TEST ONE Thursday Evening 7:30 - 9:30 pm . The Friday class immediately following is canceled because of the evening exam.

What We Expect From You On The Exam

(1) Ability to calculate the electric field of both discrete and continuous charge distributions. We may give you a problem on setting up the integral for a continuous charge distribution, although we do not necessarily expect you to do the integral, unless it is particularly straight forward. You should be able to set up problems like: calculating the field of a small number of point charges, the field of the perpendicular bisector of a finite line of charge; the field on the axis of a ring of charge; and so on.

(2) To be able to recognize and draw the electric field line patterns for a small number of discrete charges, for example, from two point charges (of same or opposite charge)

(3) To be able to apply the principle of superposition to electrostatic problems.

(4) To be able to calculate the force $\vec{F}_q = q\vec{E}_{source}$ on a moving charge in an electric field and apply Newton's second Law of motion, $\vec{F}_q = m_q\vec{a}_q$.

(5) An understanding of how to calculate the electric potential of a discrete set of charges and a continuous set of charges, that is the use of the equation $V(\mathbf{r}) = \sum_{i=1}^{N} \frac{q_i}{4\pi\varepsilon_o |\mathbf{r} - \mathbf{r}_i|}$ for the potential of N charges q_i located at positions $\mathbf{r}_i$. Also you must know how to calculate the configuration energy necessary to assemble this set of charges. For a continuous charge distribution, you must know how to set up the integrand for the electric potential $V(\vec{r}) = \frac{1}{4\pi\varepsilon_0} \int_{source} \frac{dq}{|\vec{r} - \vec{r}'|}$; $V(\infty) = 0$. (6) You must know how to calculate the change in potential energy when you move a charge from one point in space to another, $\Delta U = q\Delta V$

(7) The ability to calculate the electric potential given the electric field and the electric field given the electric potential, e.g. being able to apply the equations
$$\Delta V_{a\,to\,b} = V_b - V_a = -\int_a^b \mathbf{E}\cdot\mathbf{dl} \text{ and } \mathbf{E} = -\nabla V.$$

(8) An understanding of how to use Gauss's Law. In particular, we *may* give you a problem that involves either finding the electric field of a uniformly or non-uniformly filled cylinder, slab or sphere of charge, as well as the potential associated with that electric field. You must be able to explain the steps involved in this process clearly, and in particular to argue how to evaluate $\oiint \vec{E}\cdot d\vec{A}$ *on every part* of the closed surface to which you apply Gauss's Law, even those parts that are zero.

(9) An understanding of capacitors: how to calculate capacitance, how do find the energy stored in a capacitor.

(10) To be able to answer qualitative conceptual questions that require no calculation. There will be concept questions similar to those done in class.

(11) An understanding of the first two experiments.

To study for this exam (which you should DEFINITELY DO!) we suggest that you review your problem sets, in-class problems, Friday problem solving sessions, PRS in-class questions, and relevant parts of the study guide and class notes and work through multiple past exams