**Testing components**

When we use electric circuits a few wires and bulbs can get broken. A few batteries may also stop working.

**Apparatus**

* student sheet ‘Testing components’
* 1.5 V battery
* 1.25 V bulb in holder
* x4 connecting leads

**How can you quickly test all the components before you use them?**

|  |  |
| --- | --- |
| Draw a **picture *or* a circuit diagram** to show how you can test each component. | **Describe** how each tester works. |
| Bulb tester |  |
|  | |
| Wire tester |  |
|  | |
| Battery tester |  |

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

|  |
| --- |
| **Response activity** |
| **Testing components** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | An electric circuit is a closed conducting loop containing a battery. |
| Observable learning outcome: | * Describe how a simple circuit can be used to test for faulty components, and trace the circuit through components to identify breaks in the conducting loop |
| Activity type: | Response, application and practice, practical experiment |
| Key words: | complete circuit, electric circuit, component |

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

* Diagnostic question: ‘Bulb in a circuit’

**What does the research say?**

Students often have problems investigating and understanding electric circuits because they cannot get them to work in class. This wastes a lot of time and can cause confusion.

When given a bulb, battery (not in holders) and a connecting wire, many 8-12 year olds, and many older students too, cannot make the bulb light up (Shipstone, 1985). These students typically treat the bulb as a *one-terminal sink* and connect the wire only one connection point. Usually the one on the end of the bulb.

Whilst most students can identify a complete circuit from a picture or a circuit diagram (Gott, 1984), this activity develops understanding of how current needs to flow *through* the components as well as through the wires, and supports the scientific model for the conservation of current.

This activity develops students’ competencies in building and testing circuits that will help them to construct circuits more successfully when they are investigating the more challenging aspects of electricity later on.

**Ways to use this activity**

This practical activity gives students the opportunity to practise applying their understanding and to clarify their thinking through discussion. To support this, students should complete the practical in pairs or small groups.

Students should experiment with the equipment to find a quick way to test if each type of component, or wire, works. Students decide whether a picture or a circuit diagram is the most effective way to communicate what they have done. They should also describe what they have done and how each of their ‘testers’ works.

After students have worked out how to test components, you could give them a set of bulbs, wires and batteries that include some that do not work. Students can use their test circuits to find the damaged components and wires.

This is a good time to instigate a ‘damaged component’ box in which to place any damaged components or wires that are found when electric circuit equipment is used.

Following the practical you could discuss with the students what they would do, and in what order, if they had set up a circuit that did not work.

*Differentiation*

If some students are working with a teaching assistant, then a list of prompt questions for the TA could help to make this activity more purposeful. Some students may benefit from being challenged to plan and organise their own record keeping.

**Equipment**

For each student/pair/group

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

For the class:

* A set of wires, bulbs and batteries to test – some of which are broken or ‘flat’. (This could be a whole class set, with some broken components added, for students to share.)

**Technician notes**

Electric circuit components and connecting wires are often damaged and this can get in the way of the practical work.

For this practical it is necessary to have some ‘broken’ batteries, bulbs and wires for students to identify through testing.

It is good practice to have components checked regularly, and to have a system for collecting in damaged components as they are found. The ‘broken’ components could be collected in such a box at the end of the practical experiment.

**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**

|  |  |
| --- | --- |
| Bulb tester | If the bulb lights it is working.  Test the wires and battery first to make sure they are working.  (NB with some types of battery and bulb holders it is possible to test the bulb without using wires by placing the base of the bulb holder on top of the battery connections – this is a quicker method) |
| Wire tester  Test wire | If the bulb lights with the test-wire then the wire is working.  Test the battery and bulb first to make sure they are working. |
| Battery tester  Test battery | If the bulb lights with the test-battery then the battery is working.  Test the wires and bulb first to make sure they are working. |

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

**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.

Shipstone, D.M. (1985). Electricity in simple circuits. In R. Driver (Ed.), Children’s ideas in science (pp. 33-51). Milton Keynes: Open University Press.