PHYS 2102

Exam 1

Fall 2005

Dr. Aktas

Name :_____

SS # : _____

You have four questions, 25 points each.

This is a closed book exam. I understand I am not to use any notes or information other than on this exam sheet. I may use a pocket calculator but only for the purpose of numerical calculation. I accept the responsibility to know and observe the requirements of the UNC-Charlotte Code of Student Academic Integrity.

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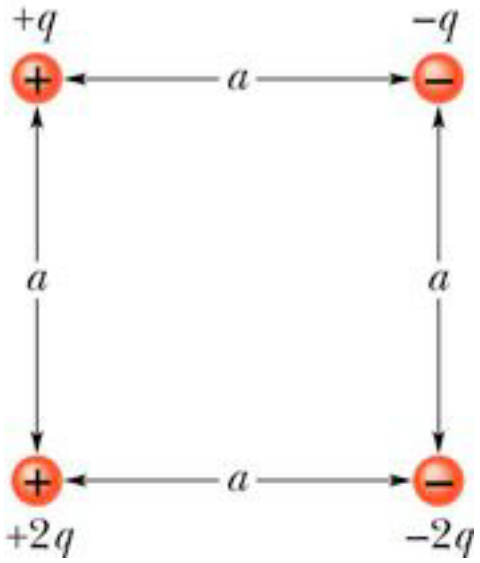
Signature

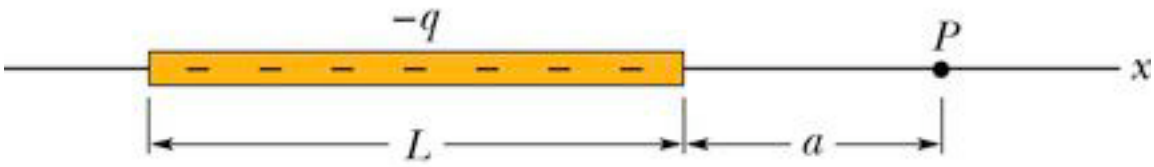
Good luck

Show all of your work. Do not skip steps. First write down the relevant equations then substitute the numbers if necessary.

1. In figure below , what are the (a) horizontal and (b) vertical components of the net electrostatic force on the charged particle in the lower left corner of the square if $q = 1.0 \times 10^{-7}$ C and $a = 5.0$ cm, $1/(4\pi\varepsilon_0) = 9 \times 10^9$ Nm^2/C^2?

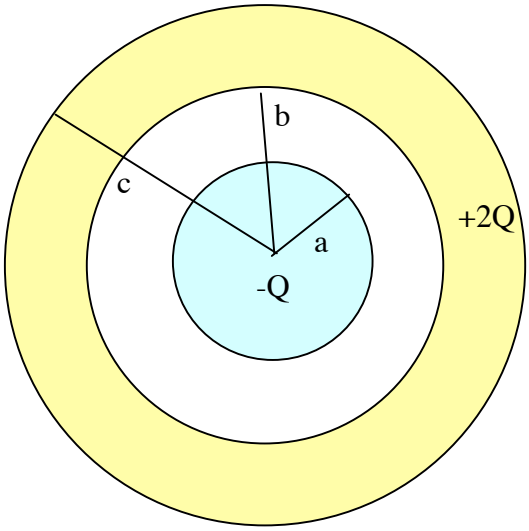


2. In figure below, a nonconducting rod of length L has charge -q uniformly distributed along its length. (a) What is the linear charge density of the rod? (b) What is the electric field at point P, a distance a from the end of the rod? (c) If P were very far from the rod compared to L, the rod would look like a point charge. Show that your answer to (b) reduces to the electric field of a point charge for a >>L.

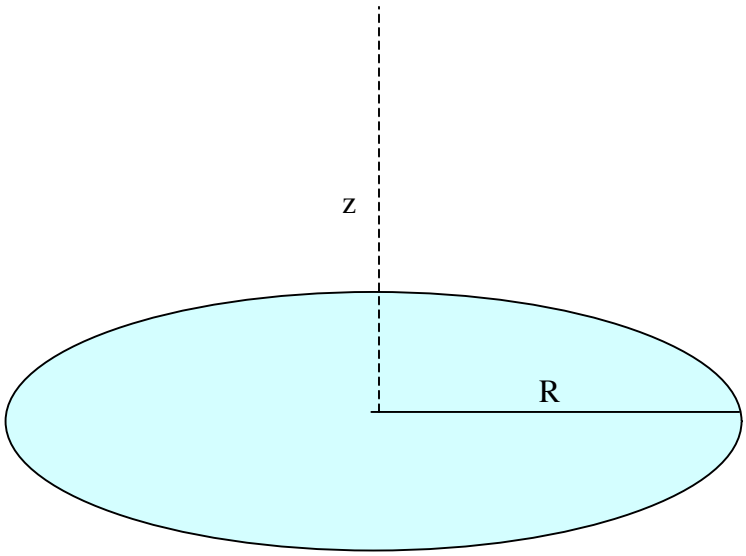


3. A uniformly charged ball of radius a and charge –Q is at the center of a hollow metal shell with inner radius b and outer radius c. The hollow sphere has a net charge of +2Q. Determine the strength of electric field in the four regions:

$r \le a, \quad a < r < b, \quad b \le r \le c, \quad and \quad r > c.$



4. Consider a charged disc with a charge of Q, and radius of R. Calculate its potential along its axis, z distance from the center of the disc as shown below figure.



Some useful formulas

$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$$

$$\vec{E} = \frac{\vec{F}}{q}, \quad E = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}$$

$$\oint_S \vec{E} \bullet d\vec{A} = \frac{q_{enc}}{\varepsilon_0}$$

$$V = \frac{1}{4\pi\varepsilon_0}\frac{q}{r}$$