

## LESSON 18

# LED Circuit and Phototransistor

30 minutes

Electricity and Simple Circuits

### WHAT THIS LESSON DOES

Guide your students through building a circuit with a phototransistor and LED using Snap Circuits. Introduce the concept of phototransistors, assist with assembling components on the base grid, and demonstrate how light activates the circuit, reinforcing electricity flow concepts.

### WHAT STUDENTS SHOULD BE ABLE TO DO

- Understand the function and purpose of a phototransistor in a circuit.
- Build a simple circuit using snap circuit components, including an LED and phototransistor.
- Recognise the importance of correct component orientation for proper circuit functionality.
- Demonstrate how light can control electrical flow in a circuit.
- Explore creative applications of light-sensitive circuits through hands-on experimentation.

### BEFORE THE LESSON

- This is a hands-on build, not a device lesson. Have one Snap Circuits set per group with its own batteries fitted, plus the base grid, number 3 wire, red LED (D1), battery holder (B1) and phototransistor (Q4).
- Check every set has working batteries in the holder before you start. A dead set stops a whole group.
- Have a torch ready for step 8, your phone torch is fine, since you will shine light into each group's phototransistor yourself.

## LED Circuit and Phototransistor

### HOW THE LESSON RUNS

|                                      |
|--------------------------------------|
| Introduction                         |
| Prepare the Base Grid                |
| Inserting Batteries                  |
| Place the battery holder (B1)        |
| Place wire block (3)                 |
| Place the red LED light block (D1)   |
| Place the phototransistor block (Q4) |
| Lighting Up the Circuit              |
| Exploration and Conclusion           |

### TEACHING MOVES

- 1. Introduction. Compare the phototransistor to a light switch that works by seeing rather than touching. Keep it to that one image before you hand out any components.
- 2. Prepare the Base Grid. Get every group's grid flat and stable on the desk before anything else. A wobbling grid unsnaps blocks mid-build.
- 3. Inserting Batteries. Check each holder has its batteries in now, before building. Do this yourself group by group so no circuit fails for a missing battery.
- 4. Place the battery holder (B1). Point them to C4 for the battery holder and have them press until it snaps. A loose snap breaks the circuit silently.
- 5. Place wire block (3). Have them connect the number 3 wire from C2 to E2 and check it is seated at both ends before moving on.
- 6. Place the red LED light block (D1). Stop the class here. The plus side of the LED must meet the plus of the battery holder. Reversed, it simply will not light, so check orientation for every group.
- 7. Place the phototransistor block (Q4). Place Q4 across E2 to E4, again watching plus and minus orientation. Remind them it does nothing until light reaches it.
- 8. Lighting Up the Circuit. Shine your torch into each group's phototransistor and let every pupil see the LED come on. Say aloud that the light is completing the circuit.
- 9. Exploration and Conclusion. Let them rebuild and vary the circuit. Move between groups asking what they think each block does and what happens when the light is removed.

### WHAT TO WATCH FOR

- Students may think: Pupils think an LED will light either way round, so they ignore the plus and minus markings. What to do: Show two identical builds, one correct and one reversed, and let them see only one lights. Make orientation the thing they check first when nothing happens.
- Students may think: Pupils expect the LED to be on the moment the circuit is built, before any light reaches the phototransistor. What to do: Ask what the phototransistor needs to do its job. Cover it, then shine the torch, so they see the light itself is what turns the circuit on.
- Students may think: Pupils assume a block that is resting in place is connected, when it has not snapped down. What to do: Have them press each block until it clicks and gently tug-test it. Treat a dark LED as a loose-snap check before anything else.

### DIFFERENTIATION

- Emerging: Pre-place the battery holder and wire for this pupil so they start from step 6 with the LED. Point to the exact grid squares by name as they work.
- Developing: Let them build unaided but ask them to name the plus and minus side of the LED before you shine the torch, so orientation becomes a habit.
- Proficient: Once their circuit works, challenge them to predict and then test what happens when the phototransistor is covered, and to explain why to a partner.