

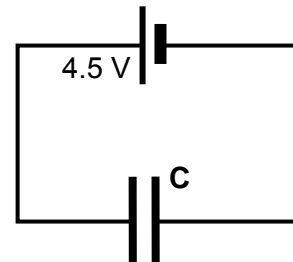
TAP126- 5: Problems on capacitors

Electron charge = -1.6×10^{-19} C

1. What is meant by the capacitance of a capacitor?
2. Define the farad.
3. (a) A capacitor of capacitance $5 \mu\text{F}$ is connected to a 6 V supply. What charge is stored in the capacitor?
(b) A 400 pF capacitor carries a charge of 2.5×10^{-8} C. What is the potential difference across the plates of the capacitor?
4. A capacitor is charged such that there is a charge of $+20 \text{ mC}$ on the positive plate. What is the charge on the negative plate?

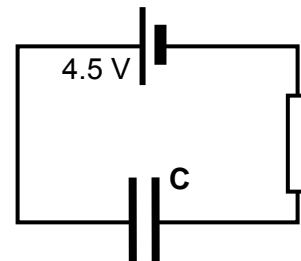
5. A $4700 \mu\text{F}$ capacitor is connected as shown in the circuit diagram. When it is fully charged:

- (a) what is the charge on the positive plate of the capacitor?
- (b) what is the potential difference across the capacitor?
- (c) how many additional electrons are on the negative plate?



6. A resistor of 100Ω is now added to the circuit as shown in the second diagram.

- (a) What effect does this have on the time to charge up the capacitor?
- (b) What is the final charge on the plates?
- (c) What is the final potential difference across the capacitor?



Solution and worked examples

1. The ratio of the charge on the plates of the capacitor to the potential difference across them.

$$C = Q/V.$$

2. The charge required to increase the potential difference across the plates by 1 V.

3. Use $C = Q/V$

(a) $Q = CV = 5 \times 10^{-6} \times 6 = 30 \times 10^{-6} = 30 \mu\text{C}$

(b) $V = Q/C = 2.5 \times 10^{-8} / 400 \times 10^{-12} = 62.5 \text{ V}$

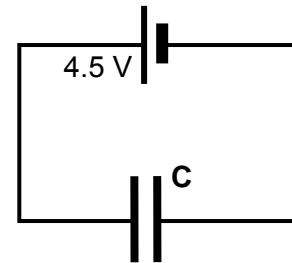
4. - 20 mC equal and opposite.

- 5.

(a) $Q = CV = 4700 \times 10^{-6} \times 4.5 = 0.021 \text{ C}$

(b) 4.5 V

(c) $0.021 / 1.6 \times 10^{-19} = 1.32 \times 10^{17}$

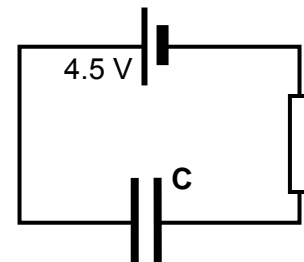


- 6.

(a) it will take longer

(b) it will be the same as before

(c) 4.5 V since no current is flowing finally there will be no potential difference across the resistor whatever its value.



External references

This activity is taken from Resourceful Physics <http://resourcefulphysics.org/>