

My Lectures from : Purcell Chapter 6

Web Notes : Lecture Notes #6

Other Notes: Magnetic Fields; Source B Field

Purcell Problems:

- 6.04 Bent wire
- 6.05 Three wires
- 6.08 Wire bent in right angle
- 6.12 Strange bent wire
- 6.16 Power of superposition
- 6.17 Solenoids
- 6.22 Magnetic torque
- 6.25 Vector potential given a field
- 6.26 Vector potential for a wire
- 6.32 Cathode ray tube

- 1. Transformation of fields** - A very large sheet of charge lies in the x-y plane of frame F. The charge per unit length is σ . In frame F', this sheet moves to the right with speed v.
 - (a) What is the electric field in the rest frame F (above and below the sheet)?
 - (b) What is the electric field in the frame F' (above and below the sheet)?
 - (c) What is the magnetic field in the frame F' (above and below the sheet)?
 - (d) Show that the results of (b) and (c) are consistent with the Lorentz transformations for electric and magnetic fields (Eq 60 of Purcell Chapter 6)

- 2. Electric and magnetic forces** - Two infinite lines of charges with charge per unit length λ_0 in their rest frame are separated by a distance d. These charges are moving in a direction parallel to their length with speed v.
 - (a) In the rest frame, what is the electric force per unit length that the top line feels due to the bottom line? Give both direction and magnitude.
 - (b) Repeat (a) in the lab frame.
 - (c) In the lab frame, what is the magnetic force per unit length that the top line feels due to the bottom line? Give both direction and magnitude.
 - (d) What is the total force per unit length in the lab frame?