

Physics 4L, Spring 2010 — Problem set 8
Due Tuesday March 30 in class

Wolfson chapter 26, “For Thought and Discussion” question 3, problems 18, 35, 64, 81, and the following additional problems:

1. Wolfson Chapter 26 problem 26, and also determine the potential difference that would be used to accelerate the electrons before they travel into the magnetic field in order to give the maximum electron energy of (b).
2. Wolfson Chapter 26 problem 36, and also find the gravitational force per length on these wires if their mass per unit length is .01 kg/m. Is the magnetic force between the wires stronger or weaker than the gravitational force per length?
3. A mass spectrometer like that shown in Example 26.2 is used to analyze a gas sample suspected of containing Ne, O₂, CO, SO₂, and NO₂. The gas sample is ionized and by a separate measurement it is determined that all ions in the sample have a positive charge equal to $+e$. The accelerating voltage V in the mass spectrometer is 2000 V and the magnetic field is 0.10 T. Ions are detected at distances of 58 cm, 68 cm, and 87 cm from the entrance to the field region. Which gases are actually present in the sample? You can find atomic masses on the periodic table in the back cover of your book and you may neglect the mass of the lost electron.

No self-test problem this week; there will be a cumulative magnetism self-test problem or two with PS9.

There is an equation sheet online (under “Handouts”) that has equations for circuits, currents, and magnetism.