

## Tap 128- 2: How many bulbs will a capacitor light?

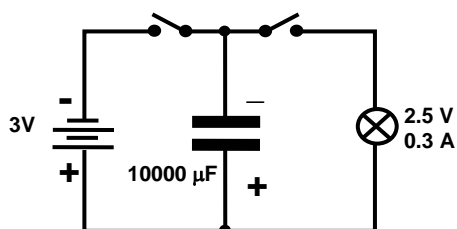
By charging a 10 000  $\mu\text{F}$  capacitor to different voltages and discharging into various numbers of small light bulbs, suggest a relationship between capacitor voltage and the energy it stores.

### Requirements

- ✓ 10 000  $\mu\text{F}$  electrolytic capacitor
- ✓ Locktronics baseboard or similar
- ✓ m.e.s. bulb holders (9)
- ✓ m.e.s. 2.5 V 0.3A bulbs (9 – must be well matched)
- ✓ voltmeter (f.s.d. 10 V)
- ✓ l.t. variable voltage power supply or a set of 1.5 V cells to reach 9 V.
- ✓ connecting leads

### Set up

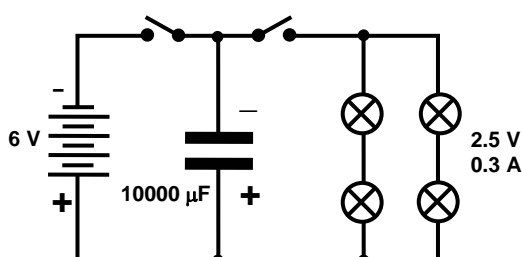
Connect up the circuit shown in the diagram below so that initially the 10 000  $\mu\text{F}$  capacitor is being charged to 3 V.



Now discharge the capacitor into the single light bulb and observe its brightness.

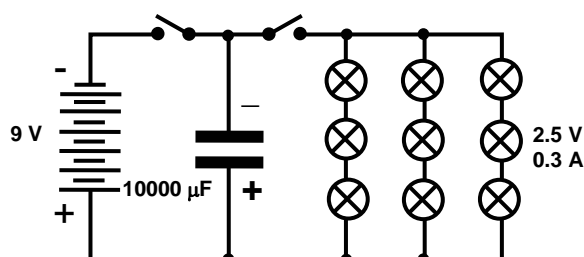
This is to be your 'standard illumination' which to compare the others with.

Charge the capacitor to 6 V and discharge into the four bulbs as shown below.



Observe the brightness of the bulbs. Are they lit about the same as the first?

Finally, charge the capacitor to 9 V and discharge into the nine bulbs as shown in the diagram below.



Observe the brightness of these bulbs compared with your initial standard brightness.

Suggest a relationship between the capacitor voltage and the energy stored.

**Practical advice**

You will need more than nine m.e.s. bulbs in order to get nine that are well matched.

To test for a match, connect all the bulbs in parallel on a board to a supply voltage of 2.5 V and select until all are of equal brightness.

Alternatively measure the m.e.s. bulb resistance with a multimeter and select bulbs with the same resistance.

**External references**

This activity is taken from Salters Horners Advanced Physics, A2, Medium is the Message, MDM Activity 23