



PHYS 1444 – Section 02

Lecture #13

Tuesday Mar 22, 2011

Dr. Andrew Brandt

- Chapter 26
 - RC Circuits
- Chapter 27
 - Magnetism

HW6 Ch 26 is due Thurs. Mar. 24
@10pm

***Test 2 will be Thurs April 14 on Ch
26-29***



RC Circuits

- Circuits containing both resistors and capacitors

- RC circuits are used commonly in everyday life

- Control windshield wiper
- Timing of traffic light from red to green
- Camera flashes and heart pacemakers

- What does an RC circuit look like?

- There should be a source of emf, capacitors and resistors

- What happens when the switch S is closed?

- Current immediately starts flowing through the circuit.

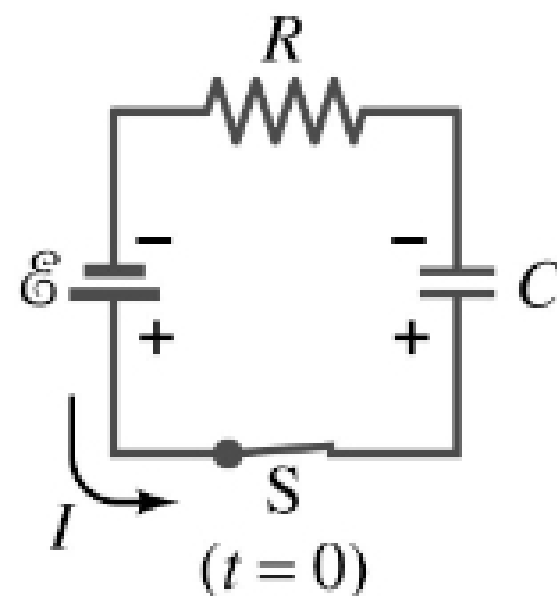
- Electrons flow out of negative terminal of the emf source, through the resistor R and accumulate on the upper plate of the capacitor

- The electrons from the bottom plate of the capacitor will flow into the positive terminal of the battery, leaving only positive charge on the bottom plate

- As the charge accumulates on the capacitor, the potential difference across it increases

- The current reduces gradually to zero -- at that point the voltage across the capacitor is the same as that of the emf

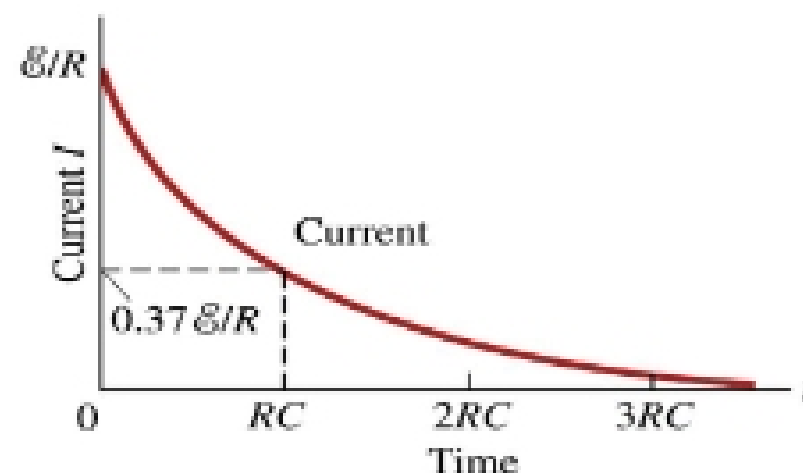
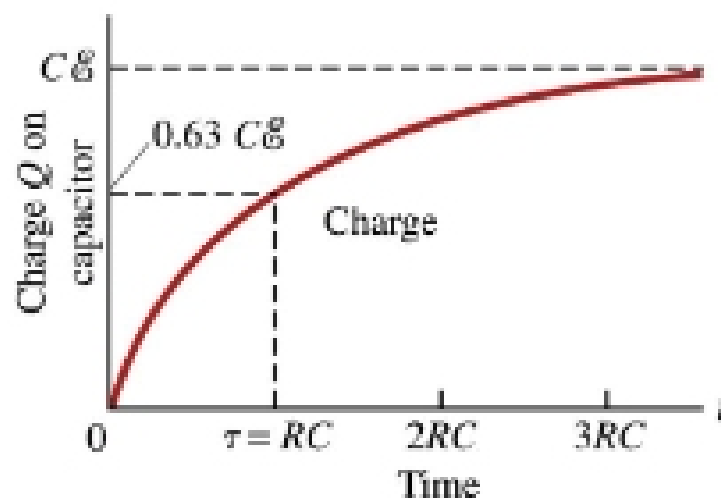
- The charge on the capacitor increases until it reaches to its maximum $C\varepsilon$.





RC Circuits

- What does all this look like graphically?
 - Charge on the capacitor and current as a function of time



- From energy conservation (Kirchhoff's 2nd rule), the emf ε must be equal to the voltage drop across the capacitor and the resistor
 - $\varepsilon = IR + Q/C$
 - \mathcal{R} includes all resistance in the circuit, including the internal resistance of the battery, I is the current in the circuit at any instant, and Q is the charge of the capacitor at that same instant