Parishram (2025)

Physics

Electric Charges and Fields

DPP : 8

Q1 If the electric flux entering and leaving an enclosed surface respectively is ϕ_1 and ϕ_2, the electric charge inside the surface will be

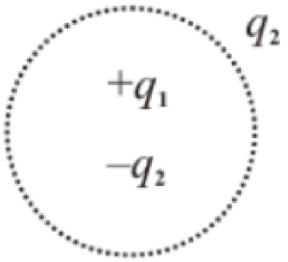
(A) $(\phi_1 + \phi_2)\varepsilon_0$

(B) $(\phi_2 - \phi_1)\varepsilon_0$

(C) $(\phi_1 + \phi_2)/\varepsilon_0$

(D) $(\phi_2 - \phi_1)/\varepsilon_0$

Q2 Consider the charge configuration and spherical Gaussian surface as shown in the figure. When calculating the flux of the electric field over the spherical surface, field will be due to



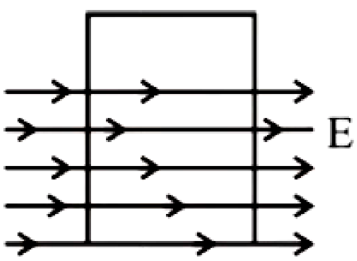
(A) q_2

(B) only the positive charge

(C) all the charges

(D) $+q_1$ and $-q_1$

Q3 A square surface of side L meters is in the plane of the paper. A uniform electric field $\vec{E}$ (volt $/\mathrm{m}$), 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 units associated with the surface is



(A) Zero

(B) EL^2

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

(D) $EL^2/2$

Q4 A cylinder of radius R and length L is placed in a uniform electric field E parallel to the cylinder axis. The total flux for the surface of the cylinder is given by

(A) $2\pi R^2 E$

(B) $\pi R^2/E$

(C) $\left(\pi R^2 - \pi R\right)/E$

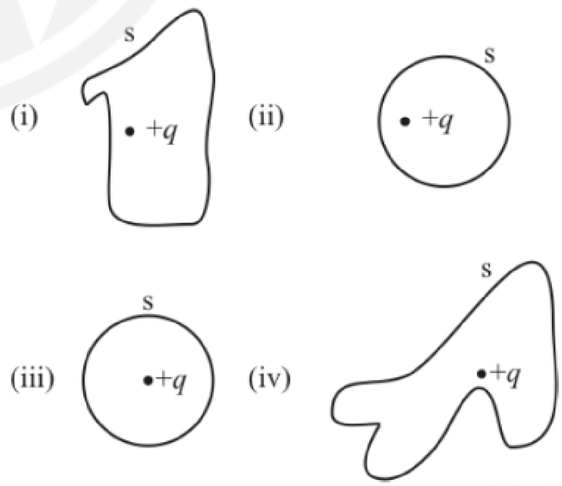
(D) Zero

Q5 In a region, the intensity of an electric field is given by $\vec{E} = 2\hat{i} + 3\hat{j} + \hat{k}$ in NC^{-1}. The electric flux through a surface $\vec{S} = 10\hat{i}\ \mathrm{m}^2$ in the region is

(A) $5\ \mathrm{Nm}^2\ \mathrm{C}^{-1}$ (B) $10\ \mathrm{Nm}^2\ \mathrm{C}^{-1}$

(C) $15\ \mathrm{Nm}^2\ \mathrm{C}^{-1}$ (D) $20\ \mathrm{Nm}^2\ \mathrm{C}^{-1}$

Q6 The electric flux through the surface



(A) In Fig. (iv) is the largest

(B) In Fig. (iii) is the least

(C) In Fig. (ii) is same as Fig. (iii) but is smaller than Fig. (iv)

(D) Is the same for all the figures

Q7 A charge q is placed at the centre of the open end cylindrical vessel. The flux of the electric field through the surface of the vessel is

(A) Zero

(B) $\frac{q}{\varepsilon_0}$

(C) $\frac{q}{2\varepsilon_0}$

(D) $\frac{2q}{\varepsilon_0}$

Q8 It is not convenient to use a spherical Gaussian surface to find the electric field due to an electric dipole using Gauss's theorem because

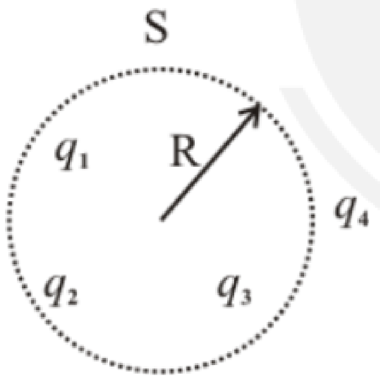
(A) Gauss's law fails in this case

(B) This problem does not have spherical symmetry

(C) Coulomb's law is more fundamental than Gauss's law

(D) Spherical Gaussian surface will alter the dipole moment

Q9 q_1, q_2, q_3 and q_4 are point charges located at points as shown in the figure and S is a spherical Gaussian surface of radius R. Which of the following is true according to the Gauss's law



(A) $\oint_S \left(\vec{E}_1+\vec{E}_2+\vec{E}_3+\vec{E}_4\right)\cdot d\vec{A}=\frac{q_1+q_2+q_3}{2\varepsilon_0}$

(B) $\oint_S \left(\vec{E}_1+\vec{E}_2+\vec{E}_3+\vec{E}_4\right)\cdot d\vec{A}=\frac{(q_1+q_2+q_3)}{\varepsilon_0}$

(C) $\oint_S \left(\vec{E}_1+\vec{E}_2+\vec{E}_3+\vec{E}_4\right)\cdot d\vec{A}=\frac{(q_1+q_2+q_3+q_4)}{\varepsilon_0}$

(D) None of the above

Q10 An electric charge q is placed at the centre of a cube of side a. The electric flux on one of its faces will be

(A) $\frac{q}{6\varepsilon_0}$

(B) $\frac{q}{\varepsilon_0 a^2}$

(C) $\frac{q}{4\pi\varepsilon_0 a^2}$

(D) $\frac{q}{\varepsilon_0}$

Answer Key

Q1	(B)
Q2	(C)
Q3	(A)
Q4	(D)
Q5	(D)
Q6	(D)
Q7	(C)
Q8	(B)
Q9	(B)
Q10	(A)

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Video Solution:

Q2 Text Solution:

The total flux linked with the closed surface is given by Gauss's law.

$\phi = \int \overrightarrow{E} . \overrightarrow{ds} = \frac{Q_{encl}}{\varepsilon_0}$

So, the electric field will be due to all the charge enclosed by the surface.

Video Solution:

Q3 Text Solution:

The electric flux linked to the surface is given by:

$\phi_E = \overrightarrow{E} . \overrightarrow{dA}$

The angle between the area vector and the field lines is 90°.

$\phi_E = EA \cos\theta = 0$

Also,

As there is no field line crossing the surface, the electric flux linked to the surface will be zero.

Video Solution:

Q4 Video Solution:

Q5 Text Solution:

Given $E = \left(2i + 3j + k\right) NC^{-1}$

$and\ S = 10im^2$

$\phi = E.S$

$\phi = (2i + 3j + k).(10i)$

$\phi = 20Nm^2C^{-1}$

Video Solution:

Q7 Video Solution:

Q8 Video Solution:

Q9 Video Solution:

Q10 Video Solution: