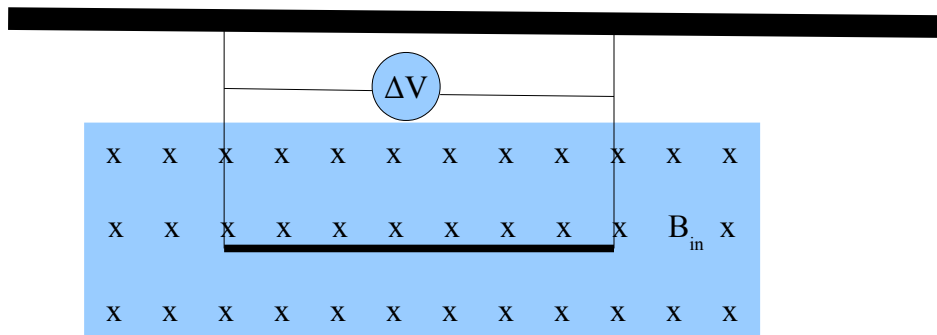


Phys 2201 E&M Homework #12

Due Jan. 26, 2016 by 4pm in dropbox outside 3L24

1. An interstellar dust grain, roughly spherical with a radius of 3×10^{-7} m, has acquired a negative charge such that its potential is -0.15 V. How many extra electrons has it picked up? What is the strength of the electric field at its surface? Suppose its mass is 10^{-16} kg and is in interstellar space where the magnetic field is 3×10^{-6} gauss. How many years will it take to complete a circular orbit?
2. A 50 kV DC power line consists of two wire conductors 2 m apart. When this line is transmitting 10 MW of power, how strong is the magnetic field midway between the conductors?
3. A proton travels with a speed of 3×10^6 m/s at an angle of 32.0° from the direction of a magnetic field of 0.5 T in the +y direction. What are (a) the magnitude of the magnetic force on the proton and (b) its acceleration?



4. A conductor suspended by two flexible wires, as shown in the figure, has a mass per unit length of 0.05 kg/m. What current must exist in the conductor in order for the tension in the supporting wires to be zero when the magnetic field is 3.80 T into the page? What is the required direction for the current?
5. In the figure below, the cube is 80.0 cm on each edge. Four straight segments of wire: ab , bc , cd , and da form a closed loop that carries a current $I = 6$ A, in the direction shown. A uniform magnetic field of magnitude $B = 0.15$ T in the positive y direction. Determine the magnitude and direction of the magnetic force on each segment.

