NO WIRES NECESSARY

TEACHER GUIDE

ACCELERATE

PLANNING

Here's a suggested schedule for this kit! The activities should be completed in order, but you can choose when the lessons take place over time.

ACTIVITY INFORMATION	SECTION (S)	TIME REQUIRED	DAY/ LESSON
ACTIVITY 1: MYSTERY CIRCUIT PHENOMENON How does electricity power circuits? **Time required: 45 min**	☐ Light the Path	45 minutes	Day 1
ACTIVITY 2: CONDUCT THE FLOW Learn about materials that conduct and resist the flow of electricity. **Time required: 1 h 30 min**	☐ Resist the Flow	90 minutes	Day 2
ACTIVITY 3: COMPLETE THE CIRCUIT Compare the design of parallel and series circuits. **Time required: 2 h**	☐ Circuits Circuits	90 minutes	Day 3
ACTIVITY 4: TURN IT OF Learn abou	☐		

activity 1

MYSTERY TAPE PHENOMENON

Your student may have experience with electrical circuits, but in this kit, they will dive deeper into electricity. This experiment starts with exploring how the flow of electricity changes using multiple LEDs.

LIGHT THE PATH

WARNING! CHOKING HAZARD - Small parts.
Not for children under 3 years.

WARNING! Contains chemicals that may be harmful if misused. Do not eat or drink. Wash your hands after use.

WARNING! Batteries can be dangerous. Store away from metal objects. Only use with an adult's supervision.

☑ PREPARATION AND SUPERVISION

■ The student will experiment with different arrangements of multiple LEDs in a circuit, using modeling dough. The design of the circuit will change and the brightness of the LEDs will lead them to wonder about the flow of electricity through the circuit.

■ The vocabulary term circuit is defined.

■ Throughout this kit, your student will learn to design an electrical circuit that can direct power to various devices. Some of this will be done through basic instruction, although the majority will be done through exploration. Additional information will be provided in future activities to help troubleshoot problems with circuit design.

- It is most common for red leads of a battery to connect to the positive terminal and the black leads to connect to the negative terminal.
- LEDs have different length leads to help differentiate positive (longer) and negative (shorter) leads.
- As mentioned in the Student Workbook, individual LEDs should not be connected directly to the leads of a 9-volt battery or the LED will burn out. They will learn more about why this happens in a future activity.

■ The LED and battery leads should be cleaned with fingers or a dry paper towel to remove modeling dough at the end of the experiment. Do not clean with water.

Expand the Circuit

• The student will make predictions about the experiment before adding more LEDs to the circuit. They will reflect on their predictions in the Think About It section.
• When the student connects one or two LEDs in a circuit there should be a similar brightness. However, when the third LED is added to the circuit the LEDs appear dimmer than before (it's possible that none of the LEDs will light at all).

- Each of the LEDs requires 3 volts, and the voltage is divided by each of the devices in the circuit. This will be explained further in Activities 2 and 3.
- They can move the battery to different positions in the circuit to see that it works with two LEDs, but adding a third LED lowers the brightness of the LEDs.

activity 3

COMPLETE THE CIRCUIT

Your student learned that a circuit allows electricity to flow from a power source to a device. Now they will investigate the two main types of circuits and how design affects the energy that flows to a device.

LEARNING GOALS:

- I can compare and contrast series and parallel circuits, and design a circuit of each type that allows electricity to successfully pass through it.
- I can make observations to show energy transfers, including sound, light, heat, and electricity.
- I can design, test, and revise a solution that causes energy transfer.

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CIRCUITS CIRCUITS

PREPARATION AND SUPERVISION

- Your student will design a parallel and series circuit for comparison in this experiment. They will evaluate the design and determine that the battery is not powerful enough to turn on both LEDs in series, but will work in parallel circuit.
- The vocabulary terms parallel circuit and series circuit are defined.
- Be sure that your student leaves more than half of the nylon conductive tape for final design challenge in a later activity. Individual strips of 5 cm tape should be enough to construct the series and parallel circuits.

THINK ABOUT IT!

Question 1: Describe how the LEDs performed in both the parallel and series circuit.
Answer: The parallel circuit powered both LEDs, but the series circuit would not turn on.
How to Help:
• The series circuit does not work at all. Testing the individual LEDs in the series circuit will show that each LED works, but the whole circuit does not work with the 3-volt battery.
• The benefits of parallel and series circuits will be discussed in the reading section that follows.

Question 2: What do you notice when the 3-volt battery is used to test each individual LED in the parallel circuit?
Answer: The entire circuit still lights up even though the battery is only touching directly to the individual LEDs. The parallel circuit allows electrical energy to flow through both LEDs.
How to Help:
• Remind your student to test each individual LED in the circuit.
• The design of a parallel circuit will be addressed in the next section.

ACCELERATE

SCIENCE UNLOCKED

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Kit	SU-NOWIRE
Instructions	IN-NOWIRET
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