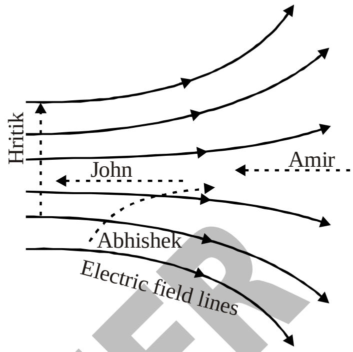
PRACTICE SHEET

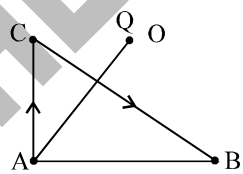
Electrostatics-1

1. Abhishek, Hritik, John, and Amir are assigned the tasks of moving equal positive charges slowly through an electric field, along assigned path (shown as dotted line). In each case the charge is at rest at the beginning. They all have paths of exactly equal lengths. Who must do the most positive work?



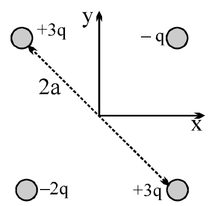
(A) Abhishek (B) Hritik
(C) Amir (D) John

2. There is a fixed positive charge Q at O and A and B are points equidistant from O. A positive charge + q is taken slowly by an external agent from A to B along the line AC and then along the line CB.



(A) The total work done on the charge is zero
(B) The work done by the electrostatic force from A to C is negative
(C) The work done by the electrostatic force from C to B is positive
(D) The work done by electrostatic force in taking the charge from A to B is dependent on the actual path

3. Four point charges are placed at the corners of a square with diagonal 2a as shown. What is the total electric field at the center of the square?



(A) kq/a^2 at an angle 45° above the +x axis
(B) kq/a^2 at an angle 45° below the –x axis
(C) $3kq/a^2$ at an angle 45° above the –x axis
(D) $3kq/a^2$ at an angle 45° below the +x axis
(E) $9kq/a^2$ at an angle 45° above the +x axis

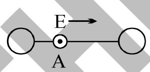
Comprehension (Q.4 to Q.6)

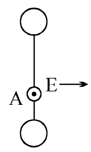
There is an insulator rod of length L and of negligible mass with two small balls of mass m and electric charge Q attached to its ends. The rod can rotate in the horizontal plane around a vertical axis crossing it at L/4 distance from one of its ends.

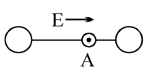
4. At first the rod is in unstable equilibrium in a horizontal uniform electric field of field strength E. Then we gently displace it from this position. Determine the maximum velocity attained by the ball which is closer to the axis in the subsequent motion.

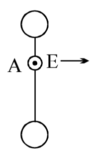
(A) $\sqrt{\frac{2QEL}{m}}$ (B) $\sqrt{\frac{2QEL}{5\,m}}$ (C) $\sqrt{\frac{5QEL}{m}}$ (D) $\sqrt{\frac{4\,QEL}{5\,m}}$

5. In what position is the rod to be set so that if displaced a little from that position it begins a harmonic oscillation about the axis A?

(A) 

(B) 

(C) 

(D) 

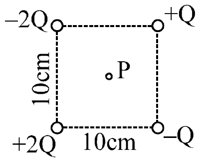
6. What is the time period of the SHM as mentioned in above question?

(A) $2\pi\sqrt{\frac{mL}{QE}}$ (B) $2\pi\sqrt{\frac{2mL}{3QE}}$ (C) $2\pi\sqrt{\frac{5\,mL}{QE}}$ (D) $2\pi\sqrt{\frac{5\,mL}{4\,QE}}$

PRACTICE SHEET

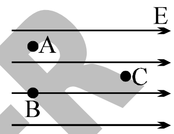
Electrostatics-2

1. Four electrical charges are arranged on the corners of a 10 cm square as shown. What would be the direction of the resulting electric field at the center point P?



(A) → (B) ↑ (C) ← (D) ↓ (E) ↗

2. Suppose a region of space has a uniform electric field, directed towards the right, as shown below. Which statement is true?



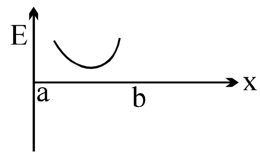
(A) The potential at all three locations is the same

(B) The potential at points A and B are equal, the potential at point C is higher than the potential at point A

(C) The potential at points A and B are equal, and the potential at point C is lower than the potential at point A

(D) The potential at point A is the highest, the potential at point B is the second highest, and the potential at point C is the lowest.

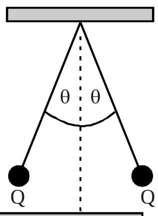
3. Two point like charges a & b whose magnitudes are same are positioned at a certain distance from each other, a is at origin. Graph is drawn between electric field strength and distance x from a. E is taken positive if it is along the line joining from a to b

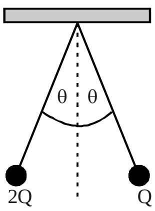


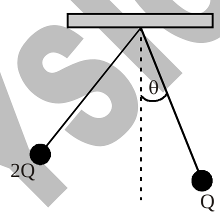
(A) a is positive, b is negative (B) a & b both are positive

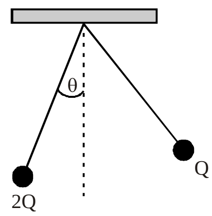
(C) a & b both are negative (D) a is negative, b is positive

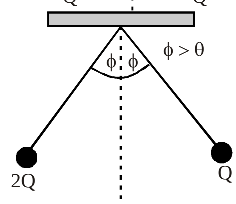
4. Two pith balls with mass m are suspended from insulating threads. When the pith balls are given equal positive charge Q, they hang in equilibrium as shown.
We now increase the charge on the left pith ball from Q to 2Q while leaving its mass essentially unchanged. Which of the following diagrams best represents the new equilibrium configuration?



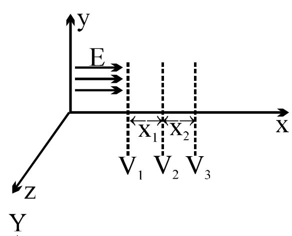
(A)


(B)


(C)


(D)


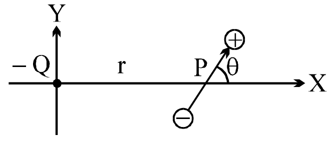
5. In an electric field shown in figure three equipotential surfaces are shown. If function of electric field is E = $2x^2$V/m, and given that $V_1 - V_2 = V_2 - V_3$, then we have



(A) $x_1 = x_2$ (B) $x_1 > x_2$

(C) x2 > x1 (D) data insufficient

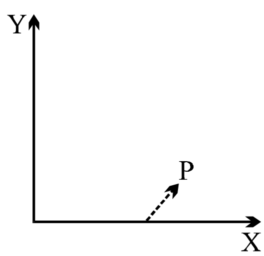
6. A point negative charge – Q is placed at a distance r from a dipole with dipole moment P as shown in figure. The x component of force acting on the charge – Q is -



(A) $-\dfrac{PKQ}{r}\cos\theta\,\hat{i}$ (B) $\dfrac{PKQ}{r}\cos\theta\,\hat{i}$

(C) $-\dfrac{2\,PKQ}{r^3}\cos\theta\,\hat{i}$ (D) $\dfrac{2\,PKQ}{r^3}\cos\theta\,\hat{i}$

7. A small electric dipole $\vec{P}$ is placed on the X axis at the point (1, 0). The dipole vector forms an angle of 30° with the X axis. Consider a non uniform electric field to have been applied in the region given by the vector $\vec{E} = x^2\hat{i} + y^2\hat{j}$. What is the force acting on the dipole?

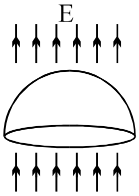


(A) $2\vec{P}\cos 30°\ (\hat{i} + 2\hat{j})$ (B) $2\vec{P}\cos 30°\ (\hat{i})$

(C) $2\vec{P}\cos 30°\ (2\hat{j})$ (D) None

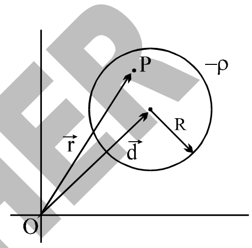
PRACTICE SHEET

Electrostatics-3



1. A hemispherical surface (half of a spherical surface) of radius R is located in a uniform electric field E that is parallel to the axis of the hemisphere. What is the magnitude of the electric flux through the hemisphere surface?

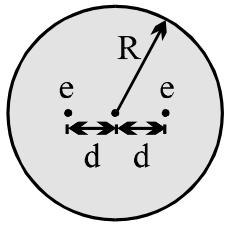
(A) 0 (B) $4\pi R^2E/3$
(C) $2\pi R^2E$ (D) πR^2E
(E) $4\pi R^2E$



2. A non-conducting sphere of radius R is filled with uniform volume charge density $-\rho$. The center of this sphere is displaced from the origin by $\vec{d}$. The electric field $\vec{E}$ at any point P having position vector, $\vec{r}$ inside the sphere is

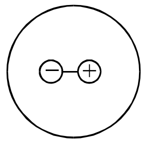
(A) $\frac{\rho}{3\varepsilon_0}\vec{d}$ (B) $\frac{\rho}{3\varepsilon_0}(\vec{r}-\vec{d})$

(C) $\frac{\rho}{3\varepsilon_0}(\vec{d}-\vec{r})$ (D) $\frac{\rho}{3\varepsilon_0}(\vec{d}+\vec{r})$



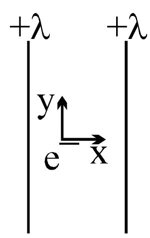
3. Using thomson's model of the atom, consider an atom consisting of two electrons, each of charge –e, embeded in a sphere of charge + 2e and radius R. In equilibrium each electron is at distance d from the centre of the atom. What is equilibrium separation between electrons?

(A) R (B) R/2
(C) R/3 (D) R/4



4. Consider a gaussian spherical surface, covering a dipole of charge q and –q, then

(A) q_{in} = 0 (Net charge enclosed by the spherical surface)
(B) ϕ_{net} = 0 (Net flux coming out the spherical surface)
(C) E = 0 at all points on the spherical surface
(D) $\int \vec{E}.d\vec{s}$ = 0 (Surface integral of over the spherical surface)

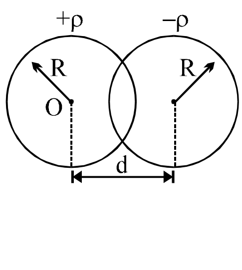


5. An electron is placed just in the middle between two long fixed line charges of charge density $+\lambda$ each. The wires are in the xy plane (Do not consider gravity)

(A) The equilibrium of the electron will be unstable along x-direction
(B) The equilibrium of the electron will be neutral along y-direction
(C) The equilibrium of the electron will be stable along z-direction
(D) The equilibrium of the electron will be stable along y-direction

Question No. 6 & 7 (2 questions)

There are two non-conducting spheres having uniform volume charge densities ρ and $-\rho$. Both spheres have equal radius R. The spheres are now laid down such that they overlaps as shown in the figure.



6. The electric field in the overlap region is

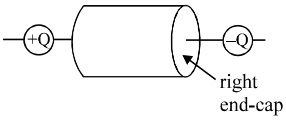
(A) non uniform
(B) zero
(C) $\frac{\rho}{3\varepsilon_0}\vec{d}$
(D) $\frac{\rho}{3\varepsilon_0}\vec{r}$

7. The potential difference ΔV between the centers of the two spheres for d = R is

(A) $\frac{\rho}{3\varepsilon_0}d^2$ (B) $\frac{\rho}{\varepsilon_0}d^2$

(C) zero (D) $\frac{2\rho}{\varepsilon_0}d^2$

Question No.8 & 9 (2 questions)
The figure applies to the following two questions.



Positive and negative charges of equal magnitude lie along the symmetry axis of a cylinder. The distance from the positive charge to the left end-cap of the cylinder is the same as the distance from the negative charge to the right end -cap.

8. What is the flux of the electric field through the closed cylinder?
(A) 0
(B) + Q/ε_0
(C) + $2Q / \varepsilon_0$
(D) – Q / ε_0
(E) None of the above

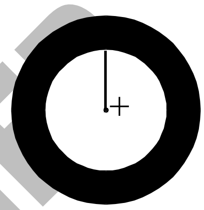
9. What is the sign of the flux through the right end-cap of the cylinder?
(A) Positive
(B) Negative
(C) There is no flux through the right end-cap.

10. A sphere of radius R carries charge such that its volume charge density is proportional to the square of the distance from the centre. What is the ratio of the magnitude of the electric field at a distance 2R from the centre to the magnitude of the electric field at a distance of R/2 from the centre (i.e. $E_{r=2R} / E_{r=R/2}$)?
(A) 1
(B*) 2
(C) 4
(D) 8

PRACTICE SHEET
Electrostatics-4

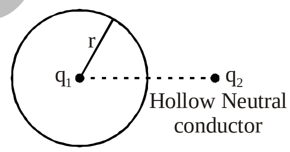
1. Which of the following is sufficient condition for finding the electric flux through a closed surface?
(A) If the magnitude of is known everywhere on the surface
(B) If the total charge inside the surface is specified
(C) If the total charge outside the surface is specified
(D) Only if the location of each point charge inside the surface is specified

2. An electrically isolated hollow (initially uncharged), conducting sphere has a small positively charged ball suspended by an insulating rod from its inside surface, see diagram. This causes the inner surface of the sphere to become negatively charged. When the ball is centered in the sphere the electric field outside the conducting sphere is approximately.



(A) zero
(B) the same as if the sphere wasn't there
(C) twice what it would be if the sphere wasn't there
(D) equal in magnitude but opposite in direction to what it would be if the sphere wasn't there

3. For the situation shown in the figure below, match the entries of Column-I with entries of Column-II.

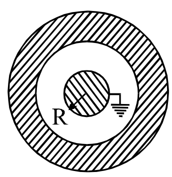


	Column-I		**Column-II**
(A)	In the situation shown	(P)	Distribution of charge on inner surface of conductor is uniform
(B)	If outside charge is not present	(Q)	Distribution of charge on inner surface of conductor is non-uniform
(C)	If we displace the outside charge while the inside charge remains at centre	(R)	Distribution of charge on outer surface of conductor is uniform
(D)	If the inside charge is displaced by small amount from centre then	(S)	Distribution of charge on outer surface of conductor is non-uniform

4. A total charge Q is distributed over two concentric hollow uniform sphere of radii a and b, (b > a), such a way that their surface charge densities are equal. The potential at the common centre is given by:

(A) $\frac{Q}{4\pi\varepsilon_o}\frac{(a+b)}{(a^2+b^2)}$ (B) $\frac{Q}{4\pi\varepsilon_o}\frac{(b-a)}{(a^2+b^2)}$ (C) $\frac{Q}{4\pi\varepsilon_o}\frac{(a-b)}{(a+b)^2}$ (D) $\frac{Q}{4\pi\varepsilon_o}\frac{(b-a)}{(a+b)^2}$

5. A conducting sphere of radius R and a concentric thick spherical shell of inner radius 2R and outer radius 3R is shown in figure. A charge +10Q is given to the shell and inner sphere is earthed. Then charge on inner sphere is



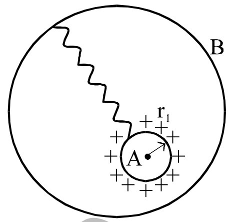
(A) –4Q (B) –10Q (C) zero (D) none

6. An uncharged aluminium block has a cavity within it. The block is placed in a region permeated by a uniform electric field which is directed upwards. Which of the following is a correct statement describing conditions in the interior of the block's cavity?
(A) The electric field in the cavity is directed upwards
(B) The electric field in the cavity is directed downwards
(C) There is no electric field in the cavity
(D) The electric field in the cavity is of varying magnitude and is zero at the exact center.

PRACTICE SHEET

Electrostatics- 5

1. A metal sphere A of radius r_1 charged to a potential ϕ_1 is enveloped by a thin walled conducting spherical shell B of radius r_2. Then ϕ_2 of the sphere A after it is connected by a thin wire to the shell B will be



(A) $\phi_1 \frac{r_1}{r_2}$ (B) $\phi_1 \frac{r_2}{r_1}$ (C) $\phi_1 (1 - \frac{r_1}{r_2})$ (D) $\phi_1 \left(\frac{r_1 r_2}{r_1 + r_2}\right)$

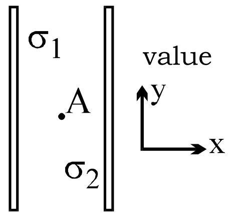
2. Statement-1 : An uncharged conducting slab is placed normally in a uniform electric field. The resultant electric field inside the slab is zero.
Statement-2 : The equal and opposite charges appearing on two surfaces of slab cancel the external field.
(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.

3. You are moving a negative charge $q < 0$ at a small constant speed away from a **uniformly charged non-**conducting spherical shell on which resides a negative charge $Q < 0$. The electrostatic field of Q is E. Let U be the total energy of **the system**, W_a the work done by the force F_a you exert on q and W_E the work done by the electrostatic force F_E on q. Then, as q is being moved,

(A) $W_a = -W_E$, therefore U remains constant (B) $F_a = -F_E$

(C) U increases (D) U decreases

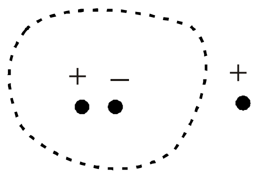
4. Two large conducting sheets are kept parallel to each other as shown. In equilibrium, the charge density on facing surfaces is σ_1 and σ_2. What is the value of electric field at A.



(A) $\frac{\sigma_1}{\varepsilon_o}\hat{i}$ (B) $-\frac{\sigma_2}{\varepsilon_o}\hat{i}$ (C) $\frac{\sigma_1 + \sigma_2}{2\,\varepsilon_o}\hat{i}$ (D) $\frac{\sigma_1 - \sigma_2}{2\,\varepsilon_o}\hat{i}$

5. Consider Gauss's Law $\oint \vec{E}.d\vec{A} = q/\varepsilon_0$. Which of the following is true?

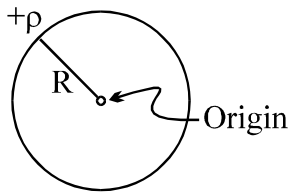
(A) $\vec{E}$ must be the electric field due to the enclosed charge
(B) If net charge inside the Gaussian surface = 0, then $\vec{E}$ must be zero everywhere over the Gaussian surface
(C) If the only charge inside the Gaussian surface is an electric dipole, then the integral is zero
(D) $\vec{E}$ is parallel to $d\vec{A}$ everywhere over the Gaussian surface



PRACTICE SHEET

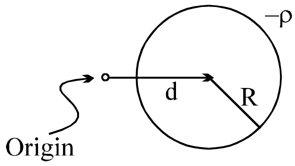
Electrostatics- 6

1. A sphere of radius R is filled with charge density +ρ and is centered on the origin.

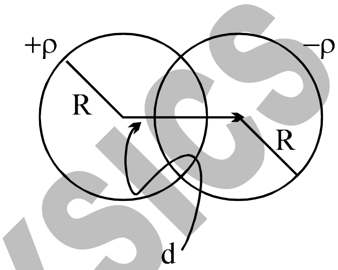


(a) Complete the electric field $\vec{E}$ for any point inside the sphere. Write your answer in terms of the displacement vector from the origin?

Consider now a sphere of radius R filled with charge density –ρ. The centre of this sphere is displaced from the origin by the vector $\vec{d} = d\hat{x}$.



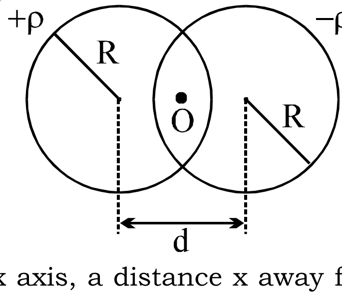
(b) Compute the electric field $\vec{E}$ for any point inside this sphere. Write your answer in terms of the displacement vector from the origin $\vec{r}$.



Both spheres are now laid down such that they overlap: d ≤ 2R.

(c) Compute the electric field $\vec{E}$ in the overlap region.

(d) What is the potential difference ΔV between the centers of the two spheres?



(e) Consider a point P on the x axis, a distance x away from the point O. What is the electric field for x >> R?

PRACTICE SHEET

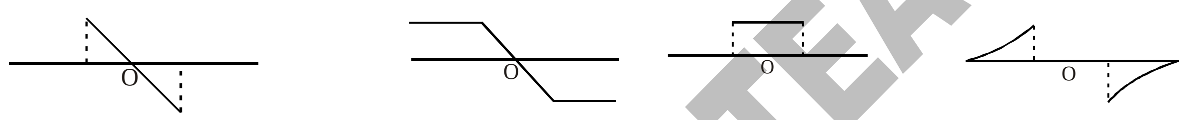
Electrostatics- 7

1. Two isolated conducting spheres each of radius R and carrying charges Q and 2Q. They are connected by a wire. Find the amount of heat produced during the transfer of charge from one sphere to other sphere.

2. A positive charge q is placed in front of a conducting solid cube at a distance d from its centre. Find the electric field at the centre of the cube due to the charges appearing on its surface.

3. Eight point charge of charge q each are placed on the eight corners of a cube of side a. A solid neutral metallic sphere of radius a/3 is placed with its centre at the centre of the cube. As a result, charge are induced on the sphere, which form certain patterns on its surface. What is the potential of the sphere?

Two **very large** parallel disks of charge have their centers on the x-axis and their planes perpendicular to the x-axis. The disk that intersects x = –R has uniform positive surface charge density +σ; the disk that intersects x = +R has uniform negative surface charge density –σ.



(i) (ii) (iii) (iv)

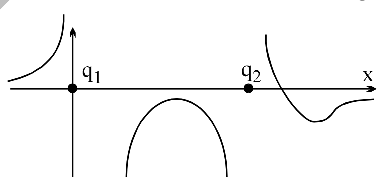
4. Which graph best represents the plot of the x-component of the electric field vector on the x-axis?

(A) (i) (B) (ii) (C) (iii) (D) (iv)

5. Which graph best represents the plot of the electric potential (V) as a function of x (treating V = 0 at x = 0) ?

(A) (i) (B) (ii) (C) (iii) (D) (iv)

6. Two charges q_1 & q_2 are kept on x-axis and electric field at different points an x-axis is plotted against x. Choose correct statement about nature and magnitude of q_1 & q_2.



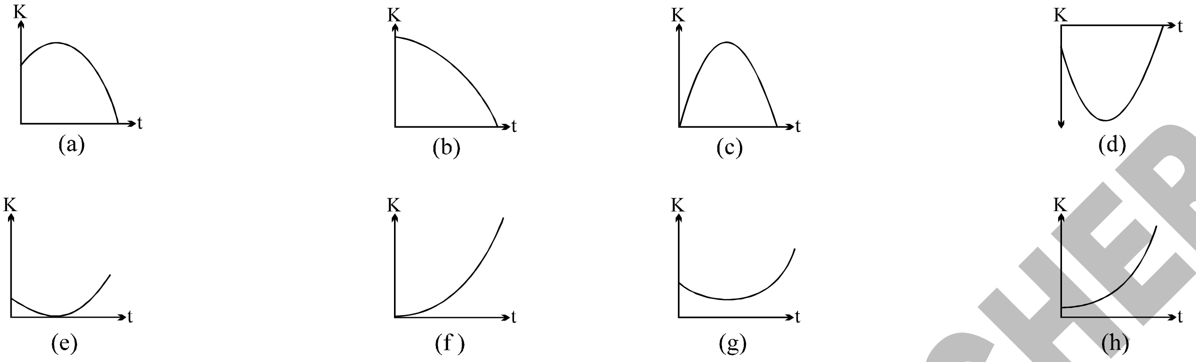
(A) q_1 +ve, q_2 –ve ; $|q_1| > |q_2|$ (B) q_1 +ve, q_2 –ve ; $|q_1| < |q_2|$

(C) q_1 –ve, q_2 +ve ; $|q_1| > |q_2|$ (D) q_1 –ve, q_2 +ve ; $|q_1| < |q_2|$

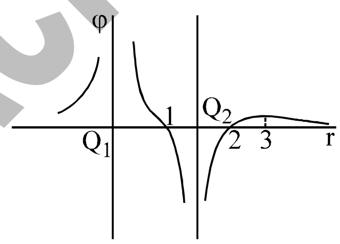
PRACTICE SHEET

Electrostatics- 8

1. A proton is either released at rest or launched with a certain velocity in a uniform electric field. Which of the graphs in figure could possibly show how the kinetic energy of the proton changes during the proton's motion?

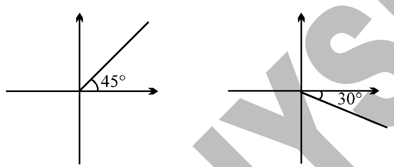


2. Two point charges, Q_1 and Q_2, are positioned at a certain distance from each other. The curves in the figure represent the distribution of the potential along the straight line connecting the two charges. At which points (1, 2 and/or 3) is the electric field strength zero? What are the signs of the charges Q_1 and Q_2 and which of the two is greater in magnitude?

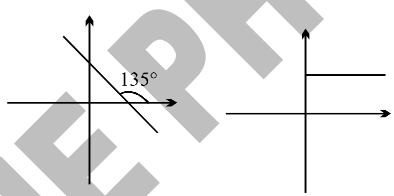


3. Column I shows graphs of electric potential V versus x and y in a certain region for four situations. Column II shows the range of angle which the electric field vector makes with positive x-direction.

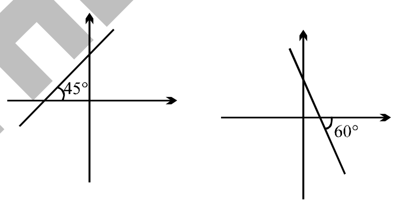
Column I **(V versus x)** **(V versus y)** **Column II**

(A)


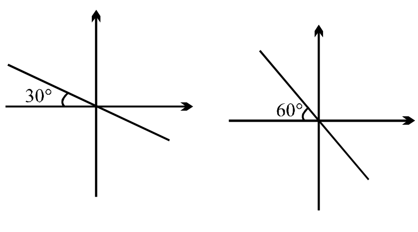
(P) $0 \le \theta < 45°$

(B)


(Q) $45° \le \theta < 90°$

(C)


(R) $90° \le \theta < 135°$

(D)


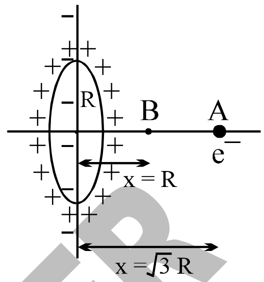
(S) $135° \le \theta \le 180°$

PRACTICE SHEET

Electrostatics- 9

Comprehension (1 to 3)

There is a uniformly charged ring having radius R. An infinite line charge (charge per unit length λ) is placed along a diameter of the ring (in gravity free space). Total charge on the ring $Q = 4\sqrt{2}\lambda R$. An electron of mass m is released from rest on the axis of the ring at a distance $x = \sqrt{3}R$ from the centre.



1. Magnitude of initial acceleration of the electron.

(A) $\frac{e\lambda}{\pi\varepsilon_o mR}\left(\frac{3-2\sqrt{2}}{4\sqrt{6}}\right)$ (B) $\frac{e\lambda}{\pi\varepsilon_o mR}\left(\frac{3+2\sqrt{2}}{4\sqrt{6}}\right)$

(C) $\frac{e\lambda}{\pi\varepsilon_o mR}\left(\frac{3-2\sqrt{2}}{4\sqrt{3}}\right)$ (D) none

2. The distance from centre of ring on the axis where the net force on the electron is zero.

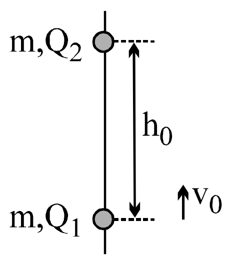
(A) 2R (B) $\sqrt{2}R$ (C) R (D) none of these

3. Potential difference between points A ($x = \sqrt{3}R$) and B (x = R) i.e. ($V_A - V_B$) is

(A) $-\frac{\lambda}{\pi\varepsilon_o}\left(1-\frac{1}{\sqrt{2}}\right)-\frac{\ln 3}{4}$ (B) $\frac{\lambda}{\pi\varepsilon_o}\left(1-\frac{1}{\sqrt{2}}\right)-\frac{\ln 3}{4}$

(C) $-\frac{\lambda}{\pi\varepsilon_o}\left(1+\frac{1}{\sqrt{2}}\right)-\frac{\ln 3}{4}$ (D) none

4. At the lower end of a vertically positioned insulator bar shown in the figure there is a pearl of the mass $m=10^{-4}$ kg and a charge of Q1. Above it at a height h_0=20 cm, there is another pearl with the same mass m and electric charge Q_2 resting in equilibrium. At a given moment we kick the lower pearl and it starts upwards at a velocity of v_0=2 m/s. How close (in cm) can the lower pearl get to the upper one at most? (The pearls can move along the bar without friction.)



5. Two point charges (Q each) are placed at (0, y) and (0, –y). A point charge q of the same polarity can move along X-axis. Then :

(A) the force on q is maximum at $x = \pm y / \sqrt{2}$

(B) the charge q is in equilibrium at the origin

(C) the charge q performs an oscillatory motion about the origin

(D) for any position of q other then origin the force is directed away from origin

6. A conducting ball is charged and another similar point charge is brought closer to the ball.

(A) the ball may attract the point charge

(B) the ball may repel the point charge

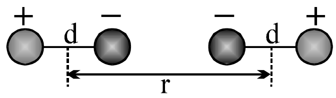
(C) the electric field inside the ball due to ball's charges is non- zero.

(D) the net electric field inside the ball is zero

PRACTICE SHEET

Electrostatics- 10

1. We have two electric dipoles. Each dipole consists of two equal and opposite point charges at the ends of an insulating rod of length d. The dipoles sit along the x-axis a distance r apart, oriented as shown below. Their separation r >> d. The dipole on the left:

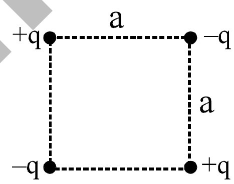


(A) will feel a force to the left.
(B) will feel a force to the right.
(C) will feel a torque trying to make it rotate counterclockwise.
(D) will feel no torque

2. Imagine a dipole is at the centre of a spherical surface. If magnitude of electric field at a certain point on the surface of sphere is 10 N/C, then which of the following **cannot** be the magnitude of electric field anywhere on the surface of sphere

(A) 4 N/C (B) 8 N/C (C) 16 N/C (D) 32 N/C

3. In a system of two dipoles placed in the way as shown in figure:



(A) It is possible to consider a spherical surface of radius a and whose centre lies within the square shown, through which total flux is +ve.
(B) It is possible to consider a spherical surface of radius a and whose centre lies within the square shown through which total flux is –ve
(C) There are two points within the square at which EF is zero.
(D) It is possible to consider a spherical s

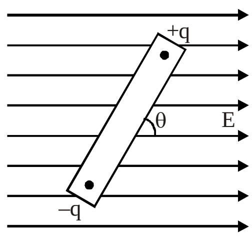
4. The net force on an electric dipole oriented parallel to the x axis in this field is

(A) directed along the x axis. (B) directed along the y axis.
(C) directed along the z axis,. (D) None of the above

5. The net torque on an electric dipole parallel to the x axis in this field is

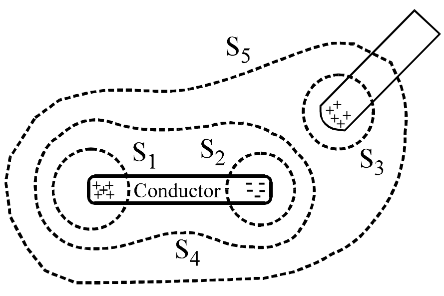
(A) directed along the x axis. (B) directed along the y axis.
(C) directed along the z axis. (D) None of the above

6. A small electric dipole is placed in a uniform electric field as shown in the diagram. Considering the situation above, choose the correct statement(s):



(A) The torque on the dipole points into the plane of the paper.
(B) If allowed to rotate freely about its center, the dipole would initially swing counter-clockwise.
(C) Work done by the electric field on the dipole, in rotating it from θ = 90° to θ = 30° is positive.
(D) The potential energy of the dipole is maximum when the electric field is perpendicular to the dipole moment.

7. A rod containing charge +Q is brought near an initially uncharged isolated conducting rod as shown. Regions with total surface charge +Q and –Q are induced in the conductor as shown in the figure. The only regions where the net charge in this configuration is non-zero are indicated by the "+" and "–" signs. Let us denote the total flux of electric field outward through closed surface S_1 as Φ_1,through S_2 as Φ_2, etc. Which of the following is necessarily **false**.



(A) $\Phi_1 > 0$ (B) $\Phi_2 = \Phi_1$ (C) $\Phi_3 = \Phi_1$ (D) $\Phi_4 = 0$

PRACTICE SHEET

Electrostatics- 11

1. Which of the following is **false** for a closed Gaussian surface?

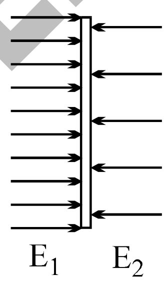
(A) If the electric field is zero everywhere on the surface, then there can be no net charge enclosed by the surface.

(B) If the total electric flux through the surface is zero, then the total charge enclosed by the surface is zero

(C) If the electric field is zero everywhere on the surface, then the total electric flux through the surface is zero

(D) If the total electric flux through the surface is zero, then the electric field must be zero everywhere on the surface.

2. A charged large metal sheet is placed into uniform electric field, perpendicularly to the electric field lines. After placing the sheet into the field, the electric field on the left side of the sheet is $E_1=5\times10^5$ V/m and on the right it is $E_2=3\times10^5$ V/m. The sheet experiences a net electric force of 0.08 N. Find the area of one face of the sheet. Assume external field to remain constant after introducing the large sheet.



(A) $3.6\,\pi\times10^{-2}$ m^2
(B) $0.9\,\pi\times10^{-2}$ m^2
(C) $1.8\,\pi\times10^{-2}$ m^2
(D) none

3. In which of following cases, electric field is uniform?

(A) Inside a uniformly charged spherical shell

(B) In any cavity inside a uniformly charged sphere

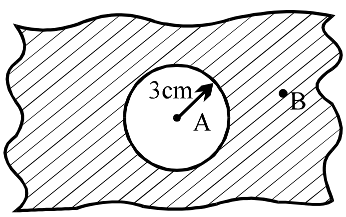
(C) In front of an infinite sheet of uniform surface charge density

(D) At a distance x from a point charge q.

4. There are two uncharged identical metallic spheres 1 and 2 of radius r separated by a distance d (d >> r). A charged metallic sphere of same radius having charge q is touched with one of the sphere. After some time it is moved away from the system. Now the uncharged sphere is earthed. Charge on earthed sphere is

(A) q
(B) – q
(C) – qr/2d
(D) 0

5. The figure shows a point charge of 0.5×10^{-6} C at the centre of a spherical cavity of radius 3cm in of piece of metal. The electric field at :



(A) A (2 cm from the charge) is 0

(B) A (2 cm from the charge) is 1.125×10^7 N/C

(C) B (5 cm from the charge) is 0

(D) B (5 cm from the charge) is 1.8×10^6 N/C

6. Pick the correct statements:

(A) If a point charge is placed off-centre inside an electrically neutral spherical metal shell then induced charge on its inner surface is uniformly distributed.

(B) If a point charge is placed off-centre inside an electrically neutral, isolated spherical metal shell, then induced charge on its outer surface is uniformly distributed.

(C) A non metal shell of uniform charge attracts or repels a charged particle that is outside the shell as if all the shell's charge were concentrated at the centre of the shell.

(D) If a charged particle is located inside a non metal shell of uniform charge, there is no electrostatic force on the particle due to the shell.