Zero Doubts

Practice Questions

1. Two equal charges are separated by a distance d. A third charge placed on a perpendicular bisector at x distance from centre will experience maximum coulomb force, when

   (a) $x = \frac{d}{\sqrt{2}}$ (b) $x = \frac{d}{2}$

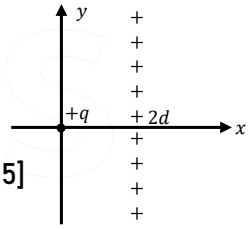
   (c) $x = \frac{d}{2\sqrt{2}}$ (d) $x = \frac{d}{2\sqrt{3}}$ [DCE 2005]

2. A simple pendulum of length l and mass of the bob is m. The bob is given a charge q coulomb. The pendulum is suspended between the vertical plates of a charged parallel plate capacitor. If E is the electric field strength between the plates, the time period of the pendulum is given by

   (a) $2\pi\sqrt{\frac{l}{g}}$ (b) $2\pi\sqrt{\frac{l}{\sqrt{g+\frac{qE}{m}}}}$

   (c) $2\pi\sqrt{\frac{l}{\sqrt{g-\frac{qE}{m}}}}$ (d) $2\pi\sqrt{\frac{l}{\sqrt{g^2+\left(\frac{qE}{m}\right)^2}}}$ [IPUEE 2007]

3. There is a plane of uniform positive charge density σ, parallel to the yz-plane and located at $x = 2d$. A point charge $+q$ is placed at the origin. Solve for the position x along the x-axis, where a positive test charge will have a net force zero.

   (a) $x = \frac{2\pi\sigma}{q}$ (b) $x = \sqrt{\frac{q}{2\pi\sigma}}$

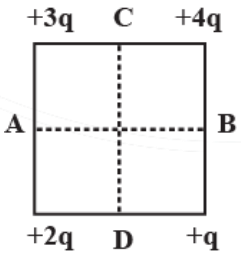
   (c) $x = \sqrt{\frac{2\pi\sigma}{q}}$ (d) $x = -2d$ [IPUEE 2015]

4. Three charges $+4q, Q$ and q are placed in a straight line l at points at distances $0, l/2$ and l respectively. What should be Q in order to make the net force on q to be zero?

   (a) $-q$ (b) $-2q$

   (c) $-\frac{q}{2}$ (d) $4q$ [AIIMS 1980]

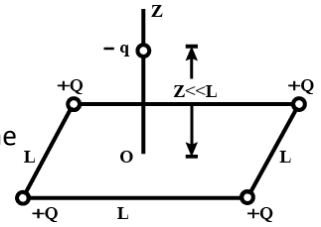
5. Four charges are arranged at the corners of a square as shown in the figure. The direction of electric field at the centre of the square is along

   (a) DC (b) BC

   (c) AB (d) AD [AIIMS 2009]

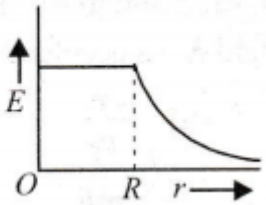
6. Four point $+ve$ charges of same magnitude (Q) are placed at four corners of a rigid square frame as shown in the figure. The plane of the frame is perpendicular to Z-axis. If a $-ve$ point charge is placed at a distance z away from the above frame, the
   (a) $-$ve charge oscillates along the Z-axis
   (b) It moves away from the frame
   (c) It moves slowly towards the frame and stays in the plane of the frame
   (d) It passes through the frame only once.

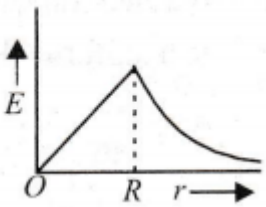


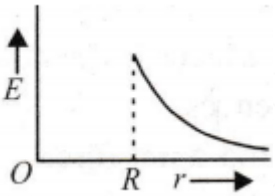
[AIIMS 2005]

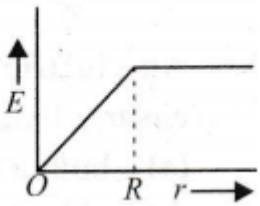
7. The point charges Q amd $-2Q$ are placed some distance apart. If the electric field at the location of Q is E, then the electric field at the location of $-2Q$ will be
   (a) $-\frac{E}{2}$ (b) $-\frac{3E}{2}$
   (c) $-E$ (d) $-2E$ [AIIMS 2001]

8. The electric field due to a uniformly charged sphere of radius R as a function of the distance from its centre is represented graphically by

(a) 

(b) 

(c) 

(d) 

[AIIMS 2004]

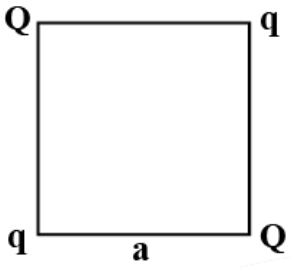
9. A semi-circular arc of radius a is charged uniformly and the charge per unit length is λ. The electric field at the centre is
   (a) $\frac{\lambda}{4\pi^2\varepsilon_0 a}$ (b) $\frac{\lambda}{2\pi\varepsilon_0 a^2}$
   (c) $\frac{\lambda}{2\pi\varepsilon_0 a}$ (d) $\frac{\lambda^2}{2\pi\varepsilon_0 a}$ [CBSE 2000]

10. A charge Q is enclosed by a Gaussian spherical surface of radius R. If the radius is doubled, then the outward electric flux will
    (a) Increase four times (b) be reduced to half
    (c) remain the same (d) be doubled [CBSE PRE 2011]

11. A hollow cylinder has a charge q coulomb within it. If ϕ is the electric flux in unit of voltmeter associated with the curved surface B, the flux linked with the plane surface A in unit voltmeter will be
    (a) $\frac{1}{2}\left(\frac{q}{\varepsilon_0}-\phi\right)$ (b) $\frac{q}{2\varepsilon_0}$
    (c) $\frac{\phi}{3}$ (d) $\frac{q}{\varepsilon_0}-\phi$ [CBSE 2007]

12. The electric field in a certain region is acting radially outward and is given by $E = Ar$. A charge contained in a sphere of radius $'a'$ centred at the origin of the field, will be given by
    (a) $A\varepsilon_0 a^2$ (b) $4\pi\varepsilon_0 A a^3$
    (c) $\varepsilon_0 A a^3$ (d) $4\pi\varepsilon_0 A a^2$ [AIPMT 15]

13. Four charges as shown in figure are placed at the corners of a square of side length a. What is the ratio of (Q/q) if net force on Q is zero?



(a) $\frac{1}{2\sqrt{2}}$ (b) $-2\sqrt{2}$

(c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}$ [DPMT 2002]

14. A particle of mass m and charge q is placed at rest in a uniform electric field E and then released, the kinetic energy attained by the particle after moving a distance y, will be

(a) q^2Ey (b) qEy

(c) qE^2y (d) qEy^2 [VMCC 2004]

15. A charge particle of mass m and charge q initially at rest is released in an electric field of magnitude E. Its kinetic energy after time t will be

(a) $\frac{2E^2t^2}{mq}$ (b) $\frac{E^2q^2t^2}{2m}$

(c) $\frac{Eq^2m}{2t^2}$ (d) $\frac{Eqm}{2t}$ [VMCC 2003]

16. A solid sphere of radius R is uniformly charged so that volume charge density is ρ. The electric field at a distance $r(r < R)$ is

(a) $\frac{\rho r^2}{\varepsilon_0 R^3}$ (b) $\frac{\rho r^2}{3\varepsilon_0 R^3}$

(c) $\frac{\rho r}{3\varepsilon_0}$ (d) $\frac{\rho r}{\varepsilon_0 R^2}$ [DPMT 2002]

17. The frequency of oscillation of an electric dipole moment having dipole moment p and rotational inertia I, oscillating in a uniform electric field E, is given by

(a) $\left(\frac{1}{2\pi}\right)\sqrt{I/pE}$ (b) $\left(\frac{1}{2\pi}\right)\sqrt{pE/I}$

(c) $2\pi\sqrt{pE/I}$ (d) $(2\pi)\sqrt{I/pE}$ [DPMT 2011]

18. An electric dipole coincides on Z-axis and its midpoint is on origin of the coordinate system. The electric field at an axial point at a distance z from origin is E_z and electric field at an equatorial point at a distance y from origin is E_y. Here $z = y \gg \alpha$, so $\frac{|E_z|}{|E_y|}$ is equal to

(a) 1 (b) 4

(c) 3 (d) 2 [VMCC 2014]

Answers:

1.	2.	3.	4.	5.	6.	7.	8.	9.
(c)	(d)	(b)	(a)	(a)	(a)	(a)	(b)	(c)
10.	11.	12.	13.	14.	15.	16.	17.	18.
(c)	(a)	(b)	(b)	(b)	(b)	(c)	(b)	(d)