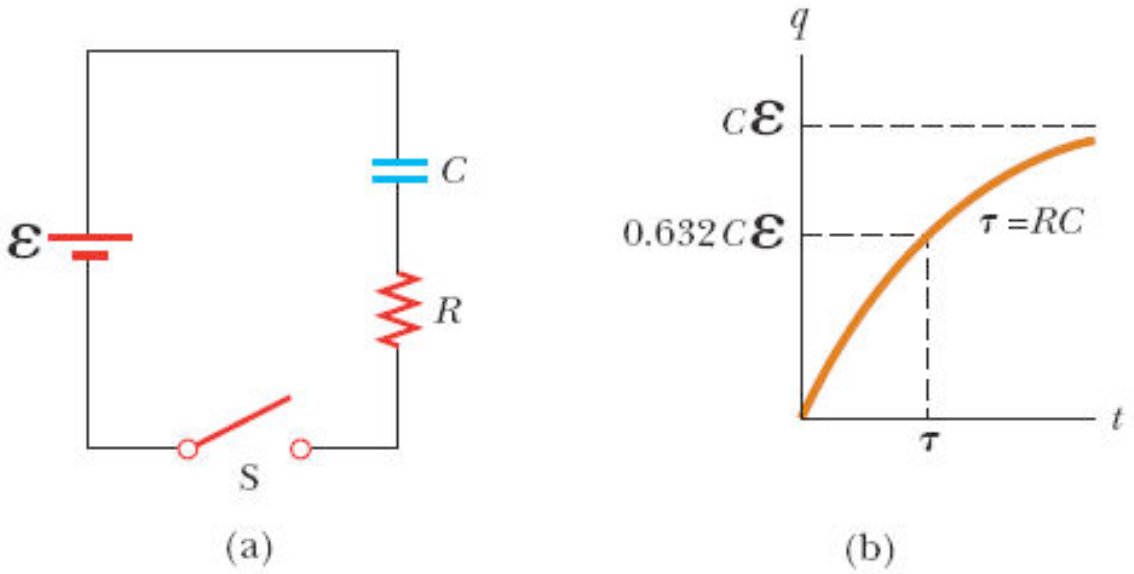
Pretest for Capacitors

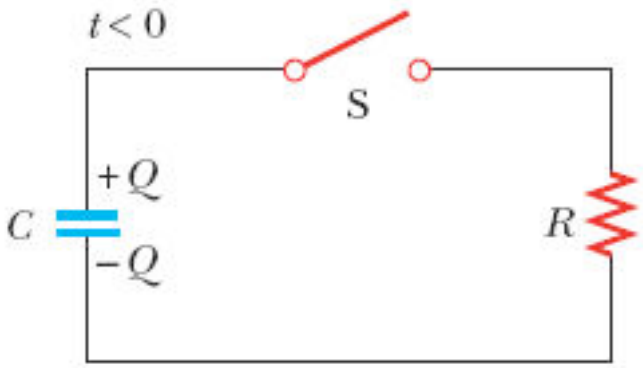
1.) At the moment the switch closes on this freshly connected RC circuit
a. $Q = 0$, $I_o = \varepsilon/R$
b. $Q = C\varepsilon$, $I_o = 0$
c. $Q = C\varepsilon$, $I_o = \varepsilon/R$
d. $Q = 0$, $I_o = 0$



2.) As the capacitor in the RC circuit above reaches its maximum charge:
a. the rate at which the current changes decreases and the rate at which the charge changes increase
b. the rate at which the current changes increases and the rate at which the charge changes increases.
c. both rates decrease.
d. both rates increase.

3.) As the capacitor in the RC circuit above reaches its maximum charge, which of the following statements is FALSE:
a. the voltage across the capacitor is at its maximum.
b. the voltage across the resistor is zero.
c. the sum of the voltages across the capacitor and resistor is equal to the initial voltage across the resistor.
d. the sum of the voltages across the capacitor and resistor is equal to the initial voltage across the capacitor.

4.) A charged 1 mF capacitor is discharged through a 1.00 k-ohm resistor as shown in the diagram. If the original charge on the capacitor is Q, approximately what is its charge 1.00 s after the switch is closed?
a. 0.632 Q
b. 0.500 Q
c. 0.368 Q
d. 0.000 Q



5.) For the circuit shown above, again a 1 mF capacitor is discharged through a 1.00 k-ohm resistor as shown in the diagram. If the original charge on the capacitor is Q, in terms of Q what is the approximate current in the circuit 1 second after the switch is closed?
a. 632 Q
b. 500 Q
c. 368 Q
d. 0 Q

6.) You have a 1 mF capacitor with Q's worth of charge on it. A dielectric whose dielectric constant is 5 is carefully slipped between the plate of the capacitor. Which statement is FALSE.
a.) the new capacitance will equal 5C.
b.) the new charge on the plates is 5Q.
c.) the new voltage across the plates is a fifth what it was.
d.) the new electric field between the plates is a fifth what it was.

7.) Capacitance is:
a. measure in farads.
b. the ratio of the magnitude of the charge on either conductor of a capacitor to the magnitude of the potential difference between the conductors.
c. constant for a parallel plate capacitor.
d. all three choices.

8.) In a circuit, a capacitor has potential difference ΔV, charge Q, and capacitance C. The potential difference is doubled. The capacitance:
a. changes in ways impossible to predict with the given information.
b. doubles.
c. does not change.
d. is divided in half.

9.) To increase the capacitance of a parallel-plate capacitor, you can:
a. increase the area of the plates.
b. increase the distance between the plates.
c. all of these choices.
d. none of these choices.

10.) Given a set of capacitors $C_1 + C_2 + ... + C_n$, where *n* is greater than 1, will a greater equivalent capacitance result by adding them in parallel or in series?

a. in series.
b. in parallel.
c. they will be the same.
d. This cannot be determine without know the value of each capacitor and number of capacitors in the system.

11.) Given *n* capacitors with charge *Q* and capacitance *C*, will you get the greatest energy stored:
a. in series.
b. in parallel.
c. They will be the same.
d. This cannot be determine without knowing more about the situation.

12.) Select the option that best describes a dielectric.
a.) A dielectric is a non-conducting material.
b. A dielectric is the material when placed between the plates of a capacitor will increase the electric field.
c. A dielectric is something that when placed between the plates decreases the capacitance of the capacitor.
d. All of these choices are true.

13.) Bakelite has a dielectric constant approximately twice that of silicone oil. The bakelite in a capacitor with capacitance *C* is replaced with silicone oil. What will the new capacitance be, approximately?
a. 2C
b. C/2.
c. C.
d. Impossible to tell without know the exact capacitances involved.

14.) A capacitor has capacitance *C*, charge *Q*, and potential difference with nothing between the plates. While still connected to a battery, a dielectric is inserted with a dielectric constant of 2. How will each change?
a. $C_{new} = 2C,\ Q_{new} = Q,\ \Delta V_{new} = \Delta V$.
b. $C_{new} = 2C,\ Q_{new} = 2Q,\ \Delta V_{new} = 2\Delta V$.
c $C_{new} = 2C,\ Q_{new} = Q,\ \Delta V_{new} = 2\Delta V$
d. $C_{new} = 2C,\ Q_{new} = 2Q,\ \Delta V_{new} = 2\Delta V$

15.) A capacitor has capacitance *C*, charge *Q*, and potential difference ΔV with nothing between the plates. The capacitor is then disconnected from the battery and a dielectric is inserted with a dielectric constant of 2. How will each of the values *C*, *Q*, and *V* change?
a. $C_{new} = 2C,\ Q_{new} = Q,\ \Delta V_{new} = \Delta V$
b. $C_{new} = 2C,\ Q_{new} = 2Q,\ \Delta V_{new} = \Delta V/2$
c $C_{new} = 2C,\ Q_{new} = Q,\ \Delta V_{new} = \Delta V/2$.
d. $C_{new} = 2C,\ Q_{new} = 2Q,\ \Delta V_{new} = 2\Delta V$

16.) Which of the following best describes the workings of a dielectric inside a capacitor?

a. Either existing dipoles or induced dipoles align with the existing electric field. This induces an electric field in the opposite direction, and creates an induced surface charge on each surface of the dielectric next to the plates.
b. Either existing dipoles or induced dipoles align with the existing electric field. This results in an induced surface charge on each surface, which amounts to an increased effective charge. Since charge and capacitance are directly proportional, this leads to the increase in capacitance observed when dielectrics are inserted
c. Even when existing dipoles are present, only induced dipoles align with the existing electric field. This results in surface charge on each dielectric surface producing an electric field in the opposite direction. This results in a decrease of the potential difference being required to place the same amount of charge on the plates, which leads to a higher capacitance, as expected.
d. Even when dipoles are induced, only existing dipoles align with the existing electric field. This results in surface charge on each dielectric surface producing an electric field in the opposite direction. This results in a decrease of the potential difference being required to place the same amount of charge on the plates, which leads to a higher capacitance, as expected.

Solutions: a, c, d, c, c, b, d, c, a, b, c, a, b, d, c, a.