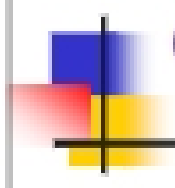
Physics 202
Chapter 32 continued
Oct 30, 2007



Induction:

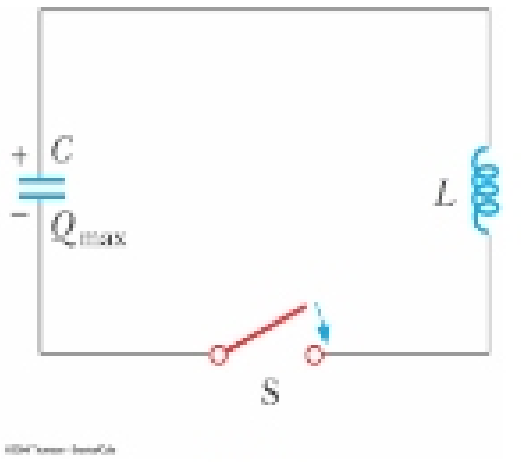
LC circuit, RLC circuit

On whiteboard

- LC circuit
  - Solve Kirchhoff's equation
  - Harmonic oscillator
    - Discussion
    - analogy to mass spring system
    - Energy
- RLC circuit
  - Solution
  - Demonstration with a weakly damped RLC circuit

LC Circuits

- Assume the capacitor is initially charged and then the switch is closed
- Assume no resistance and no energy losses to radiation
- The current in the circuit and the charge on the capacitor oscillate between maximum positive and negative values
- With zero resistance, no energy is dissipated.

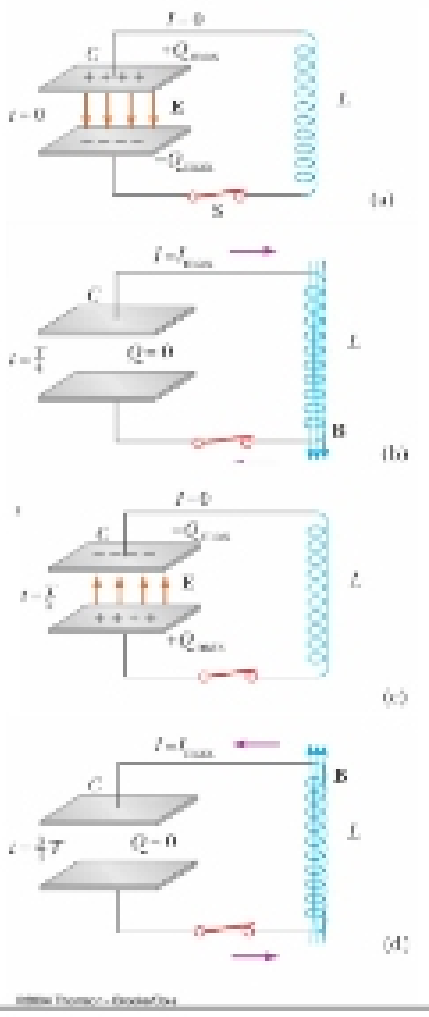


- Kirchoff's loop rule:

$$-\frac{Q}{C} - L\frac{dI}{dt} = 0$$

Discussion on whiteboard….

Derivation of LC and RLC circuit.



LC oscillator

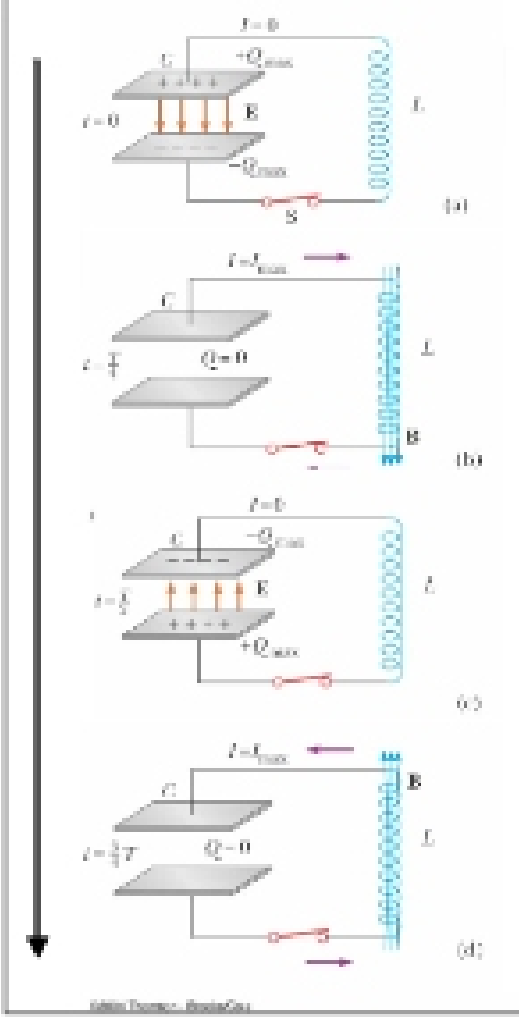
- Initially energy stored in the electric field in the capacitor

$$U = \frac{Q^2}{2C}$$

- Then energy transferred to B-field

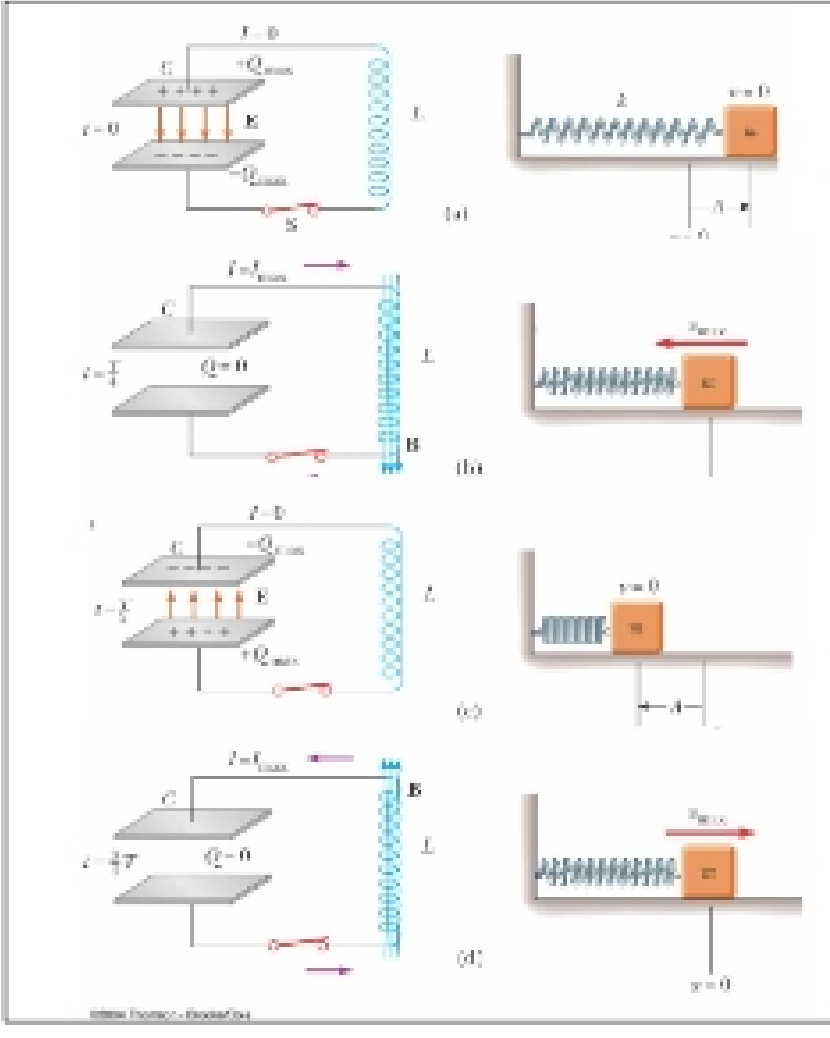
$$U = \frac{1}{2}L \cdot I^2$$

- And so forth ….



LC oscillator

Time [T]	Q [Q_{Max}]	I [I_{Max}]
0	1	0
1/4	0	1
1/2	-1	0
3/4	0	-1
1	1	0



Analogy to mechanical harmonic oscillator