1.

The electric field at a point on the equatorial plane at a distance r from the centre of a dipole having dipole moment $\vec{P}$ is given by:

(r>> separation of two charges forming the dipole, ε_0 = permittivity of free space)

1. $\vec{E} = \frac{\vec{P}}{4\pi\varepsilon_0 r^3}$
2. $\vec{E} = \frac{2\vec{P}}{4\pi\varepsilon_0 r^3}$
3. $\vec{E} = -\frac{\vec{P}}{4\pi\varepsilon_0 r^2}$
4. $\vec{E} = -\frac{\vec{P}}{4\pi\varepsilon_0 r^3}$

2.

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

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

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

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

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

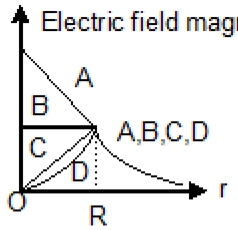
3.

What is the flux through a cube of side 'a' if a point charge q is at one of its corners?

1. $\frac{2q}{\varepsilon_0}$
2. $\frac{q}{8\varepsilon_0}$
3. $\frac{q}{\varepsilon_0}$
4. $\frac{q}{2\varepsilon_0}6a^2$

4.

An isolated sphere of radius R contains a uniform volume distribution of positive charge. Which of the curve on the graph below correctly illustrates the dependence of the magnitude of the electric field of the sphere as a function of the distance r from its centre:



1. A
2. B
3. C
4. D

5.

The electric flux from a cube of edge *l* is ϕ. What will be its value if the edge of the cube is made 2*l* and the charge enclosed is halved?

1. $\frac{1}{2}\phi$
2. 2ϕ
3. 4ϕ
4. ϕ

6.

An electric dipole is placed at the centre of a sphere. Which of the following is correct?

1. The electric flux through the sphere is zero
2. The electric field is zero at every point on the sphere
3. The electric field is zero at every point inside the sphere
4. The electric field is uniform inside the sphere

7.

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:

(1) $(\varphi_1 + \varphi_2)\varepsilon_0$

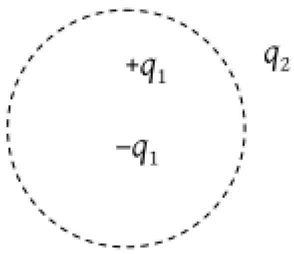
(2) $(\varphi_2 - \varphi_1)\varepsilon_0$

(3) $(\varphi_1 + \varphi_2)/\varepsilon_0$

(4) $(\varphi_2 - \varphi_1)/\varepsilon_0$

8.

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 , the electric field will be due to



(1) q_2

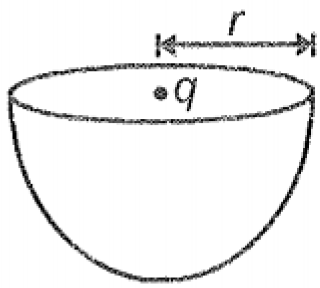
(2) Only the positive charges

(3) All the charges

(4) $+q_1$ and $-q_1$

9.

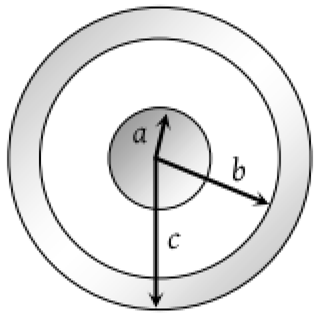
A point charge q is placed at the center of the open face of a hemispherical surface as shown in the figure. The flux linked with the surface is?



1. Zero
2. $\frac{q}{2\varepsilon_0}$
3. $\frac{q}{\varepsilon_0}$
4. $q\pi r^2$

10.

A solid conducting sphere of radius *a* has a net positive charge $2Q$. A conducting spherical shell of inner radius *b* and outer radius *c* is concentric with the solid sphere and has a net charge $-Q$. The surface charge density on the inner and outer surfaces of the spherical shell will be?



(1) $-\frac{2Q}{4\pi b^2}, \frac{Q}{4\pi c^2}$

(2) $-\frac{Q}{4\pi b^2}, \frac{Q}{4\pi c^2}$

(3) $0, \frac{Q}{4\pi c^2}$

(4) None of the above

11.

The electric field in a region is radially outward with magnitude $E = A\gamma_0$. The charge contained in a sphere of radius γ_0 centered at the origin is?

(1) $\frac{1}{4\pi\varepsilon_0}A\gamma_0^3$

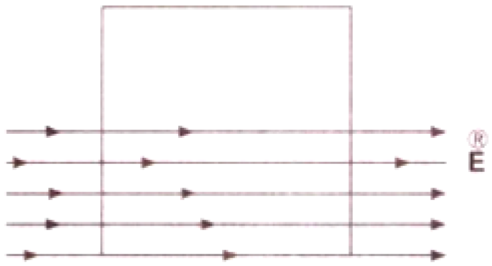
(2) $4\pi\varepsilon_0 A\gamma_0^3$

(3) $\frac{4\pi\varepsilon_0 A}{\gamma_0}$

(4) $\frac{1}{4\pi\varepsilon_0}\frac{A}{\gamma_0^3}$

12.

A square surface of side L m is in the plane of the 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 units associated with the surface is :



1. $EL^2/(2\varepsilon_0)$

2. $EL^2/2$

3. zero

4. EL^2

13.

An electric dipole is kept in a uniform electric field such that dipole moment is not collinear with the electric field. It experiences:

1 A force and a torque

2 A force but no torque

3 A torque but no force

4 Neither a force nor a torque

14.

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

1. $\sqrt{2}$qa along + y direction

2. $\sqrt{2}$qa along the line joining points (x=0, y= 0, z= 0) And (x=a, y=a, z=0)

3. qa along the line joining points (x= 0, y=0, z=0) And (x=a, y=a, z=0)

4. $\sqrt{2}$qa along + x direction

15.

An electric dipole is situated in an electric field of uniform intensity E whose dipole moment is p and moment of inertia is I. If the dipole is displaced slightly from the equilibrium position, then the angular frequency of its oscillations is?

(1) $\left(\frac{pE}{I}\right)^{1/2}$

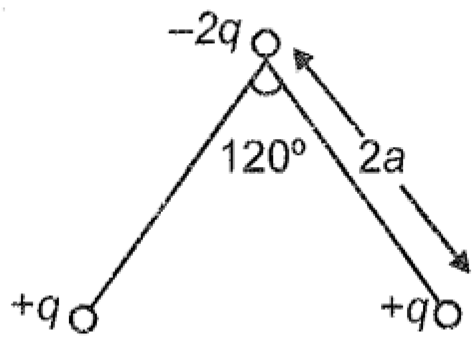
(2) $\left(\frac{pE}{I}\right)^{3/2}$

(3) $\left(\frac{I}{pE}\right)^{1/2}$

(4) $\left(\frac{p}{IE}\right)^{1/2}$

16.

The net dipole moment of the system is of the magnitude?



1. q × 2a

2. 2q × 2a

3. q × a

4. 2 × (2q × 2a)

17.

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 the dipole), then electric field at Q is proportional to?

1. p^{-1} and r^{-2}

2. p and r^{-2}

3. p^2 and r^{-3}

4. p and r^{-3}

18.

Cm is the SI unit of

1. Electric flux
2. Electric potential
3. Electric dipole moment
4. Electric field intensity

19.

A short electric dipole having dipole moment $p\hat{i}$ is placed at origin and a point charge +q is placed at point (0, r). The force on dipole due to charge is in

1. +x direction
2. -x direction
3. +y direction
4. -y direction

20.

What is the angle between the electric dipole moment and the electric field strength due to it on the equatorial line?

1. 0°
2. 90°
3. 180°
4. None of these

Fill OMR Sheet