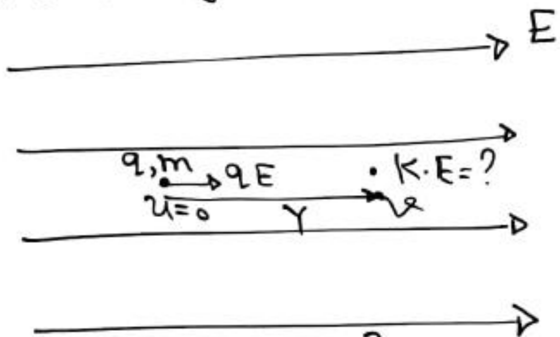
Questions

Q1) A particle of mass m & charge q is placed in a uniform electric field E & then released. The kinetic energy attained by the particle after moving distance y is [AIPMT]

(a) qEY ✓
(b) qE^2y
(c) qEY^2
(d) q^2EY



$F = qE$

$a = \frac{qE}{m}$

$v^2 = u^2 + 2aS$

$v^2 = 0 + 2\left[\frac{qE}{m}\right] \times Y$

$v^2 = \frac{2qEY}{m}$

$K.E = \frac{1}{2} m v^2$

$K.E = \frac{1}{2} m \left[\frac{2qEY}{m}\right]$

$K.E = qEY$

Questions

Q2) AIPMT A point Q lies on the perpendicular bisector of an electrical dipole of dipole moment p. If the distance of Q from the dipole is r (much larger than the size of dipole), then the electric field at Q is proportional to.

(a) p^2 & r^{-3}.

(b) p & r^{-2}.

(c) p^{-1} & r^{-2}.

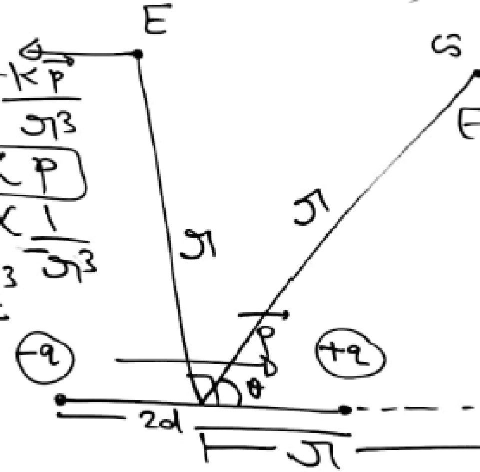
(d) p & r^{-3}.

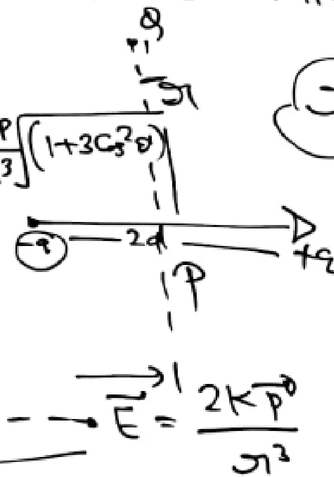
$\vec{E} = -\frac{k\vec{p}}{r^3}$

$E \propto p$

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

$E \propto r^{-3}$



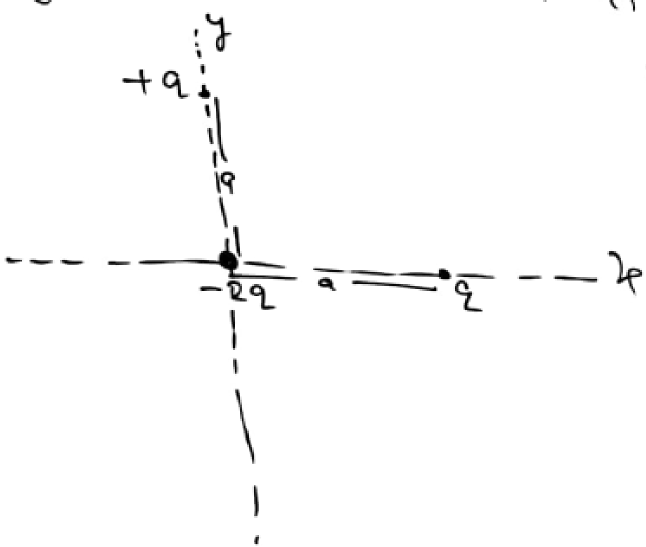


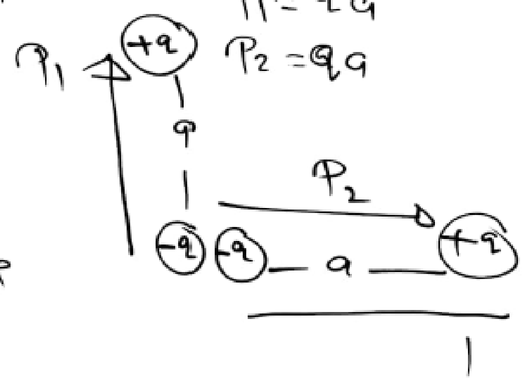
$r >> d$

Questions

AIIMS 2007

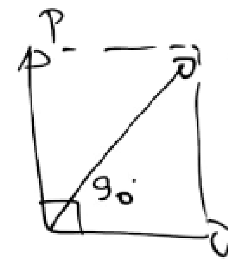
Q) Three point charges $+q, -2q$, & $+q$ are placed at points $(x=0, y=a, z=0)$, $(x=0, y=0, z=0)$ & $(x=a, y=0, z=0)$ respectively. The magnitude & dirn of the electric dipole moment vector of the charge assembly are.





$P_1 = qa$

$P_2 = qa$



$P_{net} = \sqrt{P^2 + P^2}$

$= \sqrt{2P^2}$

$p = P\sqrt{2}$

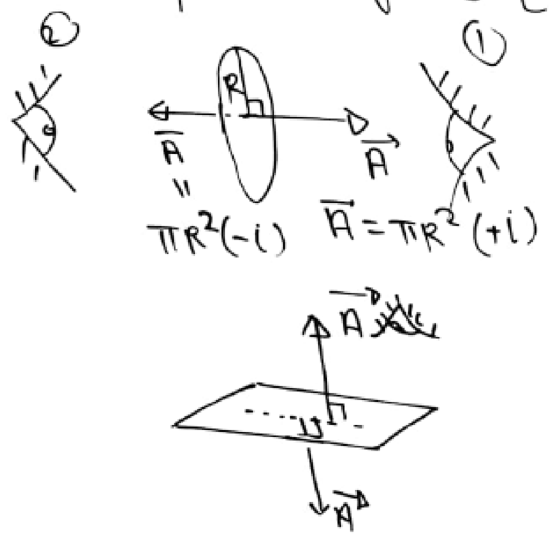
$qa\sqrt{2}$

Questions

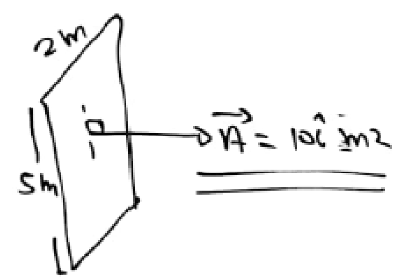
Area Vector ($\vec{A}$)

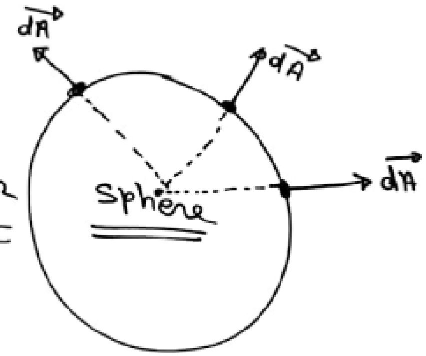
Open Surface [square, ring, plate, disc ----]

Close Surface [Ex. sphere, Cone, Cylinder]



Q1)

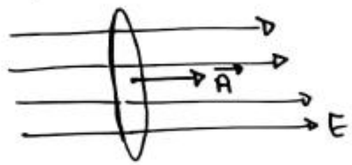




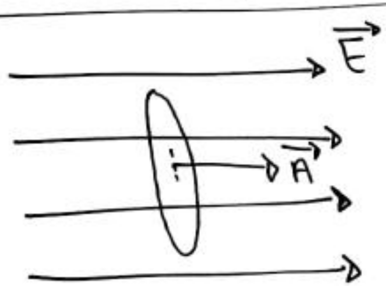
Questions

Electric flux ϕ: Number of Electric field lines passing through a Area.

Ex:

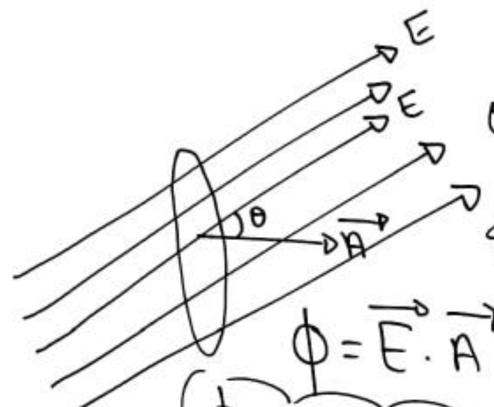


⇒ **Calculation of Electric flux:**



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

$\vec{E}$ = Constant



θ = Angle b/w Electric field $\vec{E}$ & Area vector $\vec{A}$

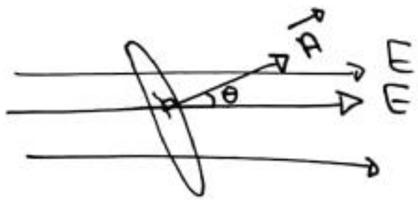
$$\phi = \vec{E}\cdot\vec{A}$$

$$\phi = EA\cos\theta$$

Questions

Electric flux (ϕ) :-

(a)



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

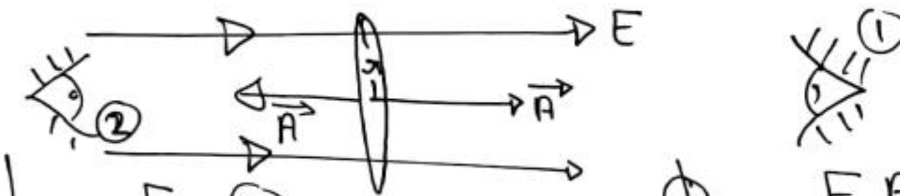
$\boxed{\phi = EA\cos\theta}$

(b) $\boxed{\cos 0^\circ = 1, \quad \cos 90^\circ = 0}$

$\phi_{max} \Rightarrow \theta = 0^\circ$

$\phi = EA$

(c) + ive flux :-



For ②

$\theta = 180$

$\phi = EA\cos 180^\circ$

$= E\pi r^2 (-1)$

$\boxed{\phi = -E\pi r^2}$

$\phi_1 = EA\cos\theta$

$= EA\cos 0^\circ$

$\boxed{\phi_1 = E\pi r^2}$

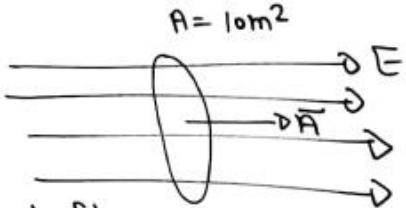
⟹ outward flux is +ive

⟹ incoming flux is −ive

Questions

Electric flux (ϕ) :-

Q1)



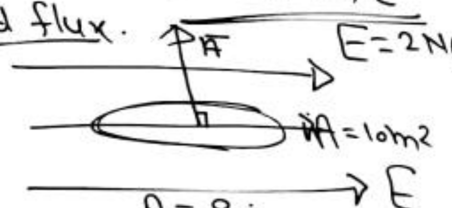
find flux. Angle b/w $\bar{E}$ & $\bar{A}$ = 0°

$\phi = \bar{E} \cdot \bar{A} = EA\cos\theta$

$= 2 \times 10 \times 1 \ N/C\text{-}m^2$

$= 20 N\text{-}m^2/c$

Q2) find flux.

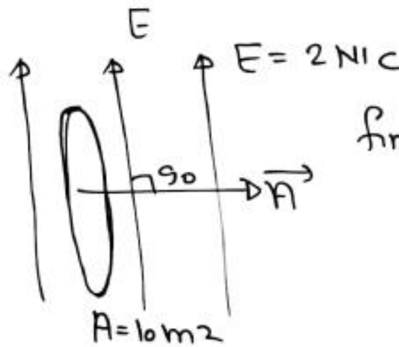


$\theta = 90°$

$\phi = EA\cos 90°$

$= 0$

(c)



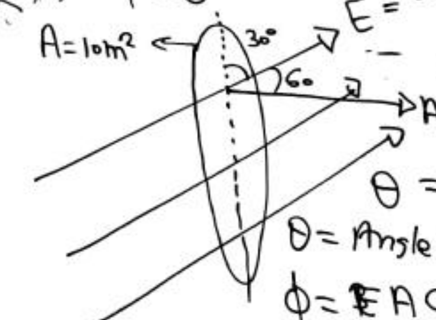
find flux.

(+ve)

** $\phi = 0$

(-ve)

(d)



find Electric flux.

$\theta = 60°$

θ = Angle b/w $\bar{E}$ & $\bar{A}$

$\phi = EA\cos 60°$

$= 2 \times 10 \times \frac{1}{2} = 10 N\text{-}m^2/c^2$

Questions

AIPMT 2006

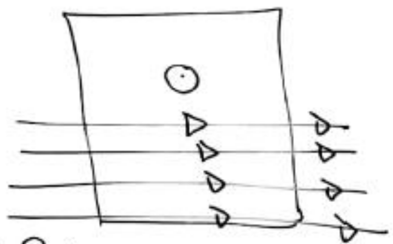
Q1 A square surface of side L metre is in the plane of paper. A uniform electric field $\vec{E}$ (V/m), also in the plane of the paper is limited only to the lower half of the square surface (see figure). The electric flux in SI unit associated with the surface is

(a) EL^2

(b) $EL^2/2\varepsilon_0$

(c) $EL^2/2$

(d) zero



$\theta = 90^\circ$

$\phi = 0$

AIPMT 2010

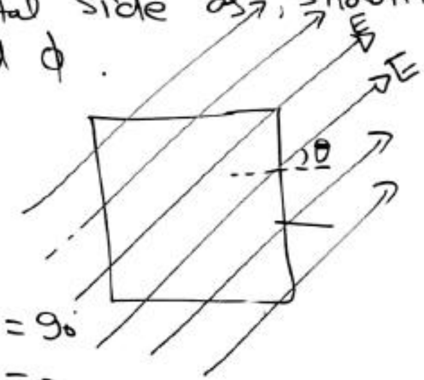
A square surface of side L meter in the plane of paper is placed in a uniform electric field E (V/m) acting along the same plane at an angle θ with the horizontal side as shown in figure. Find ϕ.

(a) EL^2

(b) $EL^2\cos\theta$

(c) $EL^2\sin\theta$

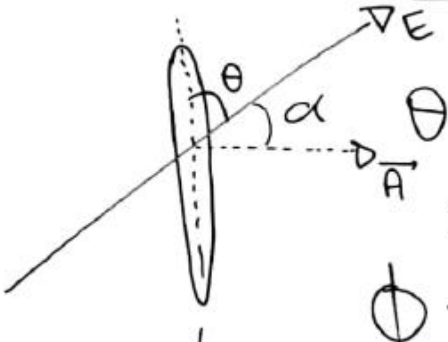
(d) zero



$\theta = 90^\circ$

$\phi = 0$

Questions



$\theta \rightarrow$ Angle b/w $\vec{E}$ & Plane of Area/coil

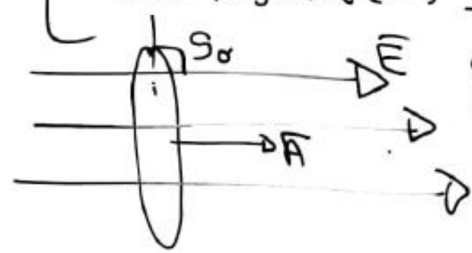
$\phi = EA\cos\alpha$

$\phi = EA\cos(90-\theta)$

$\phi = EA\sin\theta$

Q) A Circular coil of Area $\frac{5}{\pi}\, m^2$ placed in transverse Electric field $E = 5\ N/C$. Find flux.

[Transverse → ⊥ ⇒ 90°]



$\theta = 0$

$\phi = EA\cos 0$

$= 5 \times \frac{5}{\pi} = \frac{25}{\pi}\ N\text{-}m^2/C$

Questions

Q) find flux if $\bar{A} = (2i + 3j - k)\, m^2$ & $E = (4i + 6j - 2k)\, N/c$

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

$$= (4i + 6j - 2k) \cdot (2i + 3j - k)\ N\text{-}m^2/c$$

$$= 8 + 6 \times 3 + (-2)(-1)$$

$$= 8 + 18 + 2$$

$$\boxed{\phi = 28\ N\text{-}m^2/c}$$