Electricity Kit EK1

Fitting the batteries
Remove the four case securing screws and set to one side. Carefully lift the case lid and hinge it to one side being careful not to strain the wires. 4 type D cells should be fitted into the holders in the base. The negative end of the cell connects to the coiled spring contact. Once the cells are fitted re-assemble the case.

Using the unit
The unit will supply 1.5, 3, 4.5 or 6V depending on the sockets used. This is the equivalent of 1, 2, 3 or 4 cells.

e.g. Connecting to the black socket (0V) and the 4.5V socket will give 4.5V.
Connecting to the 1.5V socket and the 6V socket will also give 4.5V.

The two lamps and the two switches are independently connected to sockets and may be connected in any way.

Suggestions

Connect one lamp between 0V and 1.5V (2 wires). Can you see the lamp glow?
Move the plug from the 1.5V socket to the 3V socket. Can you see it glow now? Similarly try the 4.5V and 6V sockets. What difference does increasing the voltage make?

Connect a switch in line with the lamp (this will need an extra wire). What happens when you operate the switch? Is the marking 1 on the switch on or off?

Connect the other switch in line (this will need another wire – 4 wires in all). What do you need to do to switch the lamp on?

Remove all the wires and start again. Connect the two lamps, in a line to 6V (you will need 3 wires). How does the lamp brightness compare to 1 lamp? Try 1.5V, 3V, 4.5V and 6V. Is there any brightness that is the same?

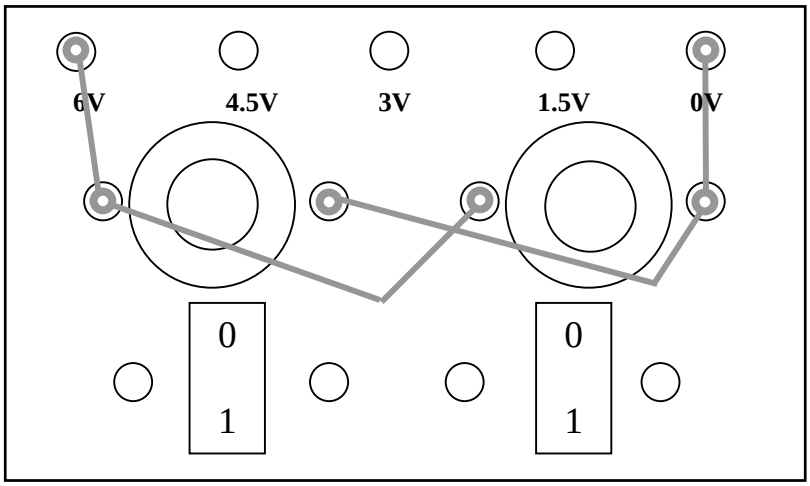
Make a chart and fill it in.

Brightness chart

Voltage	1 lamp	2 lamps series
1.5V		
3V		
4.5V		
6V		

Unscrew one of the lamps. What happens? Screw it back in and unscrew the other lamp. What happens? This is called **series** wiring where the electricity goes through each component in turn. If the circuit is broken in any way everything stops. This is what the switches were doing. A switch breaks the circuit when you switch it off.

Now remove all the wires and start again. Connect two plugs to either side of a lamp. Connect the other ends to the 0V and 6V sockets. Plug another wire into each of the two large plugs and connect the other ends to the other lamp. See below for layout picture.



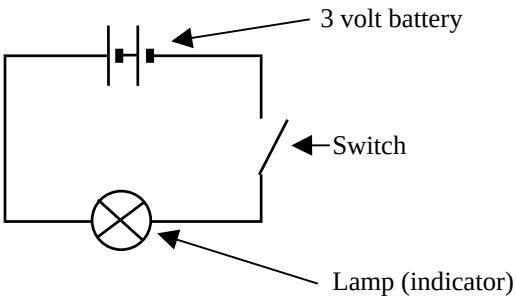
Add a third column to your chart and fill it in. Unscrew one of the lamps. What happens? Screw the lamp back and unscrew the other. What happens?
This is called **parallel** wiring. If you run your finger along the wires you can trace from the battery, through a lamp and back to the other side of the battery. You can do the same with the other lamp. The two lamps are wired independently to the battery. Now using one of the switches and **one** extra wire, connect a switch to turn both lamps off.

Finally, using all six wires can you switch one of the lamps with one switch and the other lamp with the other switch?

Conductors and Insulators
Connect one lamp to 6V. Now remove one end of one of the wires and put a third wire into the socket. Touching the two free ends of the wires together should light the lamp. You now have a simple conductivity meter. Try touching the two free plugs to a variety of objects such as paper, rubber, a pencil lead, an iron nail, a paper clip, wood etc. Make a chart showing which objects allow the lamp to light (conductors) and which do not (insulators). Can you say whether the following are conductors or insulators? Air, brass, steel, gold, cardboard, plastic.

Circuit diagrams.
To make life easier we use a **circuit diagram** to show connections. This means we do not have to draw pictures of components but instead we use symbols.

For example:



N.B. We only use horizontal and vertical lines in circuit diagrams. The lines should go either side of a component.
e.g.