DPP 04

ELECTRIC FLUX

Solution

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1. Electric field lines acting along the Same Plane

So Angle b/w $\vec{E}$ & $\vec{A}$ is 90°.

$\phi = \vec{E}\cdot\vec{A} = EA\cos 90^o$

$= 0$

2. Electric field lines Perpendicular to $\vec{A}$ (Area vector)

$\phi = 0$

3. $\vec{E} = 3\hat{i} + 24\hat{j} + 6\hat{k}$

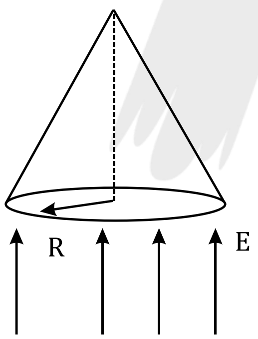
$\vec{A} = 5\cdot\hat{A}$

$= 5\dfrac{(2i + 4\hat{j} + 6k)}{\sqrt{4+16+36}}$

$\vec{A} = \dfrac{5}{\sqrt{56}}(2i + 4j + 6k)$

$\phi = \vec{E}\cdot\vec{A} = \dfrac{690}{\sqrt{56}}$

4.



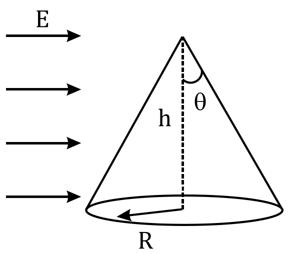
inclosed surface

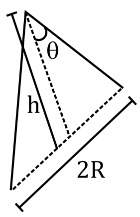
$A = \pi R^2$

$\phi = E\pi R^2$

5. $\Rightarrow \tan\ \theta = \frac{R}{h}$

$\Rightarrow A = \dfrac{1}{2}\times 2R\times h$





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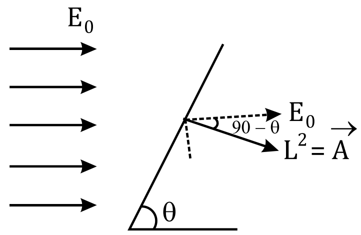
$\Rightarrow Rh \times \frac{R}{R} \Rightarrow R^2 \frac{h}{R} = \frac{R^2}{\tan\theta}$

6. $\phi_{net} = 0$

bc = incoming flux equal to out going flux.

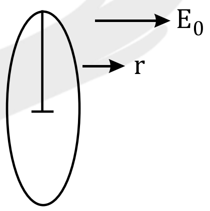
7.



$\phi = \vec{E} \cdot \vec{A}$

$= E_0 L^2 \cos(90-\theta) = E_0 L^2 \sin\theta$

8. $y = x^2$



$r = y = L^2$ at $x = L$

Projected area $= \pi r^2 = \pi L^4$

$\phi = E_0 \pi L^4$

9. $E = 500 N/C$

$R = 1.2m$

$\cos 37^\circ = \frac{4}{5}$

$\phi = 500 \times \pi \times (1.2)^2 \times \frac{4}{5}$

$\phi = 576\pi \frac{N-m^2}{C}$

$N\pi = 576\pi$

$N = 576$

10. $E_x = \alpha x^{1/2}$

$E_{x=a} = \alpha a^{1/2}$

$E_{x=2a} = \alpha(2a)^{1/2} = \alpha a^{1/2}\sqrt{2}$

$\phi_{in} = -Ea^2 = -\alpha a^{1/2} a^2 = -\alpha a^{5/2}$

$\phi_{out} = E_{x=2a} a^2 = \alpha a^{1/2}\sqrt{2} a^2 = \alpha\sqrt{2} a^{5/2}$

$\phi_{net} = \phi_{in} + \phi_{ant}$

$= \alpha a^{5/2}(\sqrt{2}-1)$

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11. $E =$ uniform

$|\phi_{in}| = |\phi_{out}|$

$\phi_{net} = 0$