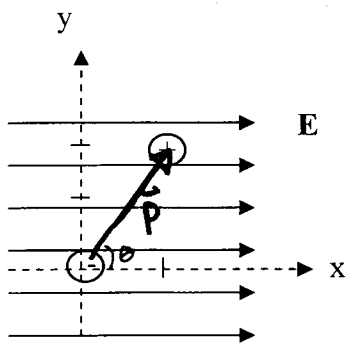
Name_____
1121/3321 (Circle one) SP222 Quiz

A dipole is placed in a 250. N/C uniform electric field oriented as shown. The dipole has charges -3.00 μC and +3.00 μC oriented with the negative charge at the origin and the positive charge at (1.00 mm, 2.00 mm).

a. What is the dipole moment vector, **p**, in Cartesian form?
b. What is the torque on the dipole?
c. What is the potential energy of the dipole?



$|\vec{p}| = 6.71 \times 10^{-9}\ m\cdot C$

$\theta = \tan^{-1}\left(\frac{2}{3}\right) = 63.4°$

(2) $\vec{p} = q\vec{r} = (3\times10^{-6}\ C)(1\times10^{-3}\ m\,\hat{i} + 2\times10^{-3}\ m\,\hat{j})$

$= 3\times10^{-9}\ mC\,\hat{i} + 6\times10^{-9}\ mC\,\hat{j}$

(4) (1) $\vec{\tau} = \vec{p}\times\vec{E} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3\times10^{-9}\ mC & 6\times10^{-9}\ mC & 0 \\ 250\ \frac{N}{C} & 0 & 0 \end{vmatrix}$

$|\vec{\tau}| = |\vec{p}||\vec{E}|\sin\theta$

$= (6.71\times10^{-9}\ m\cancel{C})(250\ \frac{N}{\cancel{C}})\sin(63.4)$

$= 1.5\times10^{-6}\ N\cdot m$ (INTO PAGE)

$= -(250\ N/C)(6\times10^{-9}\ m\cdot\cancel{C})\,\hat{k}$

$= \boxed{-1.5\times10^{-6}\ N\cdot m}\,\hat{k}$ (1)

(4) $\vec{U} = -\vec{p}\cdot\vec{E} = -(3\hat{i}+6\hat{j})\times10^{-9}\ m\cdot C \cdot 250\ N/C\ \hat{i}$

(1) $= \boxed{-.75\times10^{-6}\ J}$

Extra Credit: Who sang lead vocal for Genesis before Phil Collins?