



**Teacher's Resource sheet**  
**Episode 9**



**Curriculum Strand - Energy & Forces**  
**Strand Unit – Electricity**

**Aims and Objectives:**

To investigate how electricity works, find out what the class already know, learn about atoms, electrons, neutrons and protons, and put it all to the test with the experiments below.

**Class plan**

Suggestions:

- ✓ Ask warm up questions with the class
- ✓ Watch the video
- ✓ Fill out the first two questions of the investigator's sheet (see resources below)
- ✓ Do experiments in class
- ✓ Complete the investigator's sheet

**Resources contained in this print out:**

- ✓ Curriculum questions explaining electricity
- ✓ Some warm up question suggestions
- ✓ The Science Investigators Electricity episode can be accessed here:  
<https://scienceinvestigators.wordpress.com/about/episodes-and-resource-sheets/>
- ✓ Experiments to do in class (resources and instructions are included)
- ✓ An investigator's sheet for pupils to discuss and fill out for each experiment

## Curriculum Question Suggestions with answers. Explaining: Electricity

### Question 1

What is electricity?

#### Answer

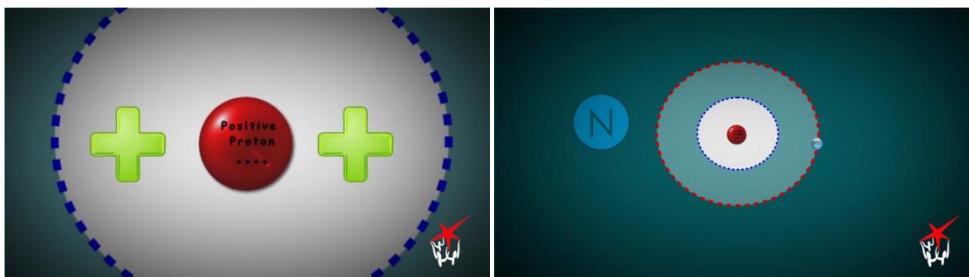
- Electricity is a form of energy produced by the flow of electrons.

*What is an electron?*

- An electron is a basic particle that orbits the nucleus of an atom.

*What is an atom?*

- An atom is the smallest particle of every piece of matter. Everything is made of atoms, including humans.
- Electricity is caused by electrons, orbiting around the edges of atoms. Each electron has a small negative charge. An atom usually has an equal number of electrons and protons. Protons are positively charged particles in its nucleus, or centre. Because the equal number of positive protons and negative electrons balance each other out, most atoms have no overall electrical charge.



- Two positive charges repel each other, as do two negative charges.

## Question 2:

How does electricity work?

### Answer

- People, you and I, have positive and negative charges but they balance each other out.
- When there is an imbalance this is what causes electricity or static, or even electric shock.



- When electrons move, they carry electrical energy from one place to another. When atoms rub off each other, the positive protons attract the negative electrons on other atoms. These electrons can hop from one atom to another and this an imbalance, which makes electricity.
- Electric current is measured in amperes (amps).
- Electric potential energy is measured in volts.

Examples of energy sources that can produce electricity:

- Solar
- Wind
- Static

Everyday items like phones and televisions need electricity to work.

## Question 3

How can we save electricity, and why should we try?

### Answer

- In the last 100 years we have hurt the Earth by burning too much fuel to make electricity.
- We can save electricity by turning off lights when we leave a room, and being mindful of everyday objects that use electricity that lead to high electricity bills. By reducing usage in the home we can save on energy being used, and save money too!

# EXPERIMENTS

There are lots of experiments in this episode. The materials for each are listed with the experiment instructions:

- ✓ **Experiment 1: Create static electricity**
- ✓ **Experiment 2: Make water move using static electricity**
- ✓ **Experiment 3: Make paper float in air using static electricity**
- ✓ **Experiment 4: Make Rice Krispies dance with static electricity**
- ✓ **Experiment 5: Make a lemon battery**

## **Experiment 1: Create static electricity**

### **You will need:**

- ✓ A balloon
- ✓ A head of hair

### **Directions**

1. Inflate the balloon.
2. Rub the balloon off your hair, or a classmate's hair.
3. Then raise balloon from your head and your hair will stick to it.
4. This is static electricity!

## **Experiment 2: Make water move using static electricity**

### **You will need:**

- ✓ A balloon
- ✓ A running tap

### **Directions**

1. Rub the balloon off someone's hair to make it static.
2. Place the balloon beside the running water.
3. Watch the water attract to the static balloon.

### **Experiment 3: Make paper float in air using static electricity**

#### **You will need:**

- ✓ A balloon
- ✓ Shredded paper

#### **Directions**

1. You will need to rub the balloon off your hair again to make it static.
2. Then hover the statically charges balloon over the paper the paper will float up to the balloon.

### **Experiment 4: Make Rice Krispies dance with static electricity**

#### **You will need**

- ✓ Books
- ✓ A sheet of Plexiglass/Perspex, big enough to create a bridge over the books
- ✓ Table
- ✓ Rice Krispies
- ✓ Cotton wool (a pleat or roll, you need a big piece)

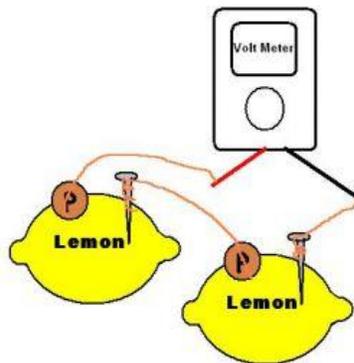
#### **Directions**

1. Put two stacks of books of equal height on the table.
2. Put the Rice Krispies on the table between the two stacks.
3. Place plexiglass on top of books, like a bridge over the Rice Krispies.
4. Rub a big piece of cotton wool back and forth on the top of the plexiglass to create static.
5. Watch the Rice Krispies dance.

## Experiment 5: Make a lemon battery

### You will need

- ✓ A screwdriver
- ✓ A calculator
- ✓ 2 lemons
- ✓ 2 copper coins
- ✓ A galvanised nail (coated in zinc)
- ✓ 3 electrician's test leads with alligator clips, or a full test kit (with a voltmeter)
- ✓ A scissors or sharp knife



### Directions:

1. Unscrew the back of the calculator with the screwdriver.
2. Cut the red and the white wires that connect to the calculator's battery.
3. Remove the battery.
4. Roll the lemons on a flat surface to break up all the juice packets inside.
5. Insert a galvanised nail and coin into opposite ends of each lemon (you may need to make small slots first with the scissors or knife). Make sure the coin and nail don't touch.
6. Attach a test lead to the positive nail on one lemon and to the negative nail on another lemon.
7. Attach one end of each of the two remaining leads to the remaining nail on one lemon, and the coin on the other.
8. Then attach the loose ends of these leads to the wires in the calculator.
9. Now turn on your calculator!

### Why does this work?

All batteries are made with two different metals suspended in acid. The metals we used are zinc (the nails) and copper (the coins). The acid comes from the citric acid inside the lemon.

# **INVESTIGATORS SHEET**

**What are we going to do?**

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**What do you think will happen?**

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**What actually happened?**

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**Why do you think this happened?**

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