Physics Investigation 10 Task Sheet

Observation

When a light bulb is connected to a number of charged capacitors, it lights up for different periods of time.

Problem

What does the rate of discharging of a capacitor depend on?

Hypothesis

Aim

Principle

A capacitor can store charge. The capacitance of a capacitor is the capacity of a capacitor to store charge. If a capacitor is charged to a higher voltage, more charge can be stored inside the capacitor. The relationship on the charge stored, capacitance and voltage is as follows:

$Q = C V$ where Q - amount of charge stored
C - capacitance of the capacitor
V - voltage of capacitor

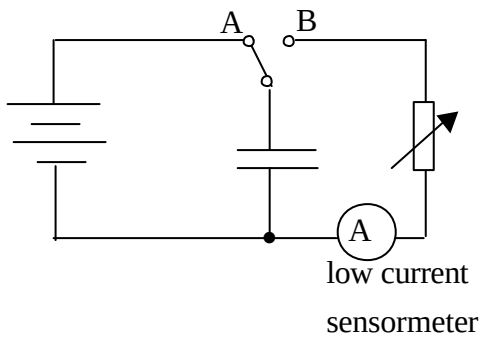
When a charged capacitor is connected across a load, it will give up its charge and energy is dissipated over the load. By measuring the current (rate of flowing of charges) in the discharging circuit, the rate of discharging of a capacitor can be studied.

In this investigation, the following variables are involved :

independent variables : _____

dependent variable : _____

Circuit diagram



Equipment and materials

1. desktop computer x 1
2. datalogging interface x 1
3. low current sensormeter x 1
4. Capacitors of capacitance 1mF, 2mF , 3.3mF , 4,7mF
5. varaible resistor (of resistance range 0 - 100Ω) x 1
6. two-way switch x 1
7. battery (6V) x 1
8. Connecting wires

Procedure

<u>Experiment a</u>

1. Connect the circuit as shown in the diagram above. Choose a 4.7mF capacitor for this part of experiment;
2. Connect the low current sensormeter to the computer via the datalogging interface;
3. Set the variable resistor at 10Ω;
4. Charge the capacitor by switching the position of the switch to A;
5. Then switch the position of the switch to B. At the same time, start recording;
6. Plot a graph of current against time by the computer;
7. Repeat steps 4 - 6 for different values of resistance (30Ω , 50Ω , 70Ω);
8. Compare the graphs obtained.

<u>Experiment b</u>

1. Connect the circuit as shown above. Fix the resistance of the variable resistor at 50Ω;
2. Connect the low current sensormeter to the computer via the datalogging interface;
3. Choose the 4.7mF capacitor;
4. Charge the capacitor by switching the position of the switch to A for short while;

5. Then switch the position of the switch to B. At the same time, start recording;
6. Plot a graph of current against time by the computer;
7. Repeat steps 4 - 6 for different values of capacitance (3.3mF , 2.0mF , 1.0mF);
8. Compare the graphs obtained.

Precautions

1. Charge the capacitors to the same voltage each time;
2. Check the polarity of the capacitors before making the connections;.
3. Make sure that the capacitors are fully charged before discharged. This can be easily achieved by not adding any resistor to the charging circuit;
4. Choose a suitable time for recording for each discharging process. Some trials are needed before the best time can be found;
5. Make sure that the capacitor is fully discharged each time.

Results

Interpretation

Possible errors

Improvement

Conclusion