or fluorescent tubes. What are they used for? They are used to light up the room. Whenever the classroom is dark, your teacher switches on the light and the room is bright again. Have you ever wondered what causes the bulb or the tube to light up? They need electricity to light up. Electricity passes through the wires that are attached to them and this makes the bulbs and tubes glow. When they glow, they give off light. That is how we get light from electricity. Can you think of other ways in which electricity is used in your classroom, in your home or elsewhere?



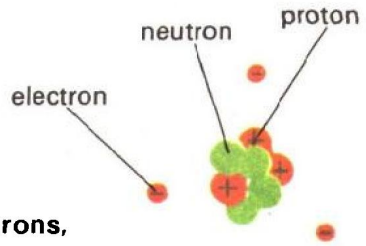
WHAT IS ELECTRICITY?

All things are made up of very tiny particles called **atoms**. Metals, wood, glass, water and gases are made of atoms.

We cannot see atoms because they are very, very small. However, scientists have found out that even atoms are made up of smaller particles. One type of particle is known as the **electron**. Another type of particle is known as the **proton**. Yet another type is known as the **neutron**.

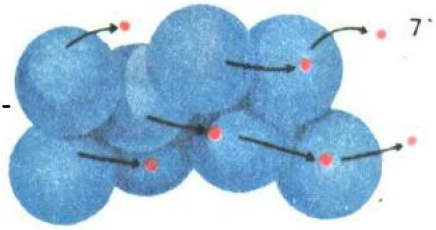


All things are made of atoms.



An atom has electrons, protons and neutrons.

Electrons have **negative charges**. Protons have **positive charges**. Neutrons have no charges.



Electricity is the flowing of electrons.

When charges move, we get an **electric current.** An electric current consists of a movement of negative charges.

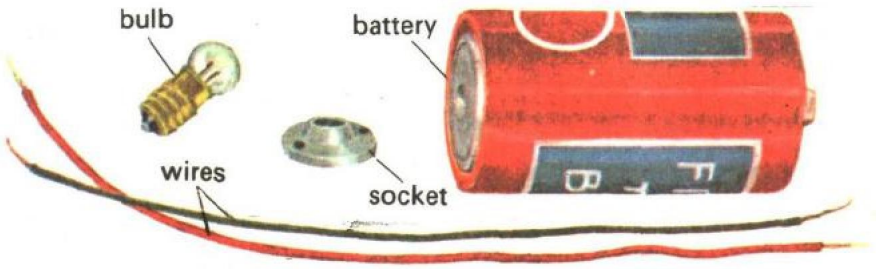
The charges that flow through the electric wire are electrons. The flow of electrons gives us electricity.

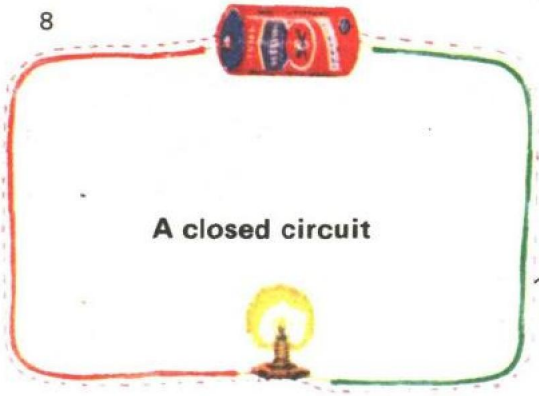
HOW ELECTRICITY TRAVELS

Electricity travels along a path. If the path is blocked, then electricity cannot keep flowing. The whole path along which electricity travels is known as a **circuit.** Let us see how electricity travels.

Things to Do

You will need the materials shown below. We are going to light the bulb. Connect your materials as shown in the picture on the next page. Use adhesive tape to stick the free end of each wire to the battery.

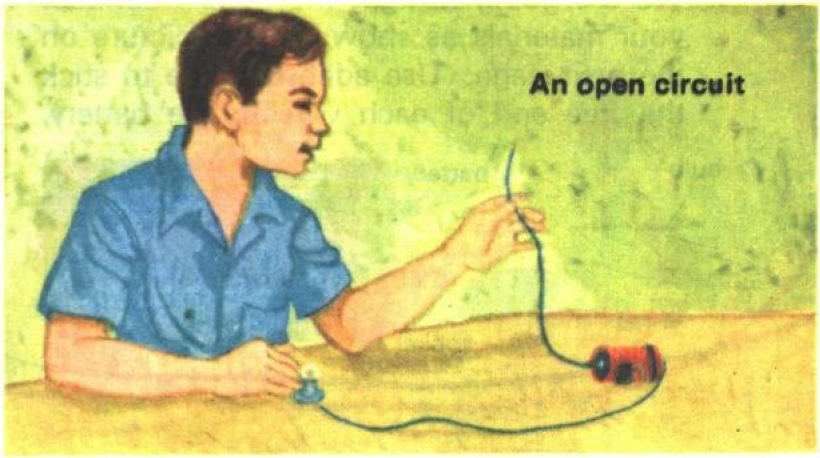




What happens when you have finished your connections? Does the bulb light up?

With your finger trace the path of the electricity from one end of the battery to the other. Where does the path end? Is the path broken? An unbroken path travelled by electricity is known as a **closed circuit**.

Disconnect one of the wires. Again trace the path of the electricity.



Is the path of electricity broken? Does the bulb light up? Is there electricity in the circuit?

A broken path is known as an **open circuit**. Electricity will not flow in an open circuit.

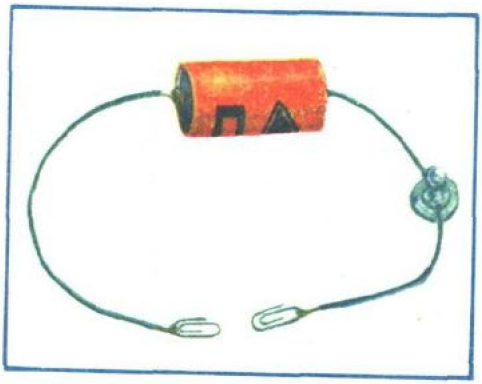
CONDUCTORS AND INSULATORS

Some materials allow electricity to flow through them easily. Some materials do not. The materials that allow electricity to flow through them easily are known as **conductors**. The materials through which it is difficult for electricity to flow are known as **insulators** or **non-conductors**.

Let us test and see which are the materials that are conductors and which are the materials that are insulators.

Things to Do

Set up the circuit as shown in the picture.



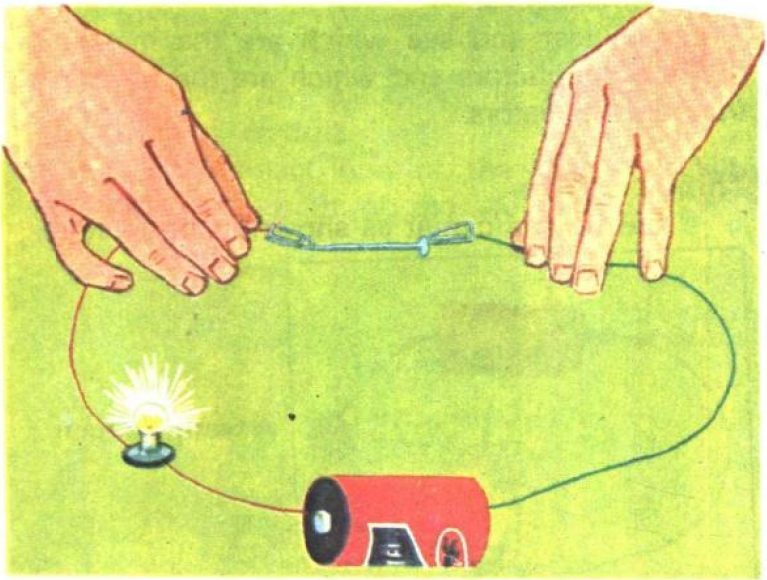
A testing circuit

Connect a paper clip to each of the free ends of the wire. Touch the two paper clips together. The bulb lights up. This shows that electricity is flowing through the circuit.

Separate the two clips. The light goes off. This means that the circuit is broken.

This kind of circuit which is used to find out whether or not electricity passes through a substance, is called a **testing circuit**.

Place a nail between the clips. Make the clips touch the nail. Does the bulb light up?



Passing electricity through a nail

If it does you know that it is a closed circuit. This means that electricity is flowing through the nail. Hence the nail is a conductor. It conducts electricity.

Place a piece of chalk between the clips. Make the clips touch the chalk. Does the bulb light up?

If it does not, you know that electricity cannot flow through the chalk. Then the chalk is an insulator. It does not conduct electricity.

Repeat the experiment using a wooden ruler, a piece of glass, a metal spoon, a coin, a piece of paper, a pin, a plastic comb, a key, a pencil, a tin lid and a rubber eraser.

Separate them into conductors and insulators. What do you notice about the conductors? Are they all metals? Are all the non-metals insulators?

Conductors are useful to us. They allow electricity to flow through them. They can form a closed circuit.

Sometimes we do not want electricity to flow into certain things. We use insulators to prevent electricity from flowing to these things. We use rubber or plastic insulators to cover electric wires in order to prevent electricity from flowing into our body. Otherwise we will get an electric shock. So we can say that insulators are also very useful to us.

HOW TO TEST FOR HIDDEN CIRCUITS

We can use the testing circuit we made earlier to find out about some other circuits which we cannot see. It is fun to find out what the results will be.

Things to Do

First of all we have to make an **octopus box**. An octopus box is one which contains a circuit inside.

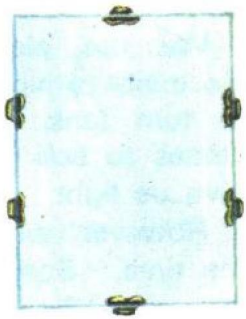
Take an open chalk box. Now use a paper binder and pierce it through the wall of the box. Let the paper binder stay firmly to the wall by twisting the

How to make an octopus box

Connections made inside the octopus box

metallic strips as shown. Repeat the same procedure using a few more paper binders on different sides of the box. Connect a few pairs of the binders by wire. Close the box with a lid. What you can see now is a closed box with the heads of the paper binders stuck to the walls outside. The heads of the paper binders are called terminals.

Turn your box round another way. Draw a diagram showing the positions of the terminals. Use your testing circuit. See



Before testing your circuit, draw a diagram of this kind.

whether it is working by touching the clips together. The next step is to let the clips touch any pair of terminals. Is there an electric current passing through the two terminals? If there is, draw a line joining the two terminals in your diagram. Repeat this procedure until you have finished testing all the pairs. What does your final diagram look like?

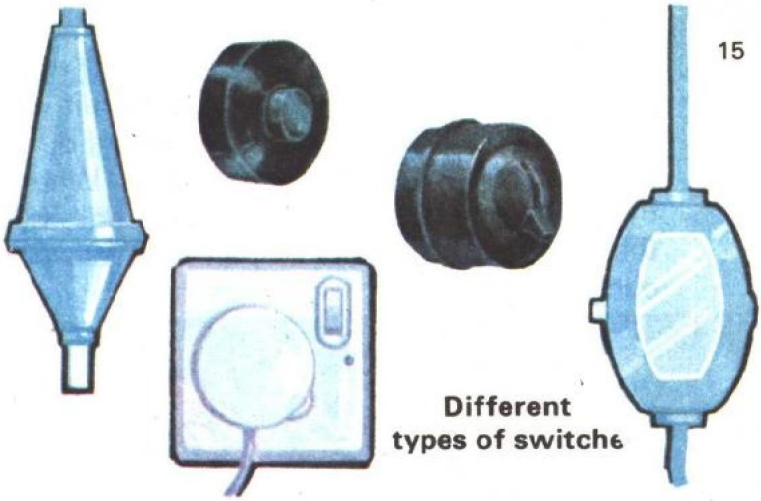
Open up the lid and see whether the circuit you have drawn is like the actual circuit in the box.

Ask your friend to make another octopus box using a different number of paper binders and a different set of connections. Exchange your box with his. Test the hidden circuit the same way as you have tested the first. Draw the circuit diagram. Check and see whether you are correct by opening up the box.

HOW TO TURN ELECTRICITY ON AND OFF

We use electricity very often. We use electricity to work our radios. We use electricity to turn fans. We use electricity in electric kettles to boil water and we use electricity to give us light.

However, we do not keep our radio on all the time. Sometimes when it is cold, we do not want the fan to keep on turning. After



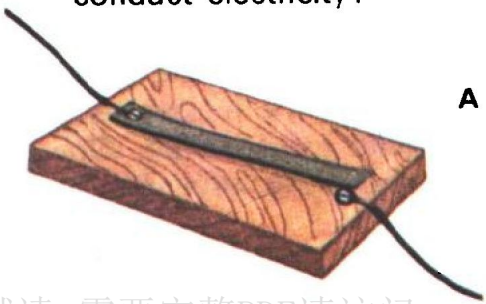
Different types of switche

the water has boiled, we do not need any more electricity. We definitely do not need to have the light on when it is very bright. Therefore we must have something to turn electricity on and off whenever we need to.

We use a **switch** to turn electricity on and off. Ask your teacher to point out the switches in your classroom. Ask your teacher to turn the switches on and off. What do you see?

Things to Do

(i) Take a metal strip and a piece of wood. Make a simple switch as shown in the picture. Which parts of the switch can conduct electricity?



A simple switch