PHYSICS 2B QUIZ 2 WINTER QUARTER 2010
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Formulas:

$\sin 30^\circ = \cos 60^\circ = 1/2,\ \ \cos 30^\circ = \sin 60^\circ = \sqrt{3}/2,\ \ \sin 45^\circ = \cos 45^\circ = \sqrt{2}/2$

$F = k\frac{q_1 q_2}{r^2}$ Coulomb's law ; $k = 9\times 10^9 \mathrm{N\cdot m^2/C^2}$; $\vec{F}_{12} = \frac{kq_1q_2}{|\vec{r}_2 - \vec{r}_1|^3}(\vec{r}_2 - \vec{r}_1)$

Electric field due to charge q at distance r : $\vec{E} = \frac{kq}{r^2}\hat{r}$; Force on charge Q: $\vec{F} = Q\vec{E}$

Electric field of dipole, along dipole axis: $E = \frac{2kp}{x^3}$ (p=qd)

Electric field of dipole, along direction perpendicular to dipole axis: $E = \frac{kp}{y^3}$

Energy of and torque on dipole in E-field: $U = -\vec{p}\cdot\vec{E}$, $\vec{\tau} = \vec{p}\times\vec{E}$

Linear, surface, volume charge density : $dq = \lambda\, ds$, $dq = \sigma\, dA$, $dq = \rho\, dV$

Electric field of infinite : line of charge : $E = \frac{2k\lambda}{r}$; sheet of charge : $E = 2\pi k\sigma = \sigma/(2\varepsilon_0)$

Gauss law : $\Phi = \oint \vec{E}\cdot d\vec{A} = \frac{q_{enc}}{\varepsilon_0}$; $\Phi =$ electric flux ; $k = \frac{1}{4\pi\varepsilon_0}$; $\varepsilon_0 = 8.85\times 10^{-12} C^2/Nm^2$

$U_B - U_A = \Delta U_{AB} = -W_{AB} = -\int_A^B \vec{F}\cdot\vec{dl} = -\int_A^B q\vec{E}\cdot\vec{dl} = q\Delta V_{AB} = q(V_B - V_A)$ V=N/C

$V = \frac{kq}{r}$; $V = \int \frac{kdq}{r}$; $V = \frac{kp\cos\theta}{r^2}$ (dipole) ; $E_l = -\frac{\partial V}{\partial l}$; $\vec{E} = -\vec{\nabla}V$