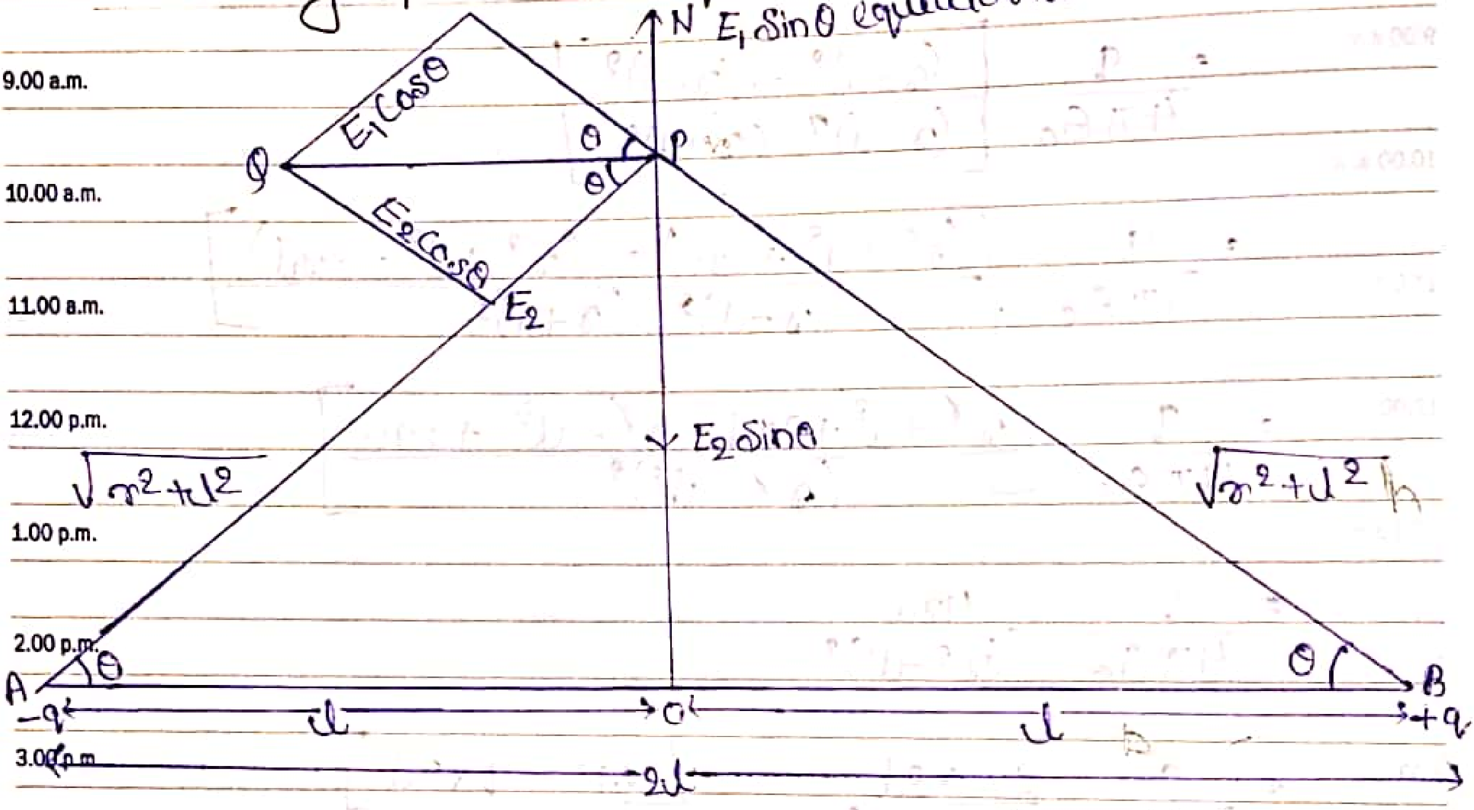
Test

Q. Derive an expression for dipole feild intensity at any point on ~~equatorial~~ equiatorial line of dipole.



7 April, Sat

Let us consider an electric dipole consist of two equal and opposite charge seperated by distance $2l$.

Let, P - be the opservation point.

E_1 - be the electric field intensity at point 'p' due to +q.

$$E_1 = \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{BP^2}$$

$$= \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{(\sqrt{r^2+l^2})^2}$$

$$= \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{(r^2+l^2)}$$

$$E_2 = \frac{1}{4\pi\epsilon_0} \cdot \frac{-q}{AP^2}$$

8.00 a.m.

$$= -\frac{1}{4\pi\epsilon_0} \frac{q}{(\sqrt{r^2+l^2})^2}$$

9.00 a.m.

10.00 a.m.

$$= -\frac{1}{4\pi\epsilon_0} \frac{q}{r^2+l^2}$$

11.00 a.m.

$$\boxed{E_1 = E_2 = \frac{1}{4\pi\epsilon_0} \frac{q}{r^2+l^2}}$$

12.00 p.m.

E_1 & E_2 can be resolved into two components

1.00 p.m.

1/ $E_1 \sin\theta$ & $E_1 \cos\theta$

2/ $E_2 \sin\theta$ & $E_2 \cos\theta$

2.00 p.m.

$E_1 \sin\theta$ & $E_2 \sin\theta$ Canceled each other. $E_1 \cos\theta$ & $E_2 \cos\theta$ can we added

3.00 p.m.

$$E = E_1 \cos\theta + E_2 \cos\theta$$

4.00 p.m.

$$= E_1 \cos\theta + E_2 \cos\theta$$

5.00 p.m.

$$\boxed{E = 2E\cos\theta} \quad , \quad \cos\theta = 2E$$

$$\boxed{\cos\theta = \frac{l}{\sqrt{r^2+l^2}}} \qquad \cos\theta = \frac{b}{h}$$

6.00 p.m.

7.00 p.m.

$$E = 2\left[\frac{1}{4\pi\epsilon_0} \cdot \frac{q}{(r^2+l^2)}\right] \cdot \frac{l}{\sqrt{r^2+l^2}} = \frac{q \times 2l}{4\pi\epsilon_0 (r^2+l^2)(\sqrt{r^2 \ldots}}$$

Notes

$$= \frac{1}{4\pi\epsilon_0} \frac{p}{(r^2+l^2)^{3/2}}$$

$r \gg l$, l^2 can be neglected

3.00 a.m.

$$E = \frac{1}{4\pi\epsilon_0} \frac{p}{r^3} \qquad E = K\frac{p}{r^3}$$

9.00 a.m.

$$E \propto \frac{1}{r^3}$$

10.00 a.m.

Relation between, E-axial & E equilateral

11.00 a.m.

$$E_{axial} = E_{equlateral}$$

12.00 p.m.

* Continues charge distribution.

1.00 p.m.

(a) Linear charge density (λ) - Charge per unit length

2.00 p.m.

$$\lambda = \frac{dq}{dl} \quad or \quad dq = dl\lambda$$

3.00 p.m.

$$\lambda = \frac{q}{l}$$

4.00 p.m.

$$dF = \frac{1}{4\pi\epsilon_0} \cdot \frac{dq\, q_0}{r^2} \cdot \hat{r}$$

5.00 p.m.

$$= \frac{1}{4\pi\epsilon_0} \cdot \frac{dl\lambda q_0 \hat{r}}{r^2}$$

6.00 p.m.

$$\vec{F} = \int \frac{1}{4\pi\epsilon_0} \cdot \frac{q_0 \lambda dl}{r^2} \hat{r}$$

7.00 p.m.

Sunday

$$\vec{F} = \frac{q_0}{4\pi\epsilon_0} \int \frac{\lambda dl}{r^2} \cdot \hat{r}$$