EXPERIMENTAL TEST I

Electrical Circuit

Objectives

- To determine electrical circuit inside a blackbox
- To observe the differences between series and parallel circuits

Theory

In electrical engineering, a switch is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of a switch can be operated manually to control the circuits (for example, a light switch or a keyboard button), by a moving object (such as a door-operated switch), and can be operated by some sensing elements such as pressure or temperature.

There are two types of electrical circuits: open circuit and closed circuit. An open circuit is a discontinuous circuit through which no current can flow. Meanwhile, a closed circuit is a circuit without interruption, providing a continuous path through which current can flow.

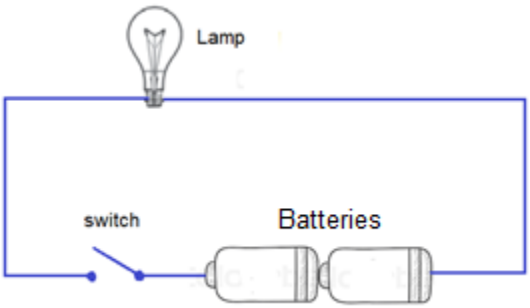


Figure 1. Open Circuit

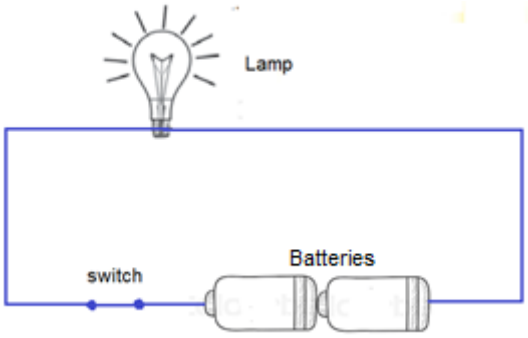


Figure 2. Closed Circuit

You will Need

- ✓ A Lamp
- ✓ 4 toggle switches
- ✓ Batteries
- ✓ Wires

blackbox

What to do

1. Make sure that the blackbox consists of four switches and a lamp.

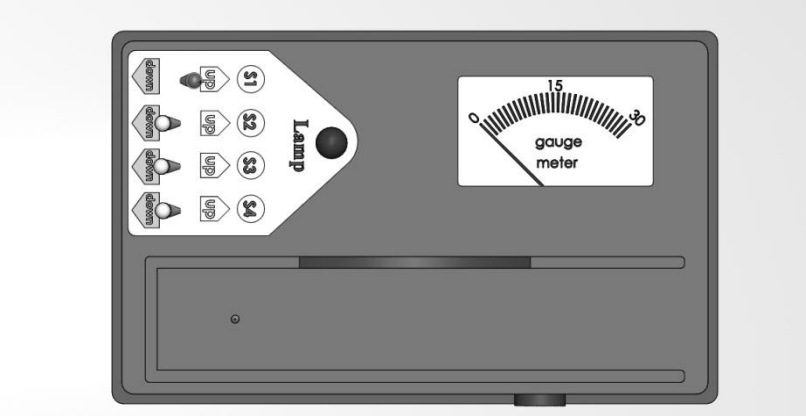


Figure 3. Blackbox

2. Move Switch 1 (S1) to an up position.

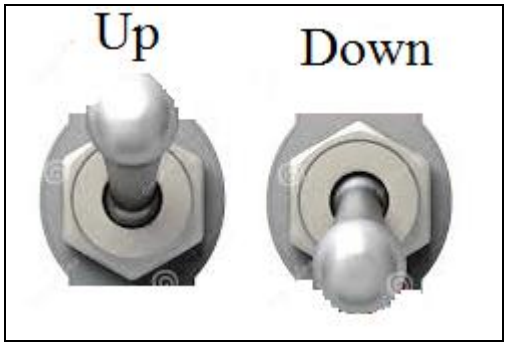


Figure 4. Switch position

3. Observe the lamp condition.
4. Move Switch 1 (**S1**) to a down position.
5. Write down the data in **Table 1**.

Table 1

Switch	Switch Position	Lamp Condition	Switch Position	Lamp Condition
S1	Up		Down	
S2	Up		Down	
S3	Up		Down	
S4	Up		Down	

6. Repeat steps 1-5 by using **S2**, **S3**, and **S4**.
7. Move Switch 1 (**S1**) and Switch 2 (**S2**) to an up position.
8. Observe the lamp condition.
9. Move Switch 1 (**S1**) and Switch 2 (**S2**) to a down position.
10. Write down the data in **Table 2**.

Table 2

Switch	Switch Position	Lamp Condition
S1 and S2	Up	
S1 and S3	Up	
S2 and S3	Up	

11. Repeat steps 7-10 by using (**S1** and **S2**), (**S1** and **S3**), (**S2** and **S3**).
12. According to the data in **Table 1**, draw an electrical circuit diagram when one switch is closed and the lamp is lit up by inserting switch, lamp, battery, and wire.

Circuit 1:

13. According to the data in Table 2, draw an electrical circuit diagram when the two switches are closed and the lamp is lit up by inserting switch, lamp, battery, and wire.

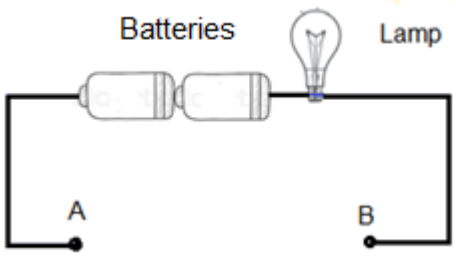
Circuit 2:
Circuit 3:
Circuit 4:

14. Draw an electrical circuit by combining three electrical circuit diagram from **step 13**.

Circuit 5:

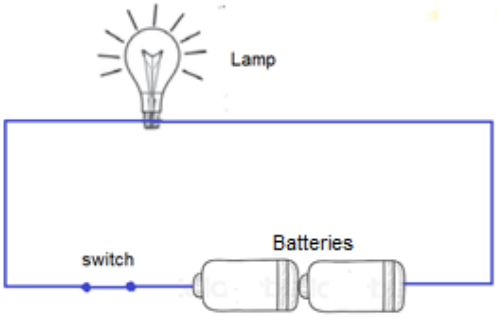
15. Draw an electrical circuit by combining circuit diagrams from **step 12** a**nd step 14**.

Circuit 6:

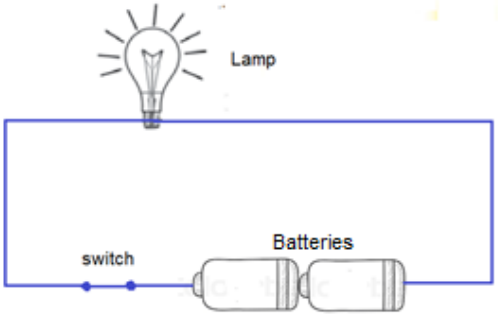


Questions

1. **(1 point)** According to the experimental results, which one is series and parallel connection?
2. **(1 point)** Draw some arrows that represent electrical current on the circuit below



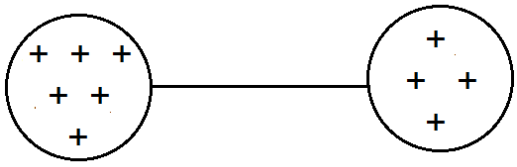
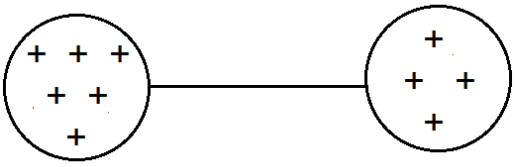
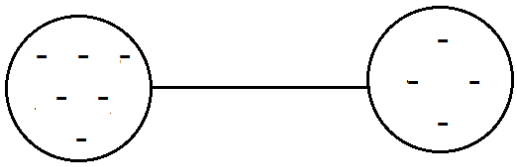
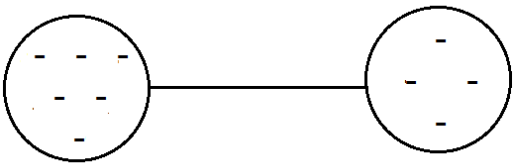
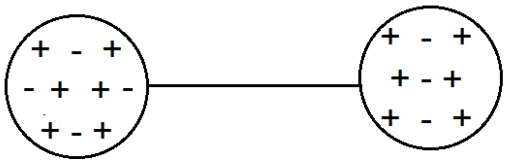
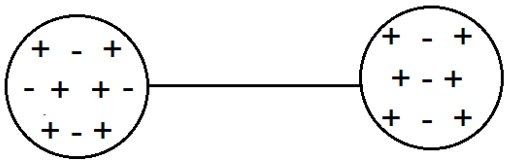
3. **(1 point)** Draw some arrows that represent electron current on the circuit below



4. **(1 point)** The following figure shows schematic diagram of the battery

Which point has higher voltage?

5. **(3 points)** Complete the table below by giving the direction of electrical current and electron current [(+) = positive charge and (-) = negative charge]

	Electrical current direction	Electron current direction
A		
B		
C		

6. **(2 points)** Two charged bodies, 10 C and 30 C respectively, are connected by a conductor. How much is their charge after equilibrium state?

EXPERIMENTAL TEST II

Electrical Conductivity in Certain Vegetables

Some organisms have an ability to conduct electricity. In this experiment, the electrical conductivity in various vegetables; cucumber, eggplant, and carrot will be measured**.**

Objectives

1. To measure electrical conductivity in cucumber, eggplant, and carrot.
2. To measure and compare electrical conductivity in a vegetables based on different electrode distances.

You will need

- Electrical "Blackbox"
- Cucumber
- Eggplant
- Carrot

What to do

1. Take a wire, then plug the base probe to the hole in the Blackbox apparatus.
2. Take a cucumber, then put it on an experiment chamber. Make sure the cucumber is located at the end of closed experiment chamber space. Press the cucumber so that the electrode needle sticks tightly with the cucumber.
3. Plug the tip point probe of red wire into the hole number 1 which is located on the side of an experiment chamber.
4. Write down the value of the gauge meter in Table 1 in your **WORKSHEET**
5. Repeat steps 3-4, to hole number 2, hole number 3, hole number 4, and hole number 5 which are located on the side of an experiment chamber.
6. Discard the cucumber from the experiment chamber, then clean the electrode needle and electrode probe with tissue papers.
7. Repeat steps 2-6 by with egg plant and carrot.
8. Make sure all of your data are written in your **WORKSHEET**.

Questions:

1. **(3 points)** Make a graph based on your data in Table 1. Give a legend in your graph.
2. **(1 point)** Based on your data, which vegetable has the highest electrical conductivity?
3. **(1 point)** On every vegetable tested, which holes number gives the highest value of electrical conductivity?
4. **(2 points)**Why is there a difference of electrical conductivity between different distances of electrode?
5. The table below show the data of water and electrolyte content in each vegetables that is used in the experiment.

Vegetables	**Water content (%)**
Cucumber	95
Eggplant	91
Carrot	87

   a. **(1 point)** Which part of the vegetable that has ability to store the water?
   b. **(1 point)** Mention 3 factors influence electrical conductivity measurement in vegetables?