

Test Information for Test 1:

Formulas to memorize:

<p><u>Electric Fields</u></p> $\mathbf{F} = \frac{k_e q_1 q_2 \hat{\mathbf{r}}}{r^2}$ $\mathbf{E} = \frac{k_e q \hat{\mathbf{r}}}{r^2}$ $\mathbf{F} = q\mathbf{E}$
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<p><u>Potential</u></p> $U = qV \quad E_x = -\frac{\partial V}{\partial x}$ $V = \frac{k_e q}{r} \quad E_y = -\frac{\partial V}{\partial y}$ $\Delta V = -\int \mathbf{E} \cdot d\mathbf{s} \quad E_z = -\frac{\partial V}{\partial z}$

<p><u>Gauss's Law</u></p> $\Phi_E = A\mathbf{E} \cdot \hat{\mathbf{n}}$ $\Phi_E = q_{\text{in}}/\epsilon_0$

<p><u>Units</u></p> $\text{N/C} = \text{V/m}$ $\text{F} = \text{C/V}$

<p><u>Capacitance</u></p> $Q = C(\Delta V)$ <p>Parallel:</p> $C_{\text{tot}} = C_1 + C_2$ <p>Series:</p> $\frac{1}{C_{\text{tot}}} = \frac{1}{C_1} + \frac{1}{C_2}$

Note: The best way to learn the units is to learn the formulas and then remember what the units are for. For example, Farads are used to measure capacitance, and from the formula $Q = C(\Delta V)$, it is obvious that the units of capacitance are the same as $Q/\Delta V = \text{C/V}$.

Formulas to know how to use, but you need not memorize:

<p><u>Constants</u></p> $e = 1.602 \times 10^{-19} \text{C}$ $k_e = 8.988 \times 10^9 \text{N} \cdot \text{m}^2/\text{C}^2$ $\epsilon_0 = 8.854 \times 10^{-12} \text{C}^2/\text{N} \cdot \text{m}^2$ $k_e = 1/4\pi\epsilon_0$
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<p><u>Charge on Surface of Conductor</u></p> $\mathbf{E} = \frac{\sigma}{\epsilon_0} \hat{\mathbf{n}}$
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<p><u>Parallel Plate Capacitor</u></p> $C = \frac{A\kappa\epsilon_0}{d}$
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<p><u>Energy in a Capacitor</u></p> $U = \frac{1}{2} C (\Delta V)^2$ $u = \frac{1}{2} \epsilon_0 E^2$

<p><u>Dipoles</u></p> $\boldsymbol{\tau} = \mathbf{p} \times \mathbf{E}$ $U = -\mathbf{p} \cdot \mathbf{E}$

General Comments on Working Out Problems

The test isn't exactly like webassign, and therefore the problems won't be quite the same. First, and this is important, I *do* take credit off for not showing units. Keeping track of units is an important part of physics, and often helps us recognize and check our mistakes.

In Webassign, keeping calculations to two or three digits is always correct. On tests, you should generally follow the standard rules of significant digits. However, I don't mind if you keep an extra digit (or even two) beyond those given in the problem. What I don't want to see is answers like $E = 36180359 \text{ V/m}$. Rewrite answers like this in scientific notation, $3.62 \times 10^7 \text{ V/m}$, or better still, 36.2 MV/m .

Material for test 1:

Chapter 23	Electric Fields
Chapter 24	Gauss's Law
Chapter 25	Electric Potential
Chapter 26	Capacitance and Dielectrics

Organization of the Test:

Part I: Multiple Choice [20 points]

For each question, choose the best answer (2 points each)

[questions 1-10]

Part II: Short answer [20 points]

Choose **two** of the following questions and give a short answer (1-3 sentences) or brief sketch (10 points each).

[questions 11-13]

Part III: Calculation: [60 points]

Choose **three** of the following four questions and perform the indicated calculations (20 points each)

[questions 14-17]