HW #5 Due Feb 18 at the ***beginning*** of class.

READING: This week we will be working on Ch. 19. You should read all of the chapter except Sections 19-5 and 19-6. We will concentrate on Sections 19-1 to 19-3, but sections 19-4 and especially 19-7 contain some important information.

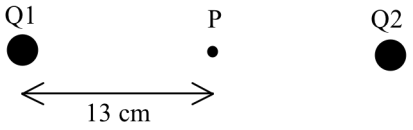
Please hand in the HW in two parts.

Part I: Ch. 19 Questions #5, 12,16
Ch. 19 Problems #3, 7, 17, 18

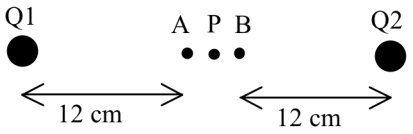
Part II: Ch. 19 Problems #19, 22
Additional Problems 1, 2, 3

Additional Problems

1) Consider an electric dipole consisting of two point charges (Q1 = +2.2 nC, Q2 = -2.2 nC) separated by 26 cm. Determine the magnitude and direction of the electric field at the point P midway between the two charges, shown below. Specify the direction as either toward Q1 or away from Q1.

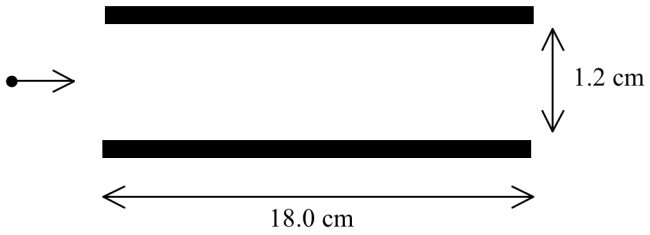


2) Consider the same two charges as in problem 1.
   a) Determine the electric potential at the point A. Don't forget the charges are oppositely charged.



   b) Determine the electric potential at the point B
   c) If you look at the electric field pattern for a dipole (Fig. 16-31a on page 455), you will see that the field is approximately uniform in the middle region between the two charges. Assuming the field is uniform, use your results from a) and b) to determine the electric field between A and B. Your result should be very close to your result from Problem 1.
   d) If a small negative charge were placed at B and released, would it move toward A, or away from A? Explain.

3) A charged particle emitted in the radioactive decay of thorium has a velocity of 1.55×10^{7} m/s. It enters a uniform electric field created by two square parallel plates as shown below.



The plates are separated by 1.2 cm and are 18.0 cm on a side. The charge on the particle is $+3.2\times10^{-19}$ C and it starts out exactly halfway between the two plates, as shown . The voltage applied to the plates is 32,100 V.

a) What is the magnitude of the electric field between the plates? Note: Your answer should be a little under the breakdown field strength for air.
b) What is the charge on each plate?
c) The particle hits one of the plates at a point 3.0 cm from the right side. Does the particle hit the top plate or the bottom plate?
d) What is the mass of the particle? Hint: This is basically a projectile motion problem. If you get this problem right, you should end up with something close to the mass of an alpha particle (2 protons + 2 neutrons).