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Challenge

Capacitor switch

Capacitor

Voltmeter

Ammeter

Bulbs

Generator handle

Switches

Capacitors are components that store electrical energy. They are found in most electrical circuits and appliances, such as computers, radios and camera flashes.

Before you start, think about...

1. What all the switches do
2. Is it hard or easy to turn the handle?
3. Is it always the same- if not, why not?
4. Can you store energy in the capacitor for later use?

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Experiment 1

1. Turn all the switches **off**. Now turn the generator handle and switch on one light bulb. Next switch on two, then three light bulbs.

Can you feel a difference? How do you know that you are using energy to light the bulbs?

More light bulbs makes it harder to turn the handle. More energy is needed to light the bulbs more energy is required to turn the handle

Experiment 2

2 a) Switch the capacitor **on** and all the light bulbs **off**.

Now charge the capacitor by turning the generator handle until the voltmeter reads **4V**.

Switch on one bulb and measure how long it remains lit.

Record in the table below.

Repeat this process using two and three bulbs.

	1 Bulb	2 Bulbs	3 Bulbs
Time (s)	approx. 30s	approx. 15s	approx. 10s

b) The energy stored in the capacitor is the same each time we charge it to 4V. Why do the timings change when we use different numbers of light bulbs?

More light bulbs require more energy, so the stored energy is used more quickly

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Experiment 3

3 a) Charge up the capacitor to 2V. Switch on all three bulbs at once and time how long they stay lit. Repeat for 4V, 6V ... up to 12V.

Starting voltage (V)	Time 3 bulbs stay lit (s)
2	approx. 0s
4	approx. 10s
6	approx. 18s
8	approx. 24s
10	approx. 30s
12	approx. 36s

b) Plot your results on the graph opposite

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c) Use your graph to describe how the time the bulbs remain lit changes as you increased the voltage.

As the starting voltage increases the time the bulbs remain lit also increases

4. Put the following boxes in order to describe the sequence of events.

Electrical potential energy stored in the capacitor

Heat and light energy in the light bulb

Kinetic energy of the moving generator handle

Electrical energy in the circuit

1) **Kinetic energy of the moving generator handle**

2) **Electrical potential energy stored in the capacitor**

3) **Electrical energy in the circuit**

4) **Heat and light energy in the light bulb**

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5. Plot your results from **Experiment 3** on the graph.

Title: Graph showing the relationship between capacitor voltage and time that bulbs are lit

