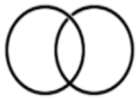
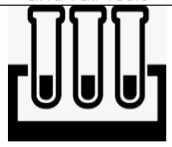
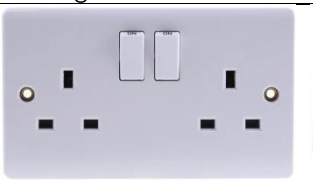
Science Unit Plan – Year 4

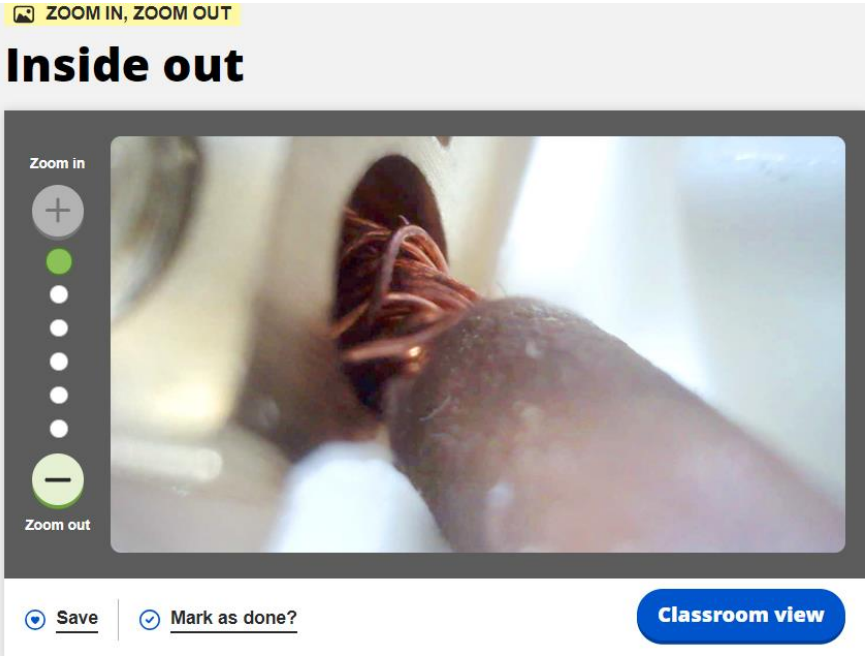
Electricity – Physics

Observe Changes over time	Group and classify	Research Using Secondary Sources	Carrying out comparative and fair tests	Seeking patterns	Asking questions	Reason and explain
						

Science coverage NC	• Identify common appliances that run on electricity. • Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. • Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. • Recognise some common conductors and insulators, and associate metals with being good conductors.
Links to previous learning	Explore how things work. (Nursery - Electricity)
Links to future learning	Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. (Y6 - Electricity) Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. (Y6 - Electricity) Use recognised symbols when representing a simple circuit in a diagram. (Y6 - Electricity)
Misconceptions	Some children may think: • a battery is not electricity
Key vocabulary	**cell** – one battery **electrical conductor** – these let electricity pass through **electrical insulator** – these don't let electricity pass through **electrical current** – a form of energy **switch** – a component that can be used to break a circuit
Key knowledge	Some electrical devices plug in to the mains and others run on batteries. An electrical circuit consists of a cell or battery connected to a component using wires. If there is a break in the circuit, a loose connection or a short circuit, the component will not work. A switch can be added to the circuit to turn the component on and off. Metals are conductors of electricity. Plastic, glass, wood and air are electrical insulators. Mains electricity is the electricity that is delivered to homes and businesses through an electric grid. The electric grid in the United Kingdom is called the National Grid Damaged electrical items can cause fires
Key diagrams	   
Resources	bulb, bulb holders, wires, battery, battery holders, switches
Which appliances run on electricity?	<u>Retrieval</u> <u>Match up the words and definition.</u> **materials** - what objects are made from **flexible** – can bend or change shape easily. **rigid** – can't bend or change shape. **transparent** - see through. **opaque** - not see through.

translucent – can see through it a little bit.

Activate task:
https://explorify.uk/en/activities/zoom-in-zoom-out/inside-out



You will be zooming in and out of the image above – starting very close and stepping back slowly.

1. Start by asking everyone:

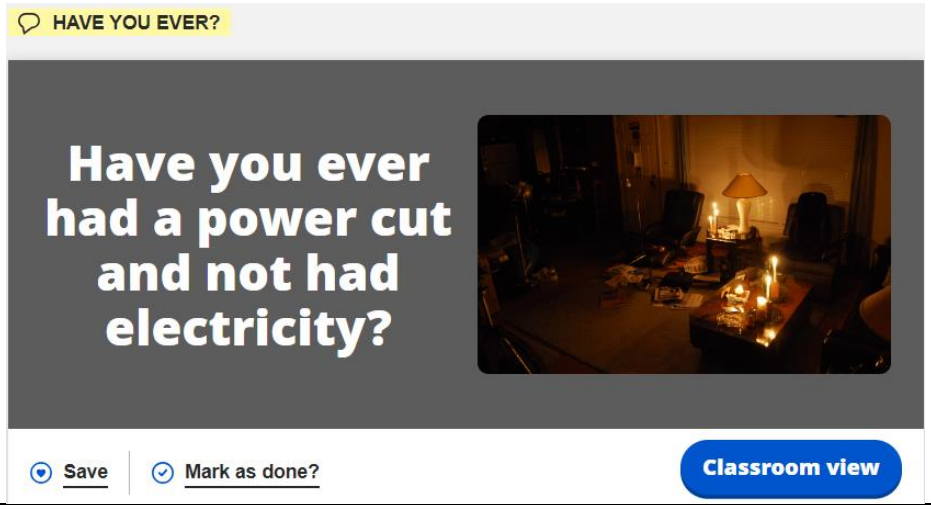
- What do they think the image is and why?
- What does the image remind them of and why?

2. Every time you zoom out, ask the class:

- Can they describe the colours, shapes and textures?
- What do they think the image is now – have they changed their minds?

Background information
Plugs are made up of several parts. You will see that some parts are insulators as they are made out of plastic and some are conductors as they are made out of metal. The wires that you see exposed are made out of copper and the three pins are made of brass. You should not see the insides of a plug when connecting an appliance as it could mean that it is dangerous to use. The current UK design of plugs and sockets was introduced in 1947, in response to safety concerns and the growing number of electrical devices (irons, kettles etc.) in our homes.

https://explorify.uk/en/activities/have-you-ever/had-a-power-cut-and-not-had-electricity



1. In pairs ask the children to share their experiences. *Be sensitive to the fact that some children could have experienced a power cut because bills haven't been paid, or money has run out on the meter.* ***Focus on the impact not the reason.***

2. Once they have had a brief chance to chat give them some prompts to help their conversation:

- What was it difficult to do without electricity?
- Which devices in your house wouldn't work? Which would work?
- How did you manage? What did you use instead to see or keep warm?
- Did it get worse the longer it went on?
- Was there anything good about it?
- Where does our electricity come from?

What is mains electricity?

Mains electricity is the electricity that is delivered to homes and businesses through an electric grid.

The electric grid in the United Kingdom is called the National Grid

How does mains electricity get to out homes?

Electricity – a form of energy

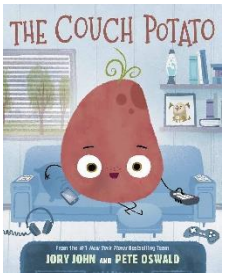
is carried into our homes through underground cables, or through overhead power lines and pylons, like in the picture below! We connect devices to the mains by using a plug.

Show children pictures of objects and ask them to paired talk about whether the objects are non-electrical, use batteries or plug in, they may sort them in other ways.

Could have a walk around school to identify different electrical devices.

Address the misconception that a battery is not electricity.

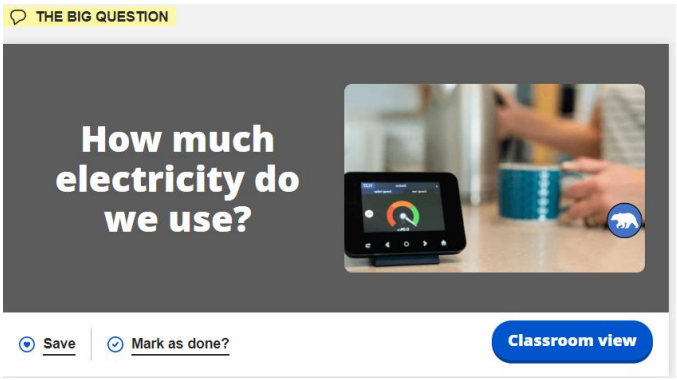
Read this story:



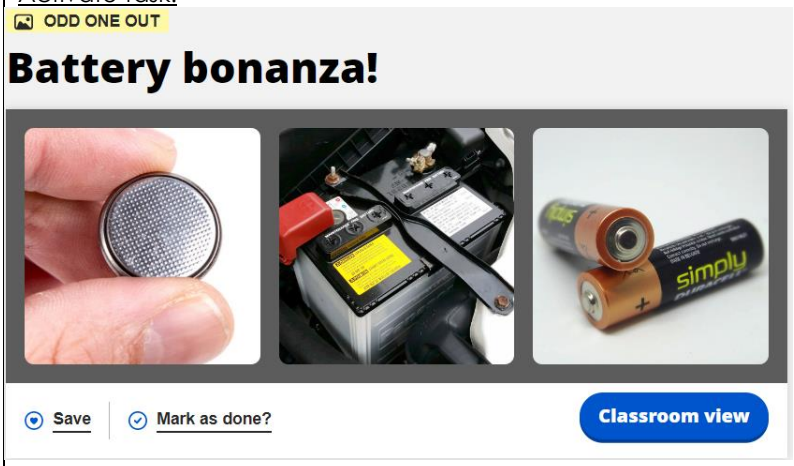
The Couch Potato has everything within reach and doesn't have to move from the sunken couch cushion. But when the electricity goes out, Couch Potato is forced to peel away from the comforts of the living room and venture outside. Could fresh air and sunshine possibly be better than the views on screen?

Readers of all ages will laugh along as their new best spuddy learns that balancing screen time and playtime is the root to true happiness.

Teacher assessment	**Still need more depth of learning**	**Shows strong understanding**

How can we reduce our use of electricity?	Retrieval Match up the words and definition. **Carnivore** - Animals that eat meat and other animals. **Herbivore** - Animals that only eat plants. **Omnivore** - Animals that eat both plants and meat or other animals Activate task:  https://explorify.uk/en/activities/the-big-question/how-much-electricity-do-we-use 1. Plan an investigation around a Big Question. What do the pupils already know about using electricity? • What appliances use the most? • How would you reduce energy use? • Why is it important to reduce our energy use? Background information In the UK, a significant percentage of our electricity (between 25-50% depending on the weather: National grid live status) is made by burning fossil fuels such as coal, oil and gas. These are non-renewable resources and will eventually run out. In addition, burning them causes pollution and releases greenhouse gases such as carbon dioxide into the atmosphere. Greenhouse gases are the cause of global warming. Children to devise their own survey to find out where electricity could be saved in school.	
Teacher assessment	**Still need more depth of learning**	**Shows strong understanding**
Can you find out how to arrange a circuit to make a bulb light?	Retrieval Match up the words and definition. **Amphibians** - Live on water and on land. They have smooth slimy skin. **Birds** - have a beak, two legs, feathers and wings. **Fish** - Live and breathe under water. They have scaly skin, fins to help them swim and gills to breathe. **Mammals** - Animals that breathe air, grow hair or fur, and feed on their mother's milk as a baby. **Reptiles** - They breathe air, they have scales on their skin.	

Activate task:



https://explorify.uk/en/activities/odd-one-out/battery-bonanza

1. Show the three images above and ask everyone to come up with as many similarities and differences as they can. If they get stuck, prompt them to think about:

- appearance
- what they do
- where they might be found

2. Then, everyone needs to decide which one is the odd one out and why. Encourage a reason for every answer and there is no wrong answer!

Background information

We use batteries for lots of things in our everyday lives. To meet these different demands, batteries can differ in size and voltage. You can imagine voltage as a 'push' coming from the battery to move electricity round a circuit. A bigger 'push' in the same circuit will create a faster flow of electricity.

The AA and the button battery are actually cells . **cell** – one battery ; they are single units that produce electricity. A car battery has multiple cells in one unit, so it is correct to call it a battery. AA and button batteries are 1.5 volts, which is perfect for a variety of small household uses. A car, however, needs a lot more power and this is why car batteries are 12 volts

Activity - Provide the children with a bulb, bulb holder, wires, battery and a battery holder and ask them to make the bulb light.

Draw their circuit.

Explain that circuits need to be complete for the electricity to flow and for the device to work.

Give the children a switch and then challenge them to explore how to connect it into the circuit.

Can they how a switch works.
electricity – a form of energy
switch – a component that can be used to break a circuit

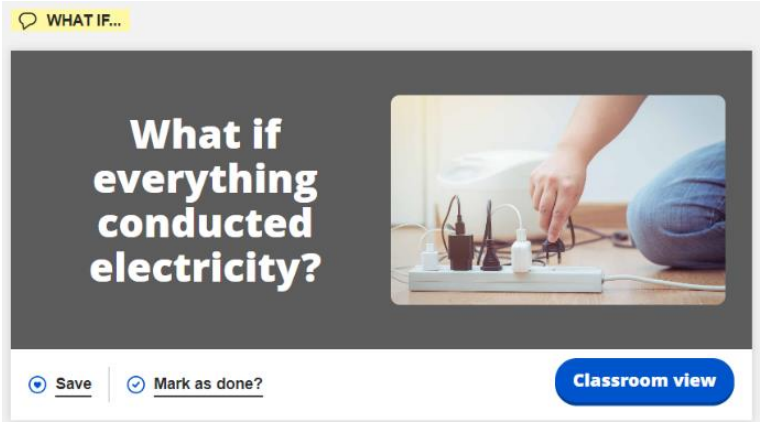
Show some images of different circuits (No symbols needed – this is Y6 Science) – some complete and some not. Children to identify which will allow the bulb to light up and which will not. Those that won't work, explain why.

Teacher assessment	**Still need more depth of learning**	**Shows strong understanding**

What materials are good electrical conductors?	Retrieval Match up the words and definition **sleet** – rain and snow mixed together

deciduous trees – stay green and keep their leaves all year
evergreen trees – lose their leaves in winter
hibernate – sleep over winter

Activate task: https://explorify.uk/en/activities/what-if/everything-conducted-electricity



1. In pairs, discuss what might be a Plus, Minus and Interesting way to think about the question. Stuck for ideas? They could think about:

- What is a conductor/insulator?
- What different metals are there?
- How do we keep safe from electricity in our everyday lives?

2. Ask the children to share their partner's ideas then encourage a broader discussion as a class, remember there is no wrong or right answer.

Background information
Electricity is all around us in our modern world – it powers objects like our mobile phones, computers and lights in the classroom.

Metals are good conductors so they can be used as wires in a circuit. Some examples of conductors include copper, aluminium, gold and water (non-metal). Non-metallic solids are insulators except for graphite (pencil lead). These can include plastic, wood, glass and air.

A conductor is a material that lets electricity pass through it easily, while an insulator does not allow electricity to pass through it freely.

Ask children to consider what would happen if different materials were placed into a working circuit.

Children to test a variety of materials. (Tin foil, cork, paper clip, cardboard, plastic spoon, lolly stick, graphite in pencil) Record results in a table.

Introduce the word conductors and insulators.
electrical conductor – these let electricity pass through
electrical insulator – these don't let electricity pass through

Write up what they discovered from their testing, using the key words.

Can you explain which materials are used to make wires and why?
https://www.bbc.co.uk/bitesize/topics/zcj6yrd/articles/zb6mt39 Watch the video to summarise electrical conductors and insulators

Children to have a range of materials. Can they create their own switch using their knowledge of materials and make a circuit work?

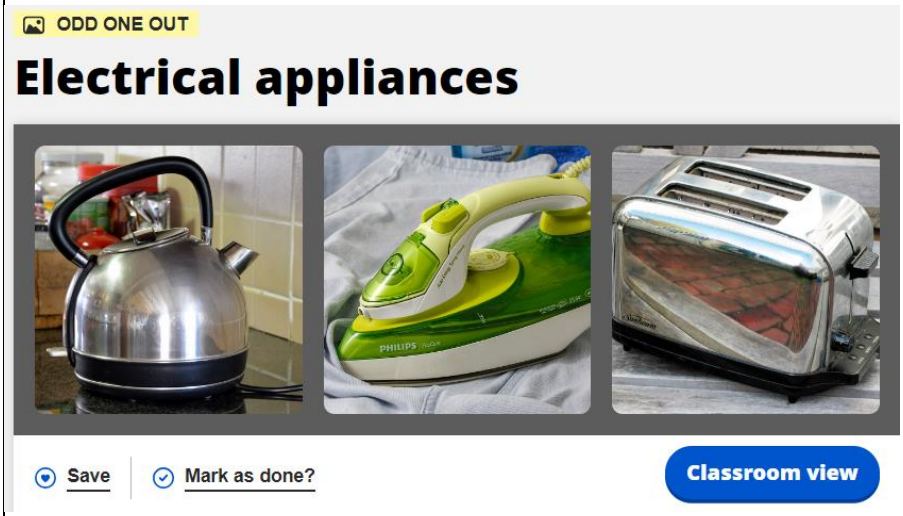
Teacher assessment	**Still need more depth of learning**	**Shows strong understanding**

What are the dangers of electricity and how can we stay safe?

Retrieval
Match up the words and definition

vertebrate – animals with backbones
invertebrate – animals with no backbone

Activate task: https://explorify.uk/en/activities/odd-one-out/electrical-appliances



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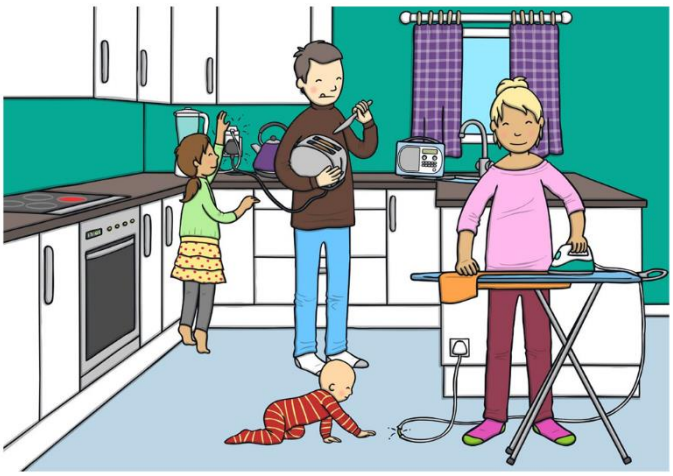
- appearance
- what they do
- where they might be found

2. Then, everyone needs to decide which one is the odd one out and why. Encourage a reason for every answer and there is no wrong answer!

Background information
The three electrical appliances are a kettle, iron and toaster. All three of these appliances use electricity to produce heat for different purposes: boiling water, toasting bread and ironing clothes. The first electric iron was invented in the 1880s. The first kettle was invented in the 1890s, as was the first toaster. It wasn't until 1919 that toasters were made that popped-up. As a safety feature, automatic kettles that switch off when water is boiled were made in the 1950s.

Activity - Share the danger sign and explain that this means that there is dangerous electrical equipment nearby.

Look at the image and identify any electrical dangers



	Share these facts with the children • Don't touch plug sockets. Ask an adult to plug something in for you. Putting your fingers (or another object) in a plug socket, even if the switch is in the off position, can give you an electric shock. • Adults must not plug too many things into one socket as this can cause a fire. • If you notice an electrical wire is damaged, do not touch it and tell a grown-up straight away. • Adults should make sure that electrical wires are tucked out of the way so that nobody trips over them. They should never be near the oven. • If wires dangle down, young children could pull them causing appliances, such as microwaves or toasters, to fall and hurt them. • If a piece of bread gets stuck in the toaster, adults must not use knives to try and get the bread out. A knife is metal. Electricity can travel through the metal and give the person holding it an electric shock. • Don't touch a light switch with wet hands as it can give you an electric shock. This is why most bathroom lights have pull cords. • Electrical appliances like hair straighteners shouldn't be used in the bathroom because water and electricity do not mix. Mixing water and electricity can cause an electric shock. Some bathrooms have special plugs so electric shavers can be used safely. • When you leave the house, electrical equipment, such as tumble dryers, shouldn't be left on. Sometimes they can get too hot and cause a fire. https://www.enwl.co.uk/advice-and-support/safety-advice-incident-reporting/electrical-safety-for-kids/ watch the safety video Write a set of safety rules for the classroom, school or the home

Teacher assessment	**Still need more depth of learning**	**Shows strong understanding**

Common strengths	Common weaknesses	Notes for subject leader	Pupils who still need more depth of learning	Shows strong understanding