Phys 222 SI Session #17

Topics: RC Circuits

Intro discussion: What is your favorite breed of dog?

1. An RC circuit is connected across a DC voltage source through an open switch. The switch is closed at t = 0 s. Which of the following is a correct statement regarding this circuit?
   A. The voltage on this capacitor after two time constants is about 100% of its maximum value
   B. The charge on the capacitor after one time constant is about 50% of its maximum value
   C. The charge on the capacitor after one time constant is about 25% of its maximum value
   D. The voltage on the capacitor after two time constants is about 14% of the maximum value
   E. The charge on the capacitor after four time constants is about 98% of the maximum value

2. An uncharged 1 µF capacitor is connected in series with a 23 kΩ, an ideal 7 V battery, and an open switch. What is the voltage across the capacitor 11 ms after closing the switch?

3. What is the time constant of an RC circuit containing two 50 Ω parallel resistors in series with 3 parallel 47 µF capacitors?

4. A light bulb is connected in the circuit shown in the figure with S open and the capacitor uncharged. The battery has no appreciable internal resistance. Which one of the following graphs (to the right) best describes the brightness B of the bulb as a function of time t after closing the switch?

5. Two capacitors with capacitances 4.0 mF and 6.0 mF are connected in parallel with a real battery with EMF 9.0 V and internal resistance 1.0 Ω. Initially the capacitor plates have zero charge. What is the current flowing from the battery, in A, 4.0 ms after the circuit is connected?

6. For the circuit shown in the figure below, the switch S is initially open and the capacitor voltage is 80 V. The switch is then closed at t = 0. What is the voltage across the capacitor, in V, when t = 20 s?