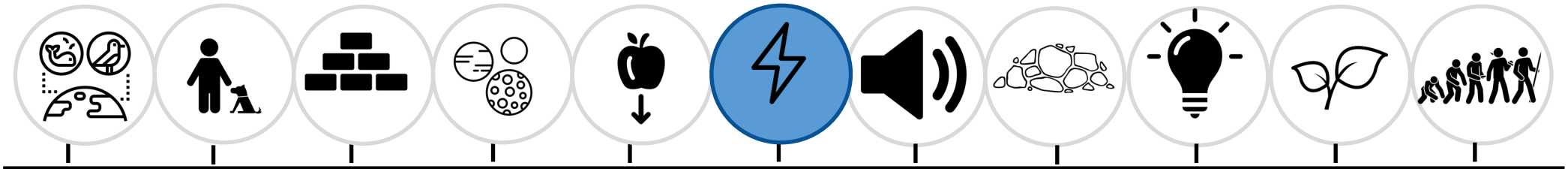
Year 4: Electricity

SCIENTIFIC CONTEXT: Physics



Key Questions

1) Name some common appliances that run on electricity.
2) Can you name basic parts of an electrical circuit?
3) Will a bulb light up if it is not in a complete loop with a battery?
4) What does a switch do?
5) How do switches affect bulbs?
6) Name some common conductor and insulators.

As scientists we will:

- 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.

Working Scientifically:

- Recording findings using drawings,
- Making systematic and careful observations,
- Report on findings from enquires, including oral and written explanations, displays or presentations of results and conclusions.

Notable Scientist: Chi Onwurah

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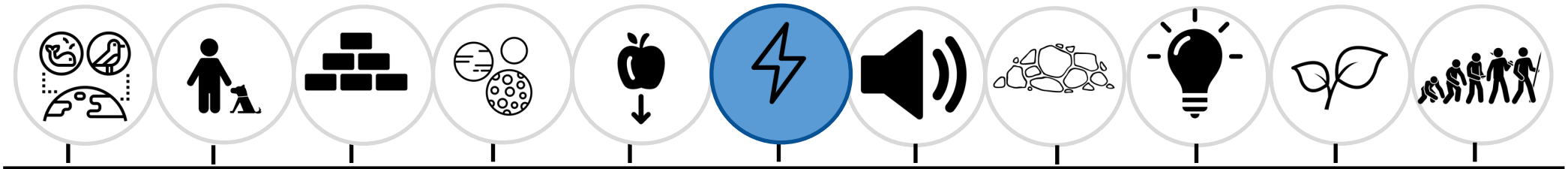

KEY VOCABULARY:

Electrical appliance	An electrical machine used to complete a job.
Mains	Mains electricity is the electricity that is delivered to homes and businesses through an electric grid.
Plug	A plug connects a device to the mains electricity supply.
Circuit	A circuit is a complete path around which electricity can flow.
Complete circuit	For a circuit to be complete, there must be wires connected to both the positive and negative ends of the power supply.
Component	A part of the circuit.
Cell	An electrical cell is a device used to generate electricity.
Bulb	a simple apparatus that converts electric energy into light energy.
Battery	A battery is a sort of container that stores energy until it is needed.
Switch	A component within an electrical Circuit which enables the flow of electricity to be turned on and off.
Buzzer	a component in a circuit that makes a sound when electricity goes through it.
Wires	A wire is a long thin piece of metal that is used to carry electric current.
Conductor	Materials that allow electricity to pass through them easily are called electrical conductors.
Insulator	An insulator is a material which does not easily allow electricity to pass through it.

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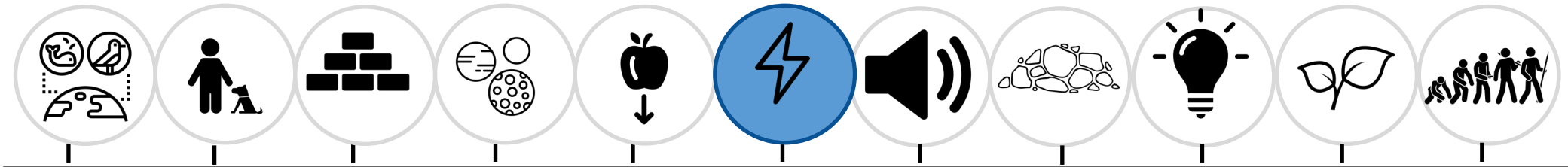

What I need to know:

Many household devices and appliances run on electricity. Some 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 good conductors so they can be used as wires in a circuit. Non-metallic solids are insulators except for graphite (pencil lead). Water, if not completely pure, also conducts electricity.

Opportunities for science capital:

Part of science capital includes scientific media consumption- documentaries, reports etc. So, I have added a couple of links which give daily science news for children. Checking in on these every now and then would be beneficial to help children see science in the wider world.

https://www.sciencenewsforstudents.org/

https://www.sciencejournalforkids.org/

Assessment:

By the end of this topic, pupils will be able to: 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.

When working scientifically, pupils will be able to:

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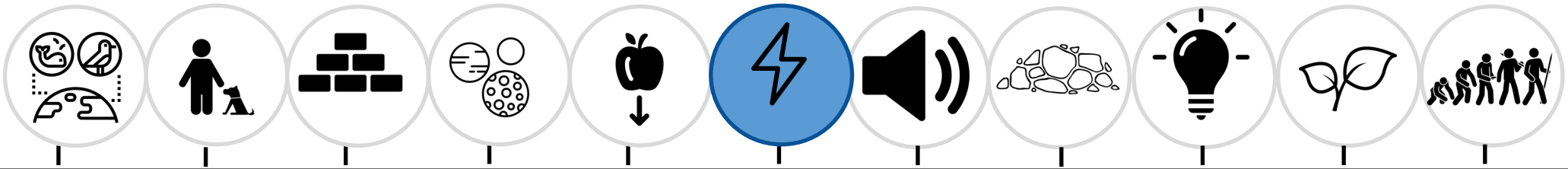

Theme 1: Series Circuits

Starter:

Complete relevant section of KWL grid

What appliances run on electricity?

Explain to children that an appliance is a machine that we rely on to due jobs for us, and it needs electricity to work. Typically, appliances need to be plugged in to the mains at home for these machines to work.

- Arrange the children into groups of four or five. Give each group a large sheet of paper and pencils/pens.
- Tell the children to write down, or draw appliances that are commonly used at home.
- Ask for a few examples and write these on the whiteboard. Give them 10 minutes to complete the task. Ask each group to give examples. Record in floorbook.

Main:

Substantive knowledge

Watch video on series circuits https://www.tigtagworld.co.uk/film/series-circuits-PRM00046/

Reiterate learning: a series circuit is circuit where components are in a single loop. Its basic parts (or components) include cells, wires, bulbs, switches and/or buzzers.

Provide children with the basic parts of a circuit, as mentioned above, and some labels with the name of each component on. In groups/pairs, ask children to try and match up the component with its name.

Plenary/assessment:

Disciplinary knowledge
Working scientifically objective: recording findings using drawings.

Pupils should construct simple series circuits, trying different components, for example, bulbs, buzzers and motors, and including switches, and use their circuits to create simple devices (e.g. a circuit for a torch, a fan and a doorbell).

Once pupils have successfully made three separate circuits with the different components, pupils should draw the circuit as a pictorial representation, not necessarily using conventional circuit symbols at this stage; these will be introduced in year 6. To be completed independently in books.

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Theme 2: Will the lamp light?

Starter:

Recap activity: last lesson, last topic, last year.

Deeper thinking opportunity: https://explorify.uk/en/activities/odd-one-out/electrical-appliances

Main:

Disciplinary knowledge

Working scientifically objective: making systematic and careful observations

Recap learning from previous lesson: a series circuit is a single, complete loop. So, what would happen to a bulb when the loop is not complete? What happens if we include a switch?

Provide the pupils with pictures/diagrams of circuits consisting of: wires, a battery, a bulb and in some of them, a switch. Some of the pictures should show a complete circuit, some should show a break in the circuit where the loop is not complete, some should show a closed switch and some should show a circuit with an open switch. Give the pupils the equipment to make the different circuits shown in the pictures. Children should work through each circuit systematically and note down observations in their books, answering the question, did the bulb light up. If so, why? If not, why didn't it light?

Plenary/assessment:

By the end of the lesson, they should be able to explain that lamp will not light it isn't part of a complete loop with the battery, or if the switch is open as this creates a loop in the circuit.

Potential for a deeper thinking activity and further investigation of switches:

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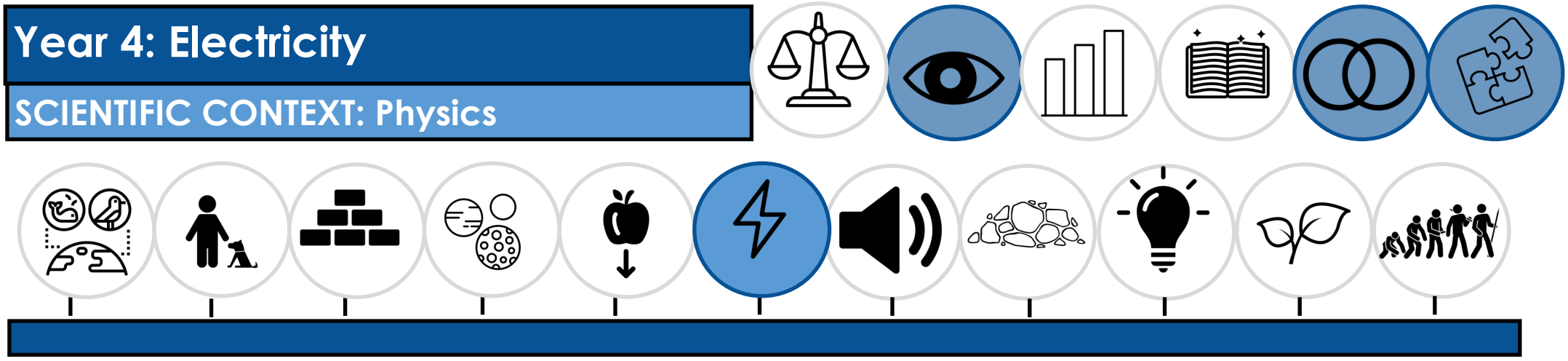

Theme 3: Insulators and conductors

Starter:

Recap activity

Who is Chi Onwurah? Run the activity as explained on explorify and introduce Chi Onwurah with the paragraph *'Background science'*:

https://explorify.uk/en/activities/who-is/chi-onwurah

Main:

Substantive knowledge:

Work through videos and activities on conductors and insulators: https://www.tigtagworld.co.uk/film/conductors-and-insulators-PRM00039/

Plenary/assessment:

Disciplinary knowledge
Classifying/problem solving
Working scientifically objective: Report on findings from enquires, including oral and written explanations, displays or presentations of results and conclusions.
Today we are electrical engineers.
Read through news on soldiers wear 'smart' clothing which conducts electricity: http://www.bbc.co.uk/news/technology-17580666
Explain that this electricity conductor uniform means soldiers can charge GPS so they don't get lost in the desert. However, a solider in the desert has ripped part of clothing losing part of the GPS circuit, so unable to provide a location to carry out a rescue mission. Explain that the soldier has a pack containing a variety of objects: which could be used to complete a circuit to activate the GPS? Provide each group with a 'soldier's backpack' containing a collection of objects/ materials (including different metals and plastics). Discuss how to find out whether electricity can pass through the materials. Groups test by putting materials into a gap in a circuit with a bulb/ buzzer.
Independent work:
Focus pupil recording/presenting on explaining what the results show. E.g. they could produce a radio or video message to send to the soldier explaining how to produce a working circuit and why they are confident that this will work, providing scientific evidence and a list of all possible conductors (in case some are damaged). Recap on the terms insulators and conductors.
See full TAPS plan on sharepoint: Y4plan Elect conductors - Review.docx
Complete KWL