Solutions

Each answer shows the steps, then the **result**.

2.1

$$\tau = RC = (2000\ \Omega)(50 \times 10^{-6}\ \text{F})$$

- $\tau = \mathbf{0.10}$ s

2.2

- zero (the capacitor is fully charged)

2.3

- it slows down (a larger $\tau = RC$)

3.1 B

- RC.

3.2 B

- zero.

3.3

(a)

$$\tau = RC = (10 \times 10^{3}\ \Omega)(100 \times 10^{-6}\ \text{F})$$

- $\tau = \mathbf{1.0}$ s

(b)

- 9.0 V (the supply voltage)

3.4

(a)

- capacitors in parallel add, $C_{\text{eq}} = C_1 + C_2 = 20\ \mu\text{F} + 30\ \mu\text{F} = 50\ \mu\text{F}$
- time constant $\tau = RC_{\text{eq}}$:

$$\tau = RC_{\text{eq}} = (2.0 \times 10^{3}\ \Omega)(50 \times 10^{-6}\ \text{F}) = \mathbf{0.10}\ \text{s}$$

(b)

- at first the uncharged capacitors have no p.d., so the whole 6.0 V is across the resistor; $I_0 = \dfrac{\mathcal{E}}{R}$:

$$I_0 = \frac{\mathcal{E}}{R} = \frac{6.0\ \text{V}}{2.0 \times 10^{3}\ \Omega}$$

- $I_0 = \mathbf{3.0 \times 10^{-3}}$ A (3.0 mA)

(c)

- finally no current flows, so each capacitor in parallel has the full 6.0 V; $Q = C_1 V$:

$$Q = C_1 V = (20 \times 10^{-6}\ \text{F})(6.0\ \text{V})$$

- $Q = \mathbf{1.2 \times 10^{-4}}$ C