Problem Set 8  
Due: See website for due dates

Chapter 28: Magnetic Fields  
Exercises & Problems: 11, 25, 33, 36, 39, 47, 51, 55

Question A
(i) Although all atoms have moving electric charges, not all materials are magnetic (for example, copper or wood are not magnetic). Why, then, aren't all materials magnetic?  
(ii) A magnet is used to pick-up three paper clips as shown on the right. Explain how the magnet is able to do this?  
(iii) The ability of the magnet to pick-up these paper clips implies that the earth’s gravitational field is very weak compare to the magnetic force of the magnet. Why is this so?

Question B
(i) Can one magnetize a piece of iron by hitting it hard, with a hammer say, along the same direction?  
(ii) The rumor was you could make a magnet by leaving a piece of iron on a train track. The train going over it would magnetize it. Explain your reasoning?

Question C
If a negatively charged particle enters a region of uniform magnetic field which is perpendicular to the particle’s velocity, will the KE of the particle increase, decrease, or stay the same. Explain your answer. (Neglect gravity.)

Question D
An electron is subject to both electric and magnetic fields. The directions of the magnetic and electric fields are shown on the right. 
(i) Sketch the trajectory of a proton if the velocity of is \( \vec{v}(0) = (E/2B)\hat{j} \).  
(ii) Describe the trajectory in terms of the forces acting on the charge.

Question E
(i) Explain how the earth’s geomagnetic field is created? Hint: be sure to include the direction of the earth’s current.  
(ii) Why is Northern Canada bombarded by more intense cosmic radiation (solar wind) than Mexico is?  
(iii) Why do astronauts keep to altitudes beneath the Van Allen radiation belts when doing space walks?