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SCIENCE

Build your own battery

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BUILD YOUR OWN BATTERY

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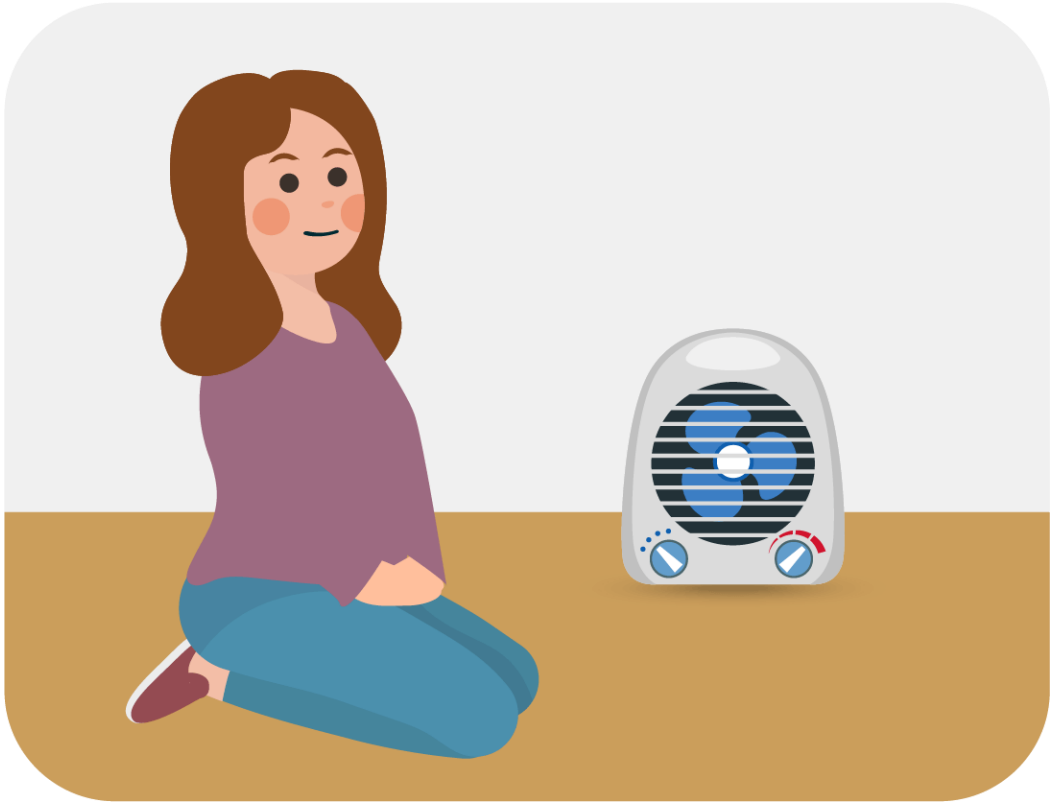
1 Introduction

Did you know that energy can be transformed from one form to another? For example, when you use a heater, electrical energy is transformed into heat energy. And there are many more examples like this one: fans, stoves and even the operation of a battery-operated toy transform energy.

In this activity you will learn how the energy contained in food (called chemical energy) can be transformed into electrical energy using the Xploris voltage sensor.

The question you will answer will be:



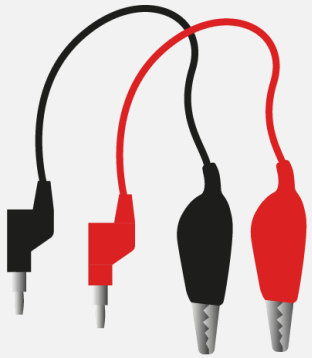
How much energy can be obtained from a potato or a lemon?

2 Setting up the experiment

You will measure the voltage produced by three energy sources—a AAA battery, a lemon, and a potato—using the Xploris voltage sensor. This experiment will explore whether it's possible to generate electrical energy from these unconventional sources and how their output compares to that of a standard battery.

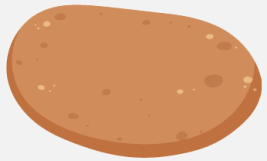
MATERIALES


Xploris


Voltage cables red and black


Battery

Lemon

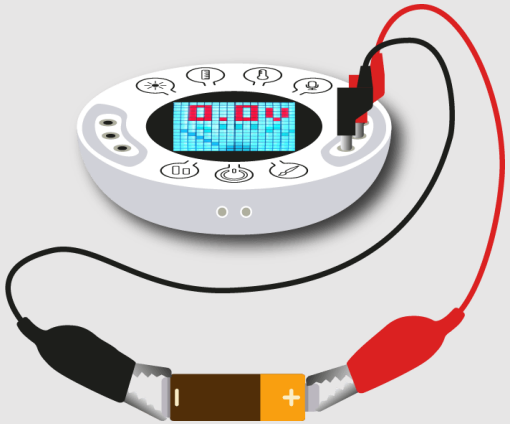

Potato


2 Galvanized screws


2 Pieces of copper

2 Setting up the experiment

ASSEMBLY 1



You will connect a AAA battery to the voltage sensor, as shown in the picture.

ASSEMBLY 2

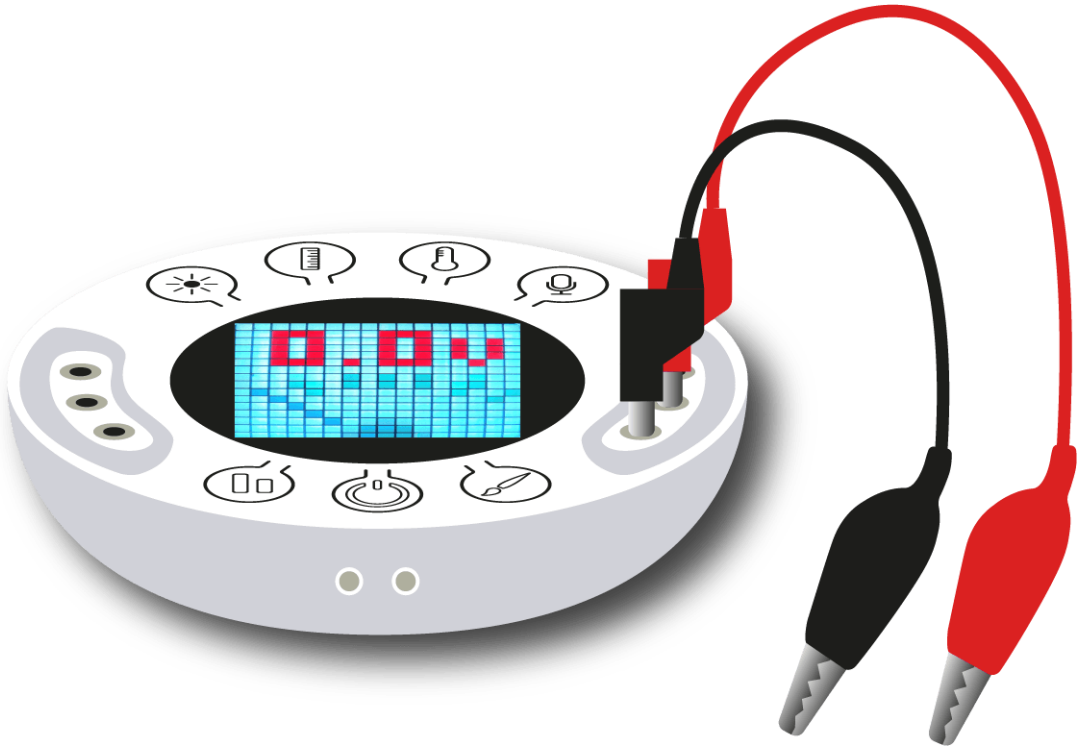
You will insert a galvanized zinc screw and a piece of copper into a lemon. Then, you will connect the Xploris voltage sensor using alligator to banana cables, as shown in the picture.

ASSEMBLY 3

This assembly is identical to the previous one, but the lemon is replaced by a potato, as shown in the image.

2 Setting up the experiment

The red and black voltage cables are inserted on the same side of the Xploris, as shown in the picture.



2 Setting up the experiment

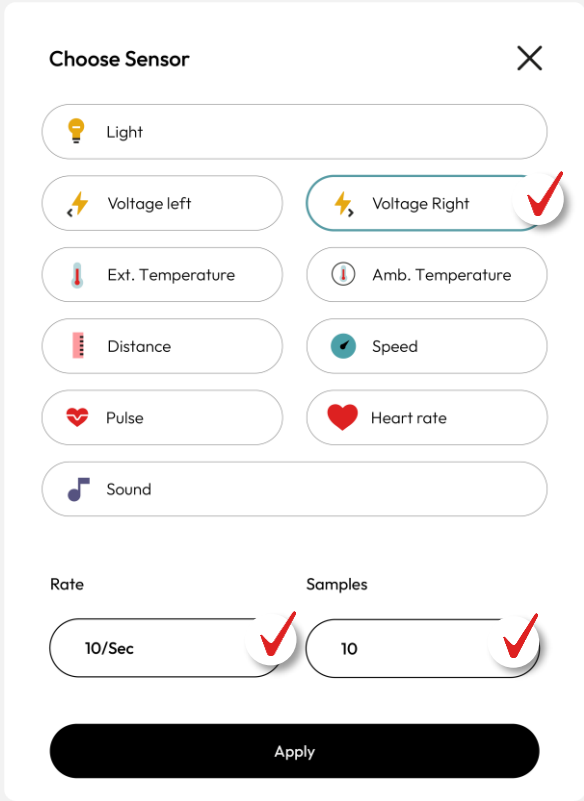
XploriLab software configuration

1

To start any configuration related to the sensors, you will select the “setup” icon.

The sensor you will use for this activity is the **voltage** sensor and you will set it to take **10 samples per second (10/sec)** for a total of 1000 samples.

Once the configuration has been completed, select “Apply” to save it.

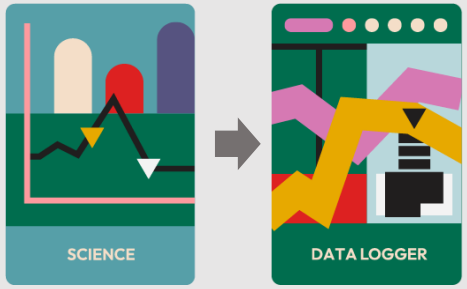


2 Setting up the experiment

Turn on your Xploris and connect it to your computer or tablet.

Open the XploriLab software on your computer or tablet.

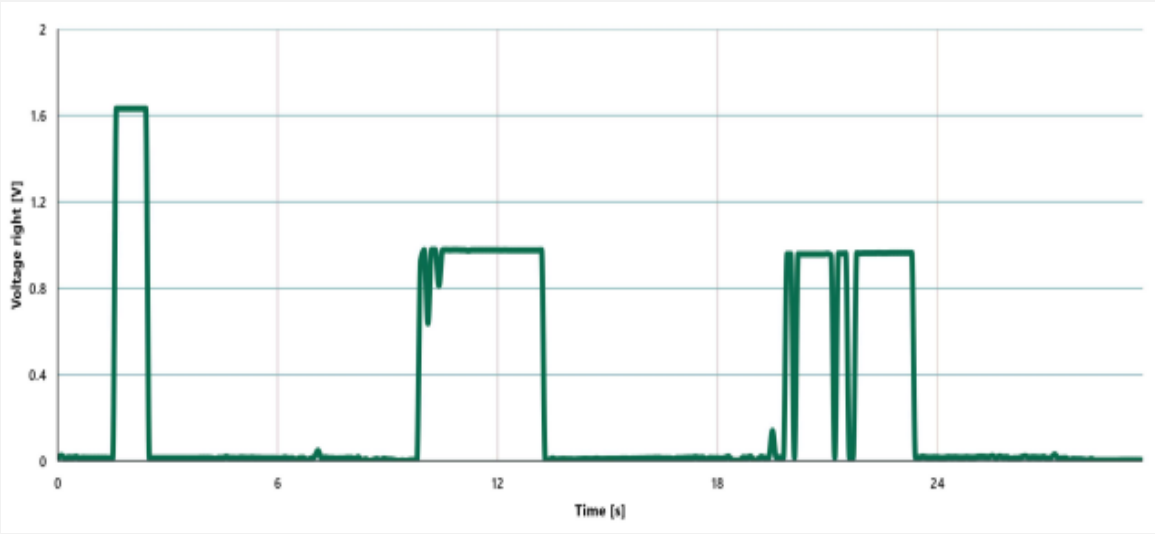
Once inside XploriLab, select the icon to connect the device via cable or bluetooth as applicable.



Go to the SCIENCE section and then to DATA LOGGER.

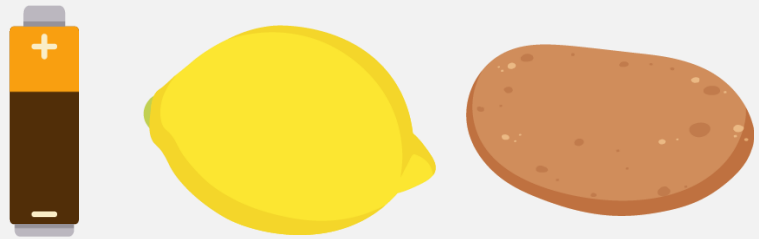
3 Data collection

Build the 3 assemblies shown above, connect the Xploris voltage sensor and record the voltage of each of them for a few seconds.



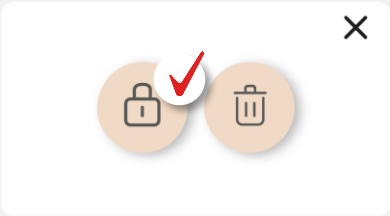
4 Data analysis

1 Use markers on the graph to indicate the voltage reached by the battery, lemon, and potato.



2 Use markers to add labels to the points on the graph. To do this you must select the “Marker” icon:

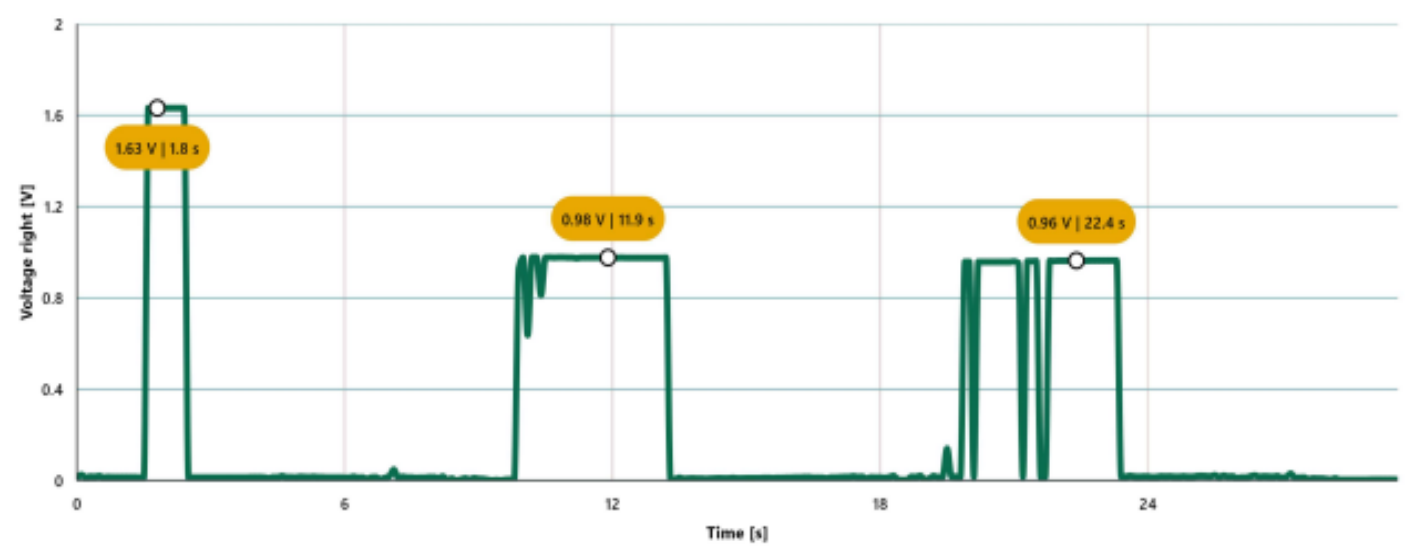
To keep the marker fixed, select it and press the lock icon.



4 Data analysis

3

GRAPH WITH VOLTAGE MARKERS

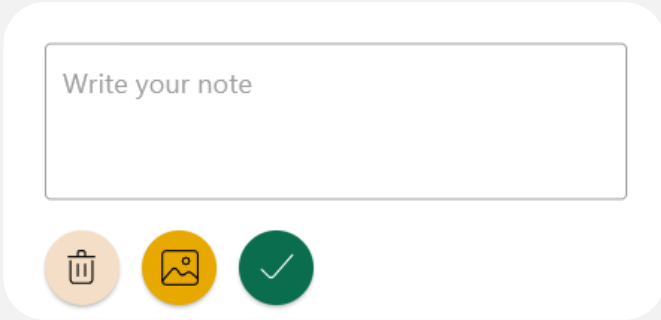


4 Data analysis

4

To add photos to the notes within a graph you must do the following:

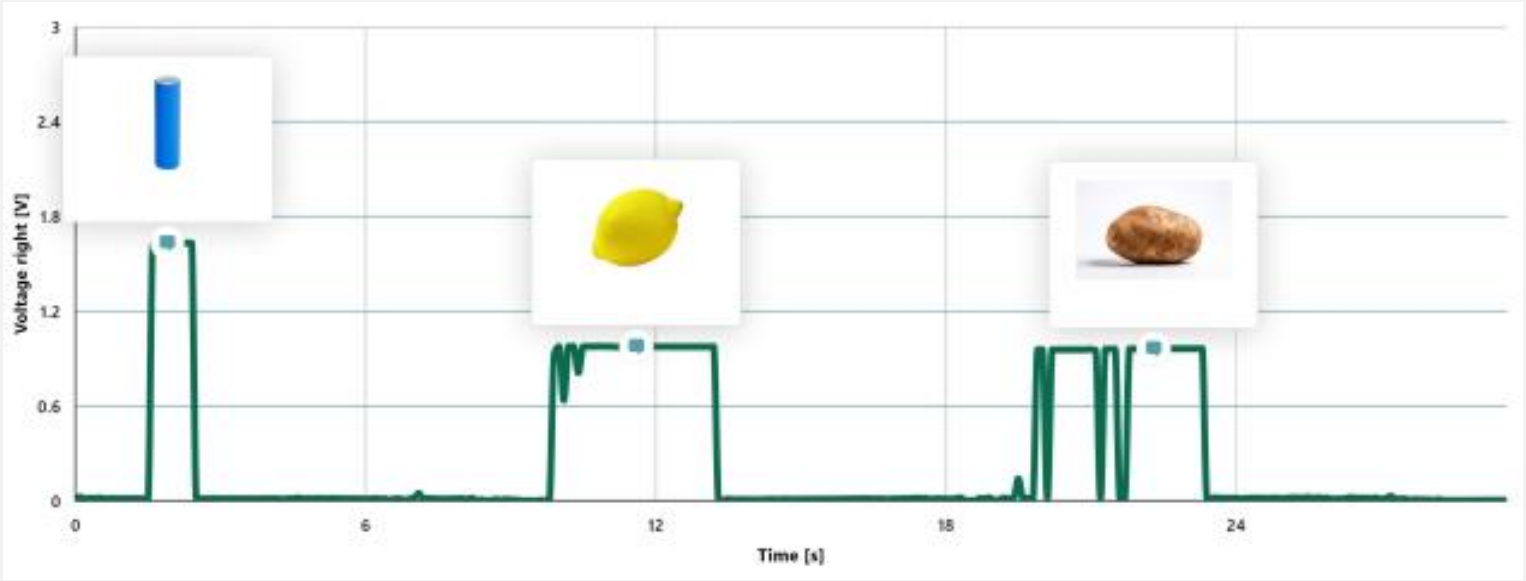
1. Select the note icon.
2. Click on the point where you want to add a note.
3. A dialog box will open and allow you to add the note with text and images.
4. Take a picture of the objects used for the measurement and select it for the note image.



4 Data analysis

5

GRAPH WITH NOTES



5 Questions

1

Let's take a look at the graph

After reviewing the measurements from the three circuits, which one produced the highest amount of electrical energy?

2

Let's take a look at the graph

Based on the voltage measurements, do you believe it’s possible to generate electrical energy from food?

3

Let's imagine

What do you think the energy produced by this type of circuits could be used for?

4

Let's imagine

What environmental or social consequences do you think the use of electricity produced from food would have?

5

Let's keep experimenting!

Do you think the voltage of your circuit will change if you add more power sources, for example, more potatoes or more lemons? Experiment by modifying your circuits, measuring their voltages and comparing your results with those obtained during the activity.

6 Activity summary

We utilized the Xploris voltage sensor to investigate whether electrical energy can be produced from food. We compared the energy generated by three different sources and created a line graph to display our findings.

We analyzed the data to establish the maximum and minimum voltage produced in the circuit and the differences in electrical power production between the 3 circuits.

We answered questions to conclude whether electrical energy can be obtained from food, what uses can be given to that energy and the consequences that the production of energy from food could have. Finally, we modified the electric circuit to show whether adding more energy sources varied the voltage or not.

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