Physics 221 – Spring 2012

Exam 3

Name: _____

1. Two point charges are placed 12 meters apart. The charge on the left is +10 nC and the charge on the right is +20nC.
    a. Find the electric field at a point between the charges, 4.0 meters from the +20nC charge.
    b. If an electron is placed between the charges, 4.0 meters from the +20nC charge, find the electrostatic force on the electron.

2. A capacitor has a charge of 5.0 μC on each plate when a potential difference of 120 V is across the plates. The plates are separated by 12×10^{-4} meters.
    a. Find the electric field between the plates.
    b. Find the electrostatic force on an electron which is between the plates, 4.0×10^{-4} meters from the positive plate.
    c. How much energy is stored in this capacitor?
    d. How much work does it take to move the electron horizontally between the plates?

3. Consider problems 1b. and 2b.
    a. Explain the difference, if any, between how electrostatic force can be calculated in each problem.
    b. What would happen to your answers for each of these problems if the distance given for the electron's position was doubled? Use equations and words to demonstrate.

4. The bottom of a blender has a tag that says all sorts of things and the only lines with numbers read: "Service no. 4094", "500 Watts max", "120 Vac 50/60Hz".
    a. What is the power used by this blender?
    b. How much current does this blender draw?
    c. What is the potential difference across the blender?
    d. If electricity is $0.12/ kWh, how much will it cost to run the blender for 1/6 of an hour?