Capacitors & Capacitance

8.21 Calculate the voltage applied to a 2.00 μF capacitor when it holds 3.10 μC of charge

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Here the voltage across a capacitor is

$$V = \frac{Q}{C}$$

, Q = charge on the plates of the capacitor.
C = Capacitance of the capacitor
V = voltage

$$V = \frac{(3.10 \times 10^{-6}\ C)}{2.0 \times 10^{-6}\ F}$$

$$\boxed{V = 1.55\ V}$$

Capacitors & Capacitance

8.27 A set of parallel plates has a capacitance of 5.0 μF. How much charge must be added to the plates to increase the potential difference between them by 100 V?

Here the capacitance of parallel plate capacitor

$$C = \frac{Q}{V}$$

$$Q = CV$$

$$= (5.0 \times 10^{-6}\ F)(100\ V)$$

$$\boxed{Q = 5 \times 10^{-4}\ C}$$

Current & Resistance

9.23 How many electrons flow through a point ~~charge~~ in a wire in 3.00 s if there is a constant current of $I = 4.00\ A$?

Here we have to know that the current is the change in charge/time

Thus $I = \frac{\partial Q}{\partial T} = \frac{\Delta Q}{\Delta T}$

, where $I = 4.00\ Amps$

$T = 3\ s$

$\Delta T \cdot I = \Delta Q$

$\therefore \Delta Q = (4.0\ A)(3\ s) = 12\ Amps \cdot s$, when $Amps \cdot s = C$

$\boxed{\Delta Q = 12\ C}$

$\because Amp = \frac{C}{s}$

Thus to find the number of Electrons

$Q = N \cdot e$, $N =$ # of electrons

$\frac{Q}{e} = N$

$\frac{12\ C}{1.602 \times 10^{-19}\ C}$

$\boxed{N = 7.49 \times 10^{19}\ electrons}$

Resistivity & Resistance

9.35 Calculate the effective resistance of a pocket calculator that has a 1.35-V battery & through which 0.200 mA flow?

Here we know that

$$V = IR$$

Thus $R = \frac{V}{I}$

$$= \frac{1.35\ V}{(0.200 \times 10^{-3}\ A)}$$

$$\boxed{R = 6750\ V/A}$$