



## Conductors and insulators

### SEQUENCE 1

Age group	6-9 y.o
Prior knowledge	None
Material needed	The Conductors and insulators box
Subjects	Conductivity
Skills involved	Learning to learn
Time to carry out the sequence	1h

#### Step 1: Test with the box

With the help of the teacher, pupils may assemble the electric circuit to light up the bulb. Once the circuit is working, pupils can start adding the other materials into the circuit to see if it keeps working. Remind your pupils of the safety measures before interacting with an electric circuit and that they should not attempt to experiment with electricity at home: sockets can be dangerous.

Ask your pupils to write down their hypotheses: which items will allow the lamp to work, and which items won't? Then, ask them to write their observations: this way, you will also check that they did the experiments correctly if the light bulb did not light up when it should have.



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## Step 2: What is a conductor, what is an insulator?

After the tests, your pupils may have noticed all materials did not react in the same fashion: when some were included, the light bulb kept working. When the others were put in the circuit, the light bulb stopped working.

A conductor is a material that transmits electricity. An insulator stops it. This is why the crocodile clips are coated in plastic: since plastic is an insulator, there is no risk for the user to get electrocuted!

Ask your pupils to give examples of conductors and insulators.

- Conductors: metals (such as iron, gold, copper, etc.), tap water
- Insulators: glass, plastic

What happens when you put electricity through an insulator? Nothing happens; the light bulb will not shine.

Replace the insulator with a resistor. What do you think will happen (based on the name only)? What happens?

What is the role of a resistance? Is it a conductor? An insulator?



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## SEQUENCE 2

Age group	10-12 y.o
Prior knowledge	Basic knowledge of electricity
Material needed	The Conductors and insulators box, a pen and paper
Subjects	Electricity
Skills involved	Scientific representation
Time to carry out the sequence	1h

### Step 1: Test with the box

Use the box with your pupils to find which materials are conductors and which are insulators. All pupils should know the difference between both, but they can confirm their hypotheses about which of the materials inside the box will conduct electricity and which will not.

Once the first tests have been made, ask your pupils to draw a scheme of the electric circuits they created. At this stage, the drawings will be imperfect, which means they should not know about the right symbols yet.

### Step 2: Correction of the schemes

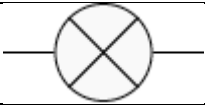

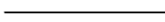
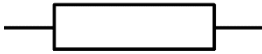
At this stage, you may start by reviewing your pupils' schemes: how did they symbolise the various electronic components? Some of the pupils may have drawn the components as they are, and some may have tried to create their own symbols.



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In this box, the components are the following:

A light bulb	
A battery	
Wires with crocodile clips	
A resistance	

Crocodile clips are not represented when drawing electric wires. Since wires are represented as straight lines, make sure your pupils are not drawing any round lines. Ideally, all angles must be square angles.

When inserting the objects from the box, your pupils may draw them in the shape they want (as long as it is easy to draw and recognise), then add a caption to specify what material they have been using. Add dots • to symbolise both ends of the electric wires in front of the object.

## Step 3: Close and open circuits

What are closed and open circuits? Let your pupils some time to figure out the answer. In their minds, “close” could mean that there is no electricity: this is actually the opposite, since electricity needs a close circuit to light the lamp. In an open circuit, the electricity cannot travel: the light bulb will not shine.



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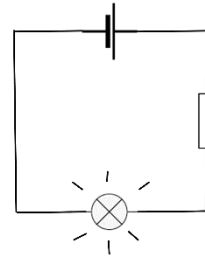
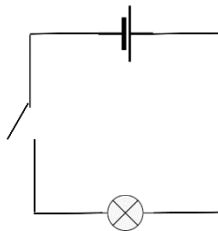
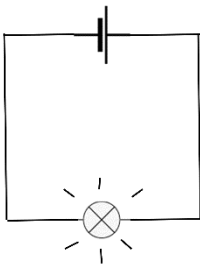
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You may show your pupils how to represent a closed and open circuit:

- In a close circuit, the light bulb shines: you may add a visual indicator around the light bulb symbol.
- In an open circuit, the light bulb does not shine: you may lightly grey out the light bulb symbol to show it is not working.

Here is what the schemes should look like:



## Step 4: What is electricity, and what can it do?

Ask your pupils to reflect on what they just did.

What can they use this electrical circuit for? Give an example of what electricity can do in your surroundings (in class, at home, etc.)

What will happen if you use a smaller light bulb? A bigger one? Why?

- At this stage, your pupils may not know about voltage and intensity. Guide them to saying that there will be “too much” electricity for the smaller light bulb and “too little” for the bigger one. You may compare electricity to a water flow to illustrate the idea.



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- The bigger light bulb will not be lit as much, and the smaller one will be very bright, perhaps even exploding!

When buying an electrical item, check the values of two units: voltage and intensity. If you don't give it the right amount of electricity, it might break.

The battery was enough to light up a small light bulb. Imagine the amount of electricity needed to power the classroom, a whole town or the entire country!

Conclusion: electricity is a valuable resource. Don't waste it!



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