HW #2 Due Jan. 28, at 9 am

READING: Next week we will finish up Ch. 16, except for Sections 16-11 and 16-12, and then move on to the first part of Ch. 17.

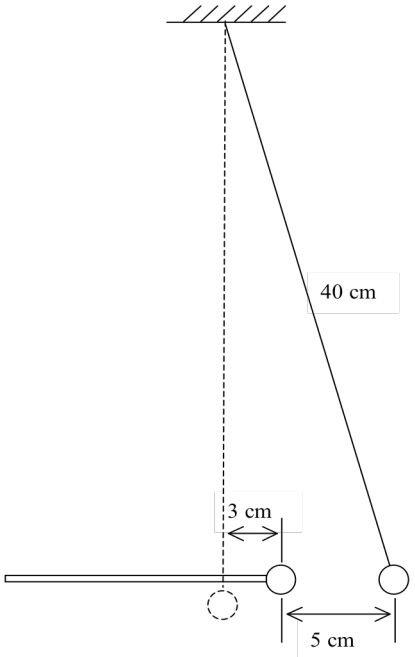
QUESTIONS: Ch. 16 #14, 18, 20 Ch. 17 #2

PROBLEMS: Ch. 16 #23,26, 29, 36, 40, 59 Ch. 17 #4

ADDITIONAL PROBLEMS:

1) An electron is in an electric field with a magnitude of 1.2×10^3 N/C.
   a) What is the magnitude of the force on the electron?
   b) If the field is pointing due south, what is the direction of the force on the electron?
   c) What is the magnitude of the acceleration of the electron?
   d) If the electron starts from rest, how long will it take to reach a speed of 1.2×10^7 m/s?

2) This problem is based on the experiment you did in lab.
   Suppose that a pith ball with a mass of 0.1 g and a charge +Q is hanging from a string that is 40 cm long. A second pith ball with the same charge, +Q, is brought near the first ball and causes it to move 8 cm from its original position, as shown below. The distance between the centers of the two charges is 5 cm.
   a) Determine the charge Q in nanocoulombs (nC).
   b) How many more protons than electrons does each pith ball have?



3) The fundamental unit of charge, *e*, was first measured by Robert A. Millikan in his famous oil drop experiment (1911). In his experiment, a very tiny, charged oil drop was suspended in mid-air by an electric field. The force from the electric field exactly balanced the force of gravity on the drop, so the drop sat motionless. See page 756 for a picture.

Suppose that an oil drop with a mass of 7.86×10^{-15} kg is suspended by a uniform electric field pointing straight down, with a magnitude of 1.605×10^{5} N/C.

a) Is the charge on the oil drop + or -. Explain.
b) What is net charge on the oil drop in coulombs?
c) What is the net charge in terms of the fundamental charge?

Millikan figured out a way to vary the charge on the oil drop and he discovered that sometimes the net charge was *e* (+ or -), sometimes 2*e*, sometimes 3*e*, etc. but it was always an integer multiple of *e.* Although there was evidence of a fundamental unit of charge before Millikan's work, Millikan is given credit for making the first measurement of its value, and for demonstrating that a fraction of a fundamental charge is never seen in nature.