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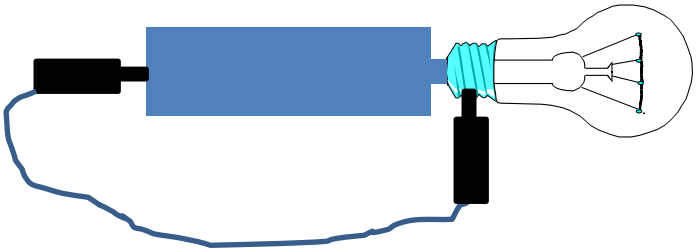
Task 1- light a lamp

1. **Try to light a small lamp using the minimum amount of equipment. Draw what you did in your jotter.**
2. You ought to be able to use just 3 pieces of equipment.
   For example:
   i. *a wire, lamp holder, lamp, batter battery holder etc.*
   ii. *Each of these counts as one piece of equipment*

3. If you use two wires, this counts as two pieces of equipment, a lamp holder or battery holder also counts as an extra piece of equipment.

4. **Draw a large diagram showing how you lit the lamp.**



NB the terminals of the lamp are on the bit at the bottom that sticks out and the sides. If both were on the sides current would not pass into the filament! Please draw the students attention to the connectors for the lamp

5. *NOTES: It is awkward having to cope with small fiddly equipment so we put the lamp and battery in holders.*
6. *Remake your circuit so that it is easier to use (ie add a lamp holder and cell holder, notice an additional lead is required).*
7. *Answer the following questions in your jotter.*
   a. *How many pieces of equipment does this use?*
   b. *Draw a diagram of your new circuit.*
8. *The circuit that you have just made can be used as a torch. It will also be used later to find out if materials allow current through them (are they conductors).*
9. *Can you improve it further (depending on the brightness of the lamp, you might want to use another cell) but also add a switch. This should be added so that the switch turns the lamp ON and not OFF*

You could introduce the idea of circuit symbols and why that is better than trying to draw the diagrams that you have been drawing. For example is this diagram anything like the circuits that the students were producing? Put up other diagrams of students with other kit. How would you tell if it was the same circuit? Therefore we introduce a new "language", that of circuit symbol. Issue as a homework exercise. Do not copy these out at school.

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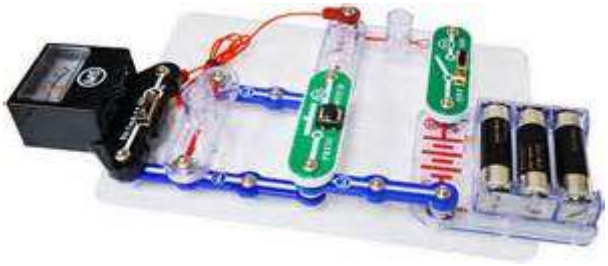
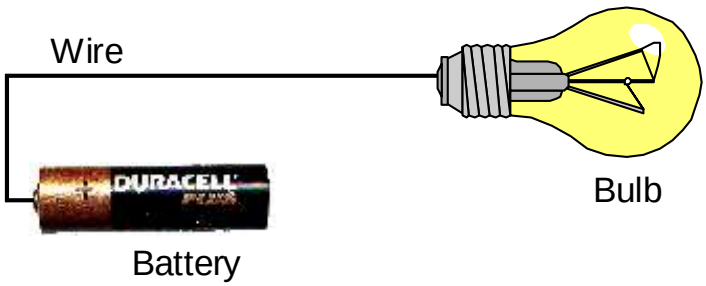
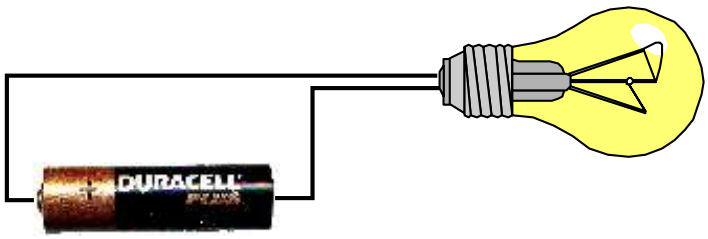
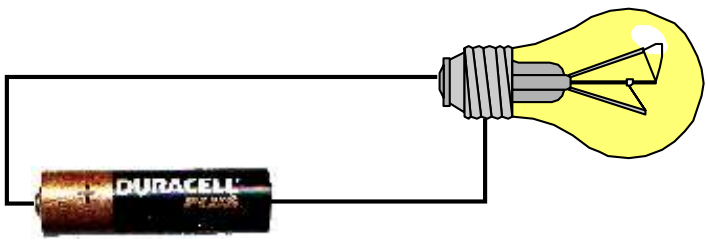


In which of the circuits would the lamp light?

10. *Good conductors of electrical current allow electrons to flow through them easily. Sometimes they bump into atoms in the wire and this slows them down. This braking effect is called the wire's resistance.*
11. *The longer the wire, the more resistance it has.*
12. *A thin wire has a higher resistance than a thick wire. There is a smaller area of wire for the electrons to pass along.*
13. *We will come back and look at resistance in more detail later.*







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ELECTRIC CURRENT
and conductors and insulators

1. Read the following passage together as a class.

When electric charge moves we have an *electric current*. Current will only flow if there is a *complete path for it to follow*. This is known as a *circuit*. You noticed this with the light bulb. It only lit if there was a complete circuit. Electric charge cannot flow through all materials. Current would not flow if one of these materials that electric charge cannot flow through was put in the circuit.

2. If a material, such as copper, lets electric charges move through it, we call it a *conductor*.
An *insulator* does not let electric charges through, for example rubber. This is similar to the conductors and insulators of heat that you met in the first unit.

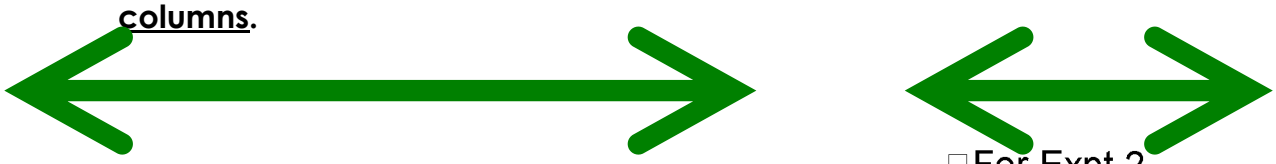
READ

3. Read the following passage together as a class.

You are going to complete TWO experiments to show which materials are conductors of electricity and which materials are insulators of electricity. You already have a good idea of what types of materials you are looking for so try to test some unusual ones.

4. Write the heading in your jotter "Testing materials for Conduction of Electricity"

5. Draw a table out like the one shown. You will need a whole page for the table. You will use this table for <u>two</u> experiments. For the first experiment only fill in the <u>first four columns</u>.



For Expt 2

The first four columns are for Expt 1

1. Material	2. Prediction	3. Does the bulb light?	4. Conductor or Insulator?	5. Current (A)	6. Order (best conductor no 1 etc)

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METHOD

6.

1. **Set up the circuit like the one above.**

YOU MUST THINK SAFELY AND NOT TRY ANYTHING THAT COULD BE DANGEROUS. ASK YOUR TEACHER IF YOU ARE IN ANY DOUBT.

DO NOT PLACE ANY WIRES NEAR OR IN ANY ELECTRICAL SOCKET OR PIECE OF ELECTRICAL APPARATUS.

2. **Choose a material to test.**
3. **Record your material in column 1.**
4. **Predict whether your material is a conductor or an insulator of electricity.**
5. **Fill in column 2.**
6. **Carefully try out your material.**
7. **Fill in columns 3 & 4 for your material.**
8. **Repeat for other materials.**
9. **You should be able to test at least 20 different objects or materials.**

7. **Explain how the light bulb would tell you which objects were the best conductors of electricity.**

READ

8. The experiment that you have just completed is not a very accurate way of measuring how much electricity (electric current) is going round the circuit. The small light bulb that you used can be replaced with a meter which will measure how much current is flowing around the circuit (see the diagram below).

9.

1. Retest all your conductors and insulators using your meter.
2. Fill in the fifth column in the table.
3. From your current readings try to list your objects in order, starting with the best conductor at the top.

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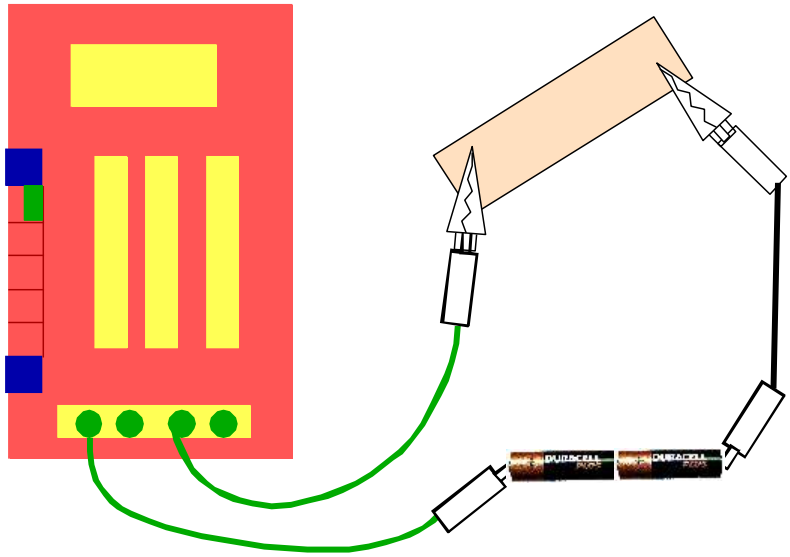
READ

10. The circuit that you built to test whether something was a conductor or an insulator is called a *continuity tester.*

11. Not all conductors are equally good at letting charge through. Some *resist* the current more than others. We say these materials have a high resistance.



12. The meter is called a multimeter and it can be set up to measure *current*, *resistance* or *voltage*. When it is set up to measure *current* we call it an *ammeter*.

13. An *ammeter* is used to measure *current*.

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TESTING FOR FAULTS

Resistance is very low

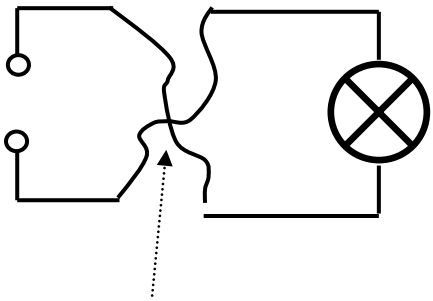
Resistance depends on the size of the resistor.
It can be **low** ⟶ **high**.

Resistance is very very very high

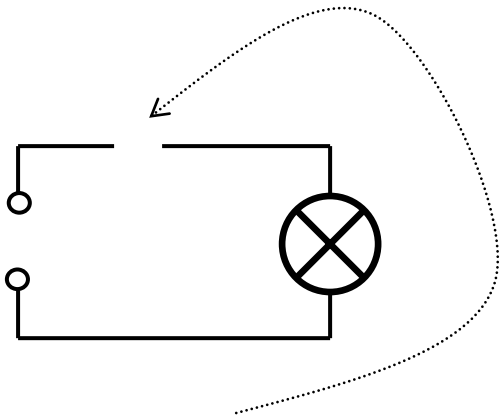
Resistance – a measure of "how hard it is for electric current to flow"
With a **large** resistance – "**hard**" for current to flow
With a **small** resistance – "**easy**" for current to flow

If there is a break in the circuit, there would be a very, very high resistance. (OPEN CIRCUIT)

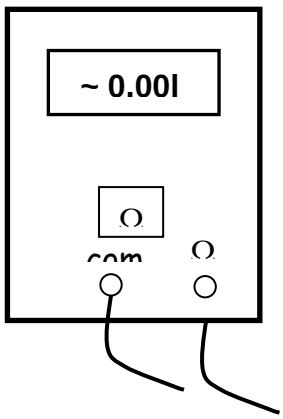
If there was a wire across a component, the resistance across the component would be very low (SHORT CIRCUIT)



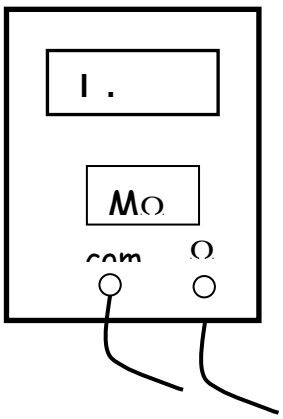
Short circuit



Open circuit



Reads a very low number



Reads a very high number

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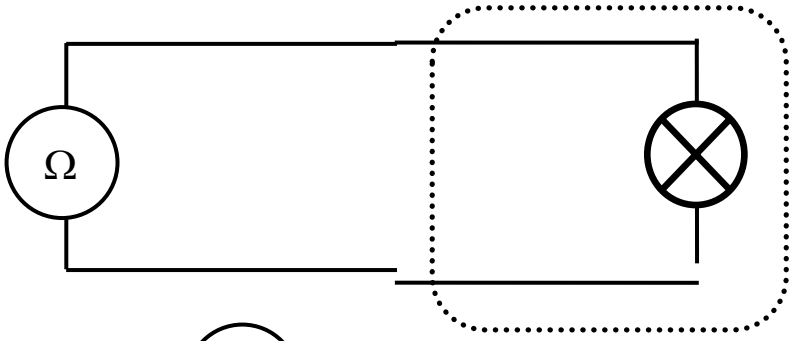
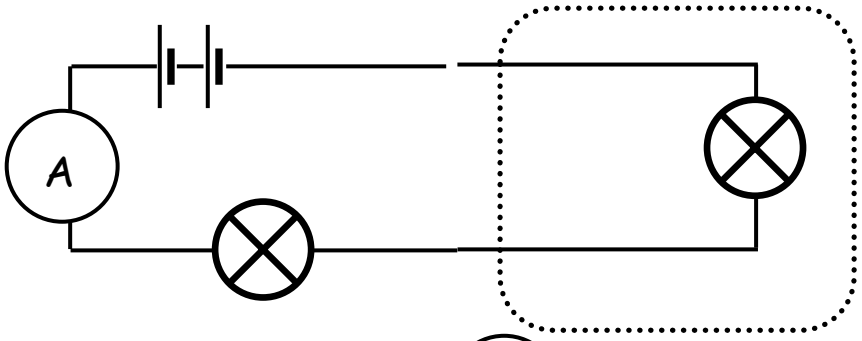


Test continuity with an ohmmeter Ω

Remember the power supply must be off or disconnected before using it.

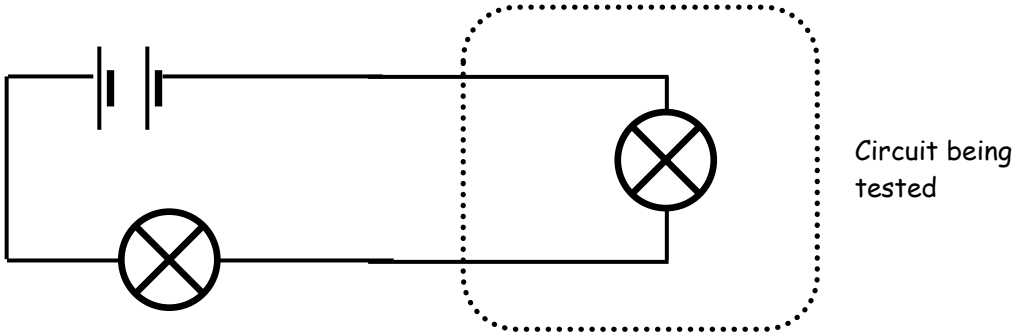
If the bulb is ok, then the ohmmeter will give a small reading. However, if the bulb is "blown" then it will be an open-circuit and there will be a very, very large reading on the ohmmeter.



Make a continuity tester with an ammeter A and bulb.

When connected to the bulb on the right, if there is an open circuit, no current would flow, therefore, 0.00A on ammeter.

Below is a circuit of a bulb and a battery being using as a continuity tester. (This is the circuit that was used in second year.)



Test with a bulb. The bulb would be bright to indicate a short circuit and off to indicate an open circuit.