

Problem Set 2Due at *beginning* of class *Wednesday, 19 April 1995***Homework Problems:**

1. If the electrons in one raindrop could be removed from the Earth without removing the protons, by how much would the potential of the Earth be increased?
2. Relate the magnetic field strength of a permanent iron magnet to the value of the Bohr magneton. Include a numerical value as part of your answer.
3. Earth's magnetic field
 - a) Estimate the ohmic decay time for the earth's magnetic field.
 - b) What does your answer in a) suggest about the origin of this magnetic field?
4. Of all the elements, only He, and to a lesser extent H_2 show interesting quantum effects in their liquid state. Give an order-of-magnitude calculation to explain why other liquids (including other noble gases besides He) don't show quantum effects, and are well described by classical (e.g. hard sphere) models. [Hint: some ingredients in your calculations will be binding energies, melting temperatures and the uncertainty principle]
5. Bathyspheres are spherical vessels designed to withstand the pressure at great depths in the ocean.
 - a) How thick must the wall of a 2 meter radius bathysphere be in order for it to safely travel to the deepest parts of the ocean, depth 10 kilometers?
 - b) Would an empty bathysphere float?
6. Invent a problem of your own.