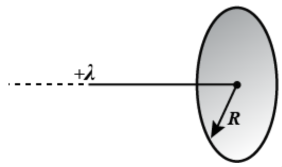
LAKSHYA (JEE)

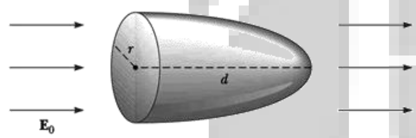
Electric Charges and Field

DPP-08

1. A very long uniformly charged wire oriented along the axis of a circle of radius R rests on its center with one of the ends. The linear charge density on the wire is λ. Evaluate the flux of vector $\vec{E}$ across the circle area.

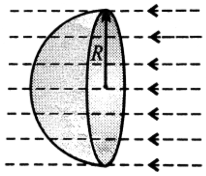


2. Calculate the total electric flux through the paraboloidal surface due to a uniform electric field of magnitude E_0 in the direction shown in

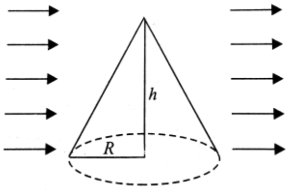


3. A uniform electric field $a\hat{i} + b\hat{j}$ intersects a surface of area A. What is the flux through this area of the surface lies (a) in the y-z plane, (b) in the x-z plane, (c) in the x-y plane.

4. Find out the flux through the curved surface of a hemisphere of radius R if it is placed in a uniform electric field E as shown in figure.



5. In figure, a cone lies in a uniform electric field E. Determine the electric flux entering the cone.



6. A cube of side l is placed in a uniform field $\vec{E}$, where $\vec{E} = E\hat{i}$. The net electric flux through the cube is

(a) Zero (b) l^2E

(c) $4l^2E$ (d) $6l^2E$

7. A cube of side 2cm is placed in a region of electric field 120 N/ C. Calculate the electric flux through the

(a) Top face

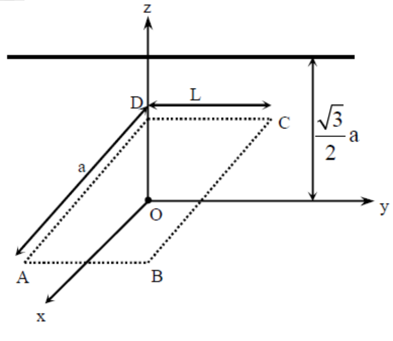
(b) Bottom face

(c) Right face

(d) Left face

(e) Net flux

8. An infinitely long uniform charge distribution of charge per unit length λ lies parallel to the y-axis in the y-z plane at $z = \frac{\sqrt{3}}{2}a$. If the magnitude of the flux of the electric field through the rectangular surface ABCD lying in the x-y plane with its centre at the origin is $\frac{\lambda L}{n\epsilon_0}$ then the value of n is.



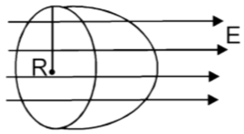
9. Electric flux through a surface of area 100 m^2 lying in the x-y plane is (in V-m) if

$$\vec{E} = \hat{i} + \sqrt{2}\hat{j} + \sqrt{3}\hat{k}$$

(a) 100 (b) 141.4

(c) 173.2 (d) 200

10. A hemisphere of radius R is placed in electric field as shown in figure. Total outgoing flux is



(a) $\pi R^2 E$ (b) $2\pi R^2 E$

(c) $4\pi R^2 E$ (d) $\frac{\pi R^2 E}{2}$

ANSWERS

1. $\frac{\lambda R}{2\epsilon_0}$

2. $E_0 \pi r^2$

3. (a) Aa, (b) Ab, (c) Zero

4. $\phi_{\text{curve}} = E\pi R^2$

5. ERh

6. (a)

7. (a) Zero, (b) Zero, (c) $\phi = 0.048\ \text{Nm}^2\ \text{C}^{-1}$, (d) $\phi = 0.048\ \text{Nm}^2\ \text{C}^{-1}$, (e) zero

8. (6)

9. (c)

10. (a)