**Building circuits (2)**

A practical activity to make electric circuits from circuit diagrams.

**Apparatus and materials**

* X3 1.5 V battery in holder
* x2 2.5 V bulb in holder
* x5 connecting leads
* ammeter
* motor

**Procedure**

1. Set up each circuit.
2. For each circuit, write down what happens.

|  |  |  |
| --- | --- | --- |
| **Circuit 1** |  | **Circuit 2** |
|  |  |  |
|  |  |  |
| **Circuit 3**  M |  | **Circuit 4**  A |
|  |  |  |

*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 (2)** |

**Overview**

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| Learning focus: | Electric circuits are represented using circuit symbols and specific circuit diagram conventions. |
| Observable learning outcome: | * Interpret circuit diagrams to build series circuits |
| Activity type: | Response, application and practice, practical experiment |
| Key words: | electric circuit, circuit symbol, connecting wire, battery, bulb, buzzer, ammeter |

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

* Diagnostic question: Circuit from a diagram

**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 misunderstanding that electric charge originates at the battery and moves sequentially through each component in turn. Starting with different components each time mitigates this concern.

Most students are competent in recognising circuit symbols and using circuit diagrams to answer questions, but difficulties arise whenever students translate a circuit diagram into a real circuit (Gott, 1984).

Being able to interpret circuit diagrams, and to build a circuit successfully, is essential if students are to use electric circuits to develop their understanding of electricity.

**Ways to use this activity**

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

**Equipment**

For each student/pair/group:

* x3 1.5 V battery in holder
* x2 2.5 V bulb in holder
* x5 connecting leads
* ammeter
* motor

**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 1 lights up when the switch is pressed (closed). Circuit 2 both bulbs light brightly, and equally as bright as each other. Circuit 3 the motor spins. Circuit 4 the bulb lights and the ammeter shows the size of a current when the switch is pressed (closed).

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

Images: EPSE

**References**

Gott, R. (1984). *Electricity at age 15: a report on the performance of pupils at age 15 on questions in electricity*. London: Dept. of Education and Science, Welsh Office, Dept. of Education for Northern Ireland.

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