INSTRUCTION MANUAL FOR BASIC ELECTRICITY KIT

The Kit is supplied in two numbers of corrugated trays with cavity in order to keep the all units in an organized manner. The kit is designed to provide basic concepts of electricity. The component is separately mounted on a plastic panel provided with 4 mm sockets. By using 4mm leads the panel may be formed into circuits. It consists of following Components:

1. 20 Bulb holders, Size 60x90mm.
2. 12 Cell holders (without cells)
3. 40 bulbs (4.5V, 0.3A)
4. 12 numbers of 4mm leads, length 10 cm, colour red.
5 12 numbers of 4mm leads, length 10 cm, colour black.
6. 4 numbers of 4mm leads, length 25 cm, colour red.
7. 4 numbers of 4mm leads, length 25 cm, colour black.
8. 4 numbers of Rheostat units, Size 60x90mm.
9. 4 numbers of universal clips, Size 60x90mm.
10. 8 numbers of crocodile clips.
11. 4 numbers of silicon diodes.
12. 4 numbers of fixed resistors.
13. 8 numbers of push switches, Size 60x90mm.
14. 4 numbers of changeover switches, Size 60x90mm.
15. 4 numbers of electrode holders, Size 60x90mm.
16. 8 numbers of iron rods.
17. 12 numbers of carbon rods.
18. 50m copper wire bare 20 swg
19. 50g 'Eureka ' wire bare 34 swg
20. 50m insulated copper wire
21. 1 sheet copper foil, Size 150x150mm
22. 1 Pack steel wool
23. 2 corrugated trays with cavity.

INTRODUCTION

Basic Electricity Kit has been designed keeping in mind the demand for a system which will provide pupils with the apparatus required for elementary work in electricity with flexibility in circuit design. It contains a number of modules connecting with 4 mm plugs leads. By using this kit 8 pupils working in pairs, can work.

KNOW YOUR ELECTRICITY KIT

Module No.1: Bulb Holder

The bulb holder designed to illuminate the bulb after fitting in the bulb holder. It will not be damaged if connected to three cells in series. It will also give adequate brightness when connected to only one cell. Module provided with two number of 4mm sockets.

Module No.2: Cell Holder

A D-type cells can be inserted into the cell holder. It is trouble-free to arrange the multiple cells.

Module No.3: Fixed / Variable Resistor

It can be used either as a fixed resistor or as a part of a rheostat. This component can be incorporated into a circuit by plugging 4 mm connectors into its end. Change in luminous Intensity of a bulb connected in a series can be demonstrated by using this unit. You can remove one of the plugs and use it as a slider produces a simple rheostat "dimmer". This unit provides a range of resistances which may be used in controlling of low voltage motors and lamps.

Module No.4: Push Switch

You can connect this switch in series with the battery. Two numbers of 4 mm plug is required for connection. The switch contact can be maintained by pressing the black knob, whereas contact breaks when pressure is released from the switch.

Module No.5: Universal Clip

This unit is meant to make connection to loose item e.g. diodes, electrodes, length of resistance wires etc. Two numbers of 4mm plugs are required for connection. It is used upright except for metal electrodes, where it can be inverted. For connecting thin wires crocodile clips are used. These clips do not make reliable connection. To overcome this problem, small pieces of aluminum foil can be clipped with crocodile clip.

Module No.6: Electrode Holder

The Carbon rod in the form of graphite conducts electricity, although it is a non-metal. Connect 3 cells in series in cell holder, positive (+ve) end of cell will go to a one electrode plug through a bulb whereas negative (-ve) end with another electrode plug. The carbon rods fit through the holes in the electrode holder, being held in place by the spring clips. Two numbers of 4mm plug leads are required for connection. The two numbers of electrodes may be dipped into the solution whereas the electrode holder provides support across the top of beaker. The carbon rods can be corroded when many of the solutions are used in the electrolysis experiments. The rods plated with metals can be cleaned by washing in a mixture of 1:1 ratio of concentrated nitric acid in water. This experiment should be conducted in a fume cupboard and is followed by a thorough rinsing of rods in distilled water before they are reused.

Module No.7: Changeover Switch

The battery is connected to the centre 'wiper' contact and the current can then be switched to either of two circuits. This type of switch is used to make electricity flow from two different ways depending on the way it is set. If there are two bulbs, three cells and one changeover switch in a circuit, you should be able to light one bulb or the other. If you set the switch in its mid position, neither lamp will light.

Attention: These modules can be used for demonstrating the experiment in a class room to a group of students . For this purpose, modules can be mounted on a magnetic board by using small magnets of size 5x1.5mm(ϕ x t), which are well fitted on four grooves provided on rear side of each modules. Also for this particular need, the name and symbol of each component is printed with large fonts so that it can be viewed from a pretty good distance.

Note: Magnetic board and Magnets are not provided with this kit. Can be provided as an optional.

Other Modules

Diode

Diode are used for analyzing flow of an electric current in one direction. It can be used either forward bias or Revers bias.


Diode

Copper and Eureka Wire

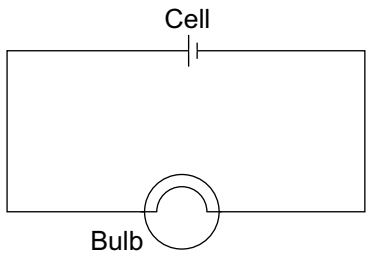
Materials that will allow electricity to pass through them easily are called Conductors. Many materials will not, under normal conditions, allow electricity to pass and these materials are called insulators. The resistance of Eureka wire is more in comparisons to copper wire. If a circuit is formed, using Universal clip, a bulb, three numbers of cells and a push switch, note the brightness of bulb by using copper and eureka wire of same thickness and length. The bulb will show more brightness when copper wire is used in universal clip.

EXPERIMENT 1

Making light in a Dark Room:

The first experiment is to make a light in a dark room by using one cell and one bulb.

Try It: Reverse the cell in the circuit and find does it make any differences.

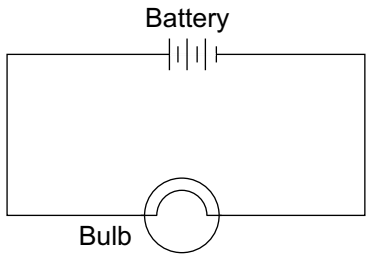


EXPERIMENT 2

Making intense light:

When two or more cells are added in line to make a battery for making the bulb brighter.

Try It: Check your result using with one cell, two cells and finally with three cells. Is their any change on the bulb intensity?

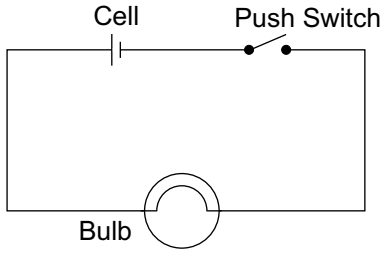


EXPERIMENT 3

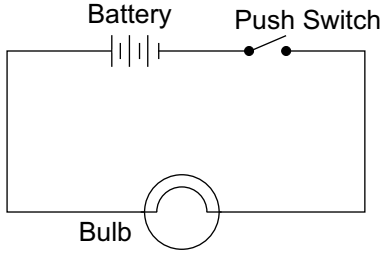
Light Signal:

At this point the student is asked to insert a push switch for making light signal circuit which might attract attention. (See the figure).

Try It: Perform the same experiment for two or more cells so that light signal have greater strength.



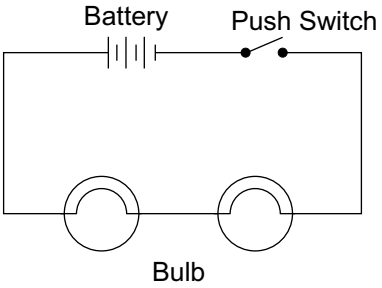
Note: The self releasing (push) switches are used for enhancing the long time battery life during your experiment hours.



EXPERIMENT 4

Series Circuit:

When two or more bulbs are connected in a line so that, bulbs light. While removing one of the bulb, another bulb/bulbs go out known as series circuit.

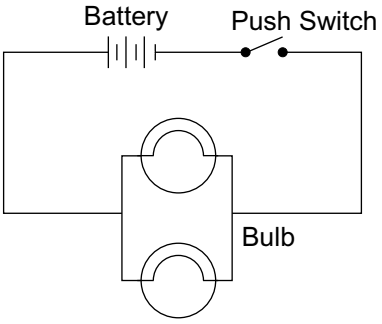


Note: In series circuit the current remain same while the voltage drop across each bulb.

EXPERIMENT 5

Parallel Circuit:

When two or more bulbs are connected as shown in figure. While removing one of the bulb, another bulb/bulbs still stay on known as parallel circuit.

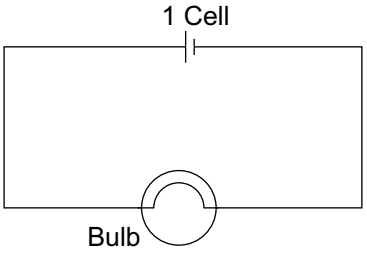


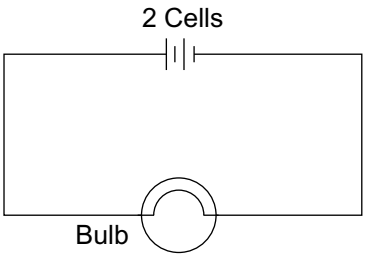
Note: In parallel circuit the voltage remain same while the current drop across each bulb.

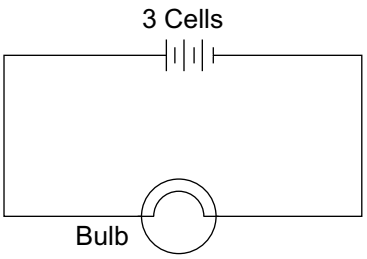
EXPERIMENT 6

Strength of Electric Current:

The brightness of a bulb to measure the strength of current flowing across circuit. These diagrams show the three different reading i.e. Low current, medium current and high current as brightness of bulb varies from dim, medium and brighter respectively while using one cell, two cells and three cells respectively.





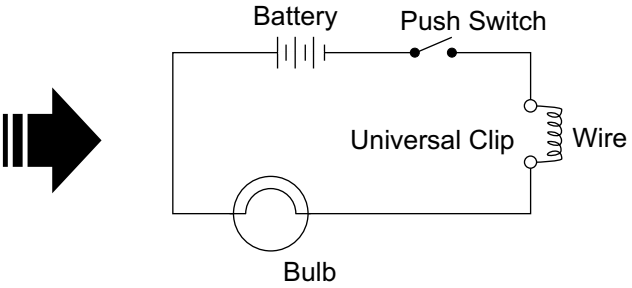


Try It: Repeat the same experiment for series and parallel circuit with push switch and note down the brightness of bulbs using one cell, two cells and three cells.

EXPERIMENT 7

Things under Control:

Take a 1 meter length of copper and eureka wire from reel of 20swg copper and 34swg eureka wire. Connect the wire with the help of crocodile clip and universal clip as shown in diagram. Let check out the brightness of bulb in each case.



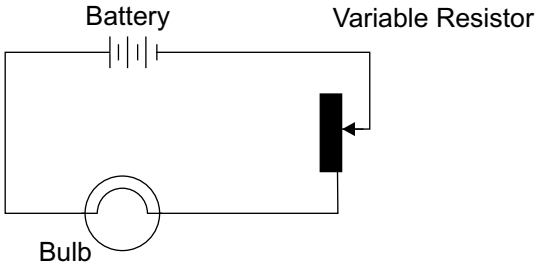
Try It: Repeat the same experiment with fixed resistance and long copper and eureka wire.

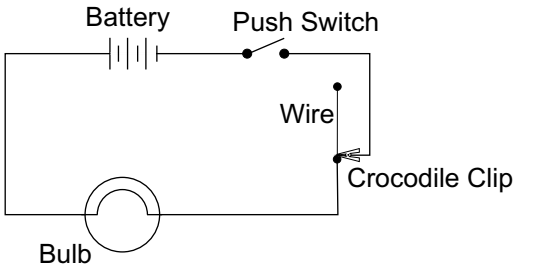
EXPERIMENT 8

Resistance to good use:

To control the brightness of a bulb, use a variable resistor (Rheostat). Make a circuit as shown in the diagram.

Try It: Try the same experiment with different resistance wire using crocodile clip for sliding purpose.



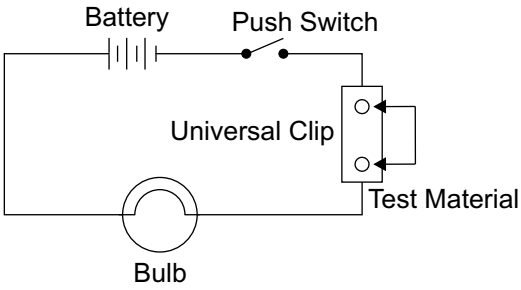


Note: A small electric motor can also be used instead of a bulb.

EXPERIMENT 9

Conductors and Insulators:

In this experiment student will be aware of conducting and insulating materials. If the material placed as shown in diagram, bulb flash light known as Conductors, while no light is insulators..

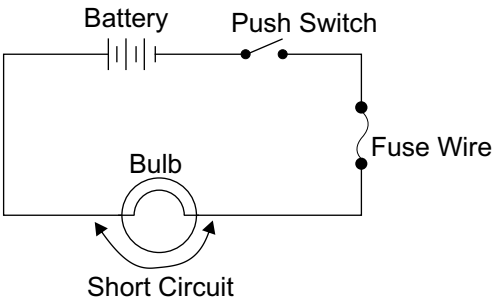


Note: Materials you can try are:
Steel, Glass, Copper, Aluminum, Wood, Paper, Carbon rod, Cotton, Rubber, Perspex, Polythene etc.

EXPERIMENT 10

Thin Wire:

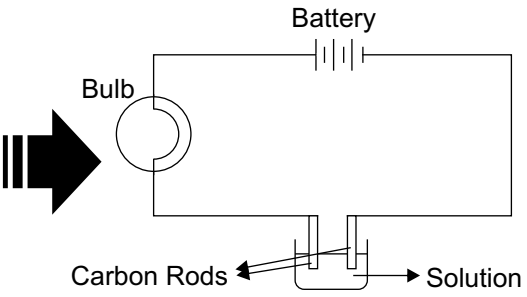
The heating effect of an electric current is established by using thin wire of steel wool. When a small current passes through it in a circuit, the wire become hot while in case of large current it will be broken and act as a fuse. Also check in series and parallel circuit.



EXPERIMENT 11

Conduction of an Electric Current:

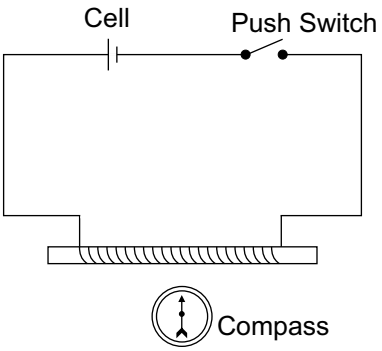
An electrode holder fitted with two carbon rods placed in a beaker having different solution for testing conductivity. Samples of solution can try: Purified water, Tap water, Lemon juice, Dilute Sulphuric Acid, Ethanol, Acetone, Sugar Solutions, Salt solutions etc.



EXPERIMENT 12

Electricity and Magnetism:

For this experiment wind a coil of insulated copper wire round on iron rod for making an electromagnet. Make sure the end of the wire are tripped before you start to wind your coil. With bared end, clipped into universal clip using crocodile clip. A small compass is placed as shown, see what happens when push switch on.



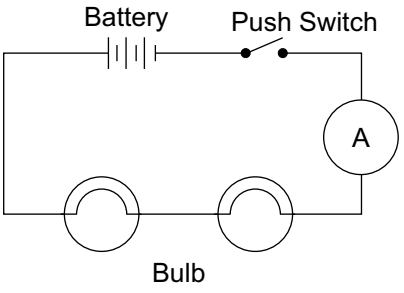
EXPERIMENT 13

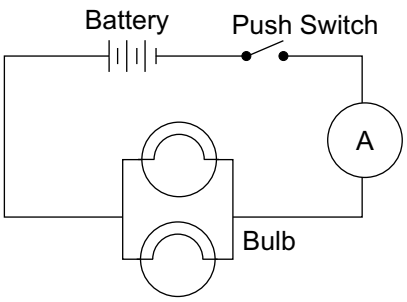
Measurement of Electric Current:

For this experiment you need an ammeter for measurement of electric current through circuit. Place an ammeter in series as shown. Be careful If rechargeable cells are used as these have a much lower internal resistance than do dry cells.

Try It: Repeat the same experiment for series and parallel circuit.

Note: An ammeter is not provided.

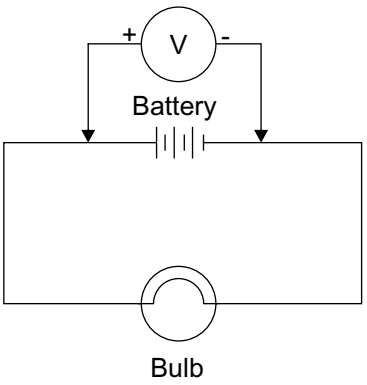




EXPERIMENT 14

Driving force of Battery:

You can increase the driving force of a battery by adding more cells in series, resulting increase of the intensity of bulb. To measure the driving force an instrument called voltmeter, which measure it in Volt. The voltmeter is connected across the battery you wish to measure.

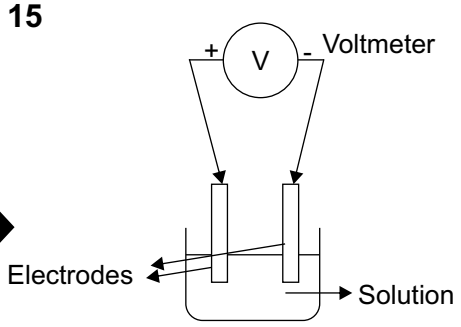


Note: A Voltmeter is not provided with this kit

EXPERIMENT 15

Making and Testing your own Cells:

In this experiment you need a universal clip and crocodile clip to suspend different material in various solutions. You need to set up as shown in this diagram.



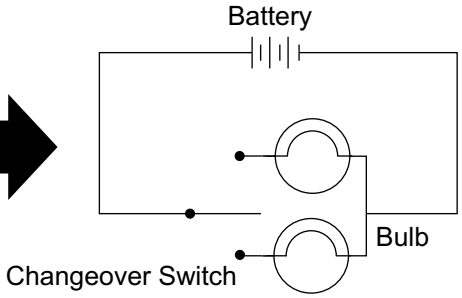
Solution and electrode you can try:
Solutions: NaCl, vinegar, Dil Sulphuric Acid.
Electrode: Cu, Al, Pb, Fe, Zn etc.

Note: Beaker and Voltmeter is not provided.

EXPERIMENT 16

More Advance work with Switches:

In this experiment you need a changeover switch for making an advance experiment. You should be able to light one bulb or other. If you set the switch in its mid position, neither bulb will light.



EXPERIMENT 17

Flow of an Electric Current:

Set up the following circuit Use two numbers of cells, one bulb and one diode. The bulb will glow in forward bias, not in reverse bias. There is too much resistance in reverse bias of diode, therefore bulb does not glow.