

### RC Circuits

**Directions:** Read online textbook pages 746 – 751. Solve the following problems using the GUESS method and proper significant figures. Be sure to show ALL work.

1. A capacitor is made of two charged parallel plates of area A that are separated by a distance d, and it has a capacitance of C.
- a. What happens to the capacitance when the area of the plates is tripled?

$$C = \epsilon_0 \frac{A}{d} = 1 \cdot \frac{3}{1} = 3$$

- b. What happens to the capacitance when the distance is doubled?

$$C = \epsilon_0 \frac{A}{d} = 1 \cdot \frac{1}{2} = \frac{1}{2}$$

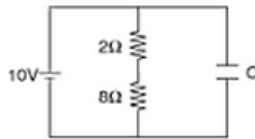
2. A 12 V battery is connected in series to a 3 ohm resistor and an initially uncharged capacitor.
- a. Determine the current in the circuit immediately after the battery is connected to the resistor and capacitor.

$$I = \frac{V}{R} = \frac{12V}{3\Omega} = 4A$$

- b. Determine the current in the circuit a long time later.

A long time later the capacitor is fully charged and acts like a broken wire – current will not flow in a series circuit with a broken wire.

3. A circuit is set up so a 2 ohm and an 8 ohm resistor are in series with each other and in parallel with a capacitor and a 10 volt cell, as shown.



- a. Determine the current in the 2 ohm resistor immediately after the battery is connected to the circuit.

An empty capacitor acts like a wire – in a parallel circuit it is a short circuit – current will not flow through the other segment – so there is no current through the 2 ohm resistor.

- b. Determine the current in the 2 ohm resistor a long time later.

$$R_{eq} = R_1 + R_2 = 2\Omega + 8\Omega = 10\Omega$$

$$I_T = \frac{V_T}{R_{eq}} = \frac{10V}{10\Omega} = 1A$$