**Building circuits (1)**

A practical activity to make electric circuits from pictures.

**Apparatus and materials**

* X2 1.5 V battery in holder
* x2 2.5 V bulb in holder
* x4 connecting leads

**Procedure**

1. Set up each circuit.
2. Write down how bright the bulbs are compared to bulb 1.

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| --- | --- | --- |
| **Circuit 1** |  | **Circuit 2** |
| **Bulb 1** lights up |  | Compared to **bulb 1** this bulb is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **Circuit 3** |  | **Circuit 4** |
| Compared to **bulb 1** these bulbs are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  | Compared to **bulb 1** these bulbs are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

*Physics > Big idea PEM: Electricity and magnetism > Topic PEM1: Simple electric circuits > Key concept PEM1.1: Making circuits*

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| **Response activity** |
| **Building circuits (1)** |

**Overview**

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| --- | --- |
| Learning ofocus: | Electric circuits are represented using circuit symbols and specific circuit diagram conventions. |
| Observable learning outcome: | * Build simple circuits from pictures or demonstrations |
| Activity type: | Response, application and practice, practical experiment |
| Key words: | electric circuit, circuit symbol, connecting wire, battery, bulb |

This activity can help develop students’ understanding by addressing the sticking-points revealed by the following diagnostic question:

* Diagnostic question: Circuit from a picture

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| **P** | **PRIOR UNDERSTANDING**  This activity explores ideas that are usually taught at age 5-11, to aid transition from earlier stages of learning. |

**What does the research say?**

Building complete circuits is an idea that many students have seen earlier in their learning, but if this is their first experience of electric circuit work in a new school then unfamiliar equipment and surroundings will impair their ability to recall what they know (Solomon, 2000).

Students generally set up circuits correctly if they approach circuit building in a systematic way. E.g. starting at one point in the circuit and connecting each component or wire in order, going clockwise or anti-clockwise from that point. However if students always start at the battery then this may reinforce the misunder that electric charge originates at the battery and moves sequentially through each component in turn. Starting with different components each time mitigates this concern.

**Ways to use this activity**

This practical activity gives students the opportunity to build circuits from pictures and describe what happens in the working circuits. Each individual student needs to construct the circuits, so if they are working in pairs they need to take turns.

Observing individual groups as they work often highlights any difficulties they might have. These can often be overcome, through a whole class clarification or redirection part way through the activity.

*Differentiation*

This response activity: Building circuits (1) may be used as part of a series of practical activities with the response activities: Building circuits (2) and Drawing circuits. Students can work through these at a pace appropriate for them.

**Equipment**

For each student/pair/group:

* x2 1.5 V battery in holder
* x2 1.25 V bulb in holder
* x4 connecting leads

**Technician note**

It is good practice to regularly check that electrical components are in good working order, and to have a system for collecting in damaged components as they are found to facilitate this.

**Health and safety**

**Mains electricity:** students should be reminded that wires should never be pushed into electrical sockets. It should be made clear to them that mains supply can kill.

If there are students in your class who are at risk of ignoring this advice, then it is advisable to turn off the power to the electrical sockets in your room.

Practical work should be carried out in accordance with local health and safety requirements, guidance from manufacturers and suppliers, and guidance available from CLEAPSS.

**Expected answers**

Circuit 2 bulb is much brighter than bulb 1. Circuit 3 bulbs are the same brightness as bulb 1. Circuit 4 bulbs are dimmer than bulb 1.

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

Images: EPSE

**References**

Solomon, J. (2000). Electricity and magnetism. In Sang, D. (Ed.), Teaching secondary physics (pp.139-186). London: John Murray (Publishers) Ltd.