Chapter 01

Electrostatics

Practice Section-01

Q.1 When a piece of a material is rubbed with another material, mass of 9.1×10^{-20} kg is reduced from one material. Calculate the number of electrons gained by the another material.

(1) 10^{10} (2) 10^{13} (3) 10^{5} (4) 10^{11}

Q.2 Two point charges +9q and +q are kept 16 cm apart. Where should a third charge Q be placed between them so that the system remains in equilibrium ?

(1) 24 cm from + 9q (2) 12 cm from + 9q (3) 24 cm from + q (4) 12 cm from + q

Q.3 A charge Q is divided in two parts Q_1 and Q_2 and these charges are placed at a distance R. There will be maximum repulsion between them when:-

(1) $Q_1 = Q - q; Q_2 = q$ (2) $Q_1 = \frac{2Q}{3}, Q_2 = \frac{Q}{3}$ (3) $Q_1 = \frac{3Q}{4}, Q_2 = \frac{Q}{4}$ (4) $Q_1 = Q_2 = \frac{Q}{2}$

Q.4 An uncharged sphere of metal is placed in between two charged plates as shown. The lines of force look like

(1) A (2) B (3) C (4) D

Q.5 Two charges +5μC and +10μC are placed 20 cm apart. The net electric field at the mid-Point between the two charges is :

(1) 4.5×10^6 N/C directed towards + 5μC (2) 4.5×10^6 N/C directed towards +10μC

(3) 13.5×10^6 N/C directed towards +5μC (4) 13.5×10^6 N/C directed towards +10μC

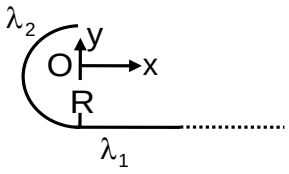
Q.6 Two point charges +8q and –2q are located at x=0 and x=L respectively. The location of a point on the x-axis at which the net electric field due to these two point charges is zero is :

(1) 8L (2) 4L (3) 2L (4) $\frac{L}{4}$

Q.7 A semicircular ring of radius 0.5 m is uniformly charged with a total charge of 1.4×10^{-9} C. The electric field intensity at the centre of this ring is:–

(1) zero (2) 320 V/m. (3) 64 V/m. (4) 32 V/m.

Q.8 In the figure shown, find the ratio of the linear charge densities λ_1 (on semi-infinite straight wire) and λ_2 (on semi-circular part) that is, λ_1/λ_2 so that the field at O is along y direction.



(1) 2 (2) 1.5 (3) 3 (4) 2.5

Q.9 $-1 \times 10^{-6} C$ charge is on a drop of water having mass 10^{-6} kg. What electric field should be applied on the drop so that it is in the balanced condition with its weight ?

(1) 10 V/m upward (2) 10 V/m downward (3) 0.1 V/m downward (4) 0.1 V/m upward

Q.10 Two point charges +3μC and +8μC are repel each other by force of 10 N. If a charge of –5μC is added to each of them and the distance become half then what will be the force between them would ?

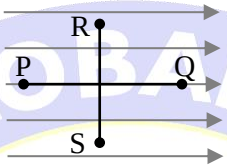
(1) –10 N (2) –20 N (3) 5 N (4) 10 N

Practice Section-02

Q.1 Gauss's law is valid for
(1) Any closed surface
(2) Only regular close surfaces
(3) Any open surface
(4) Only irregular open surfaces

Q.2 The total electric flux through a cube when a charge 8q is placed at one corner of the cube is
(1) $\varepsilon_0 q$ (2) $\frac{q}{\varepsilon_0}$ (3) $4\pi\varepsilon_0 q$ (4) $\frac{q}{4\pi\varepsilon_0}$

Q.3 The points resembling equal potentials are



(1) P and Q (2) S and Q (3) S and R (4) P and R

Q.4 Two charged spheres of radi R_1 and R_2 having equal surface charge density. The radio of their potential is
(1) R_1/R_2 (2) R_2/R_1 (3) $(R_1/R_2)^2$ (4) $(R_2/R_1)^2$

Q.5 A cylinder of length L and radius b has its axis coincident with the x-axis. The electric field in this region is $\vec{E} = 200\hat{i}$. Find the flux through the left end of the cylinder.
(1) 0 (2) 200 πb^2 (3) 100 πb^2 (4) –200 πb^2

Q.6 The potential of an electric field $\vec{E} = (y\hat{i} + x\hat{j})$ is
(1) V = –xy + constant
(2) V = –(x + y) + constant
(3) V = –(x^2 + y^2) + constant
(4) V = constant

Q.7 A hollow metal sphere of radius 5 cm is charged so that the potential on its surface is 10 V. The potential at the centre of the sphere is
(1) 0 V
(2) 10 V
(3) Same as at point 5 cm away from the surface
(4) Same as at point 25 cm away from the surface

Q.8 A charge of 5 C experiences a force of 5000 N when it is kept in a uniform electric field. What is the potential difference between two points separated by a distance of 1 cm
(1) 10 V (2) 250 V (3) 1000 V (4) 2500 V

Q.9 If a charged spherical conductor of radius 10 cm has potential V at a point distant 5 cm from its centre, then the potential at a point distant 15 cm from the centre will be
(1) $\frac{1}{3}$V (2) $\frac{2}{3}$V (3) $\frac{3}{2}$V (4) 3 V

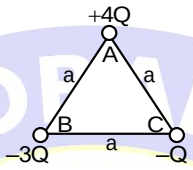
Q.10 If a unit positive charge is taken from one point to another over an equipotential surface, then work done on the charge is:
(1) Positive (2) Negative (3) Zero (4) Constant

Practice Section-03

Q.1 The angle between the dipole moment and electric field at any point on the equatorial plane is
(1) 90° (2) 45° (3) 0° (4) 180°

Q.2 An electric dipole is kept in non-uniform electric field. It experiences
(1) A force and a torque (2) A force but not a torque
(3) A torque but not a force (4) Neither a force nor a torque

Q.3 Three charges of (+4Q), (–3Q) and (–Q) are placed at the corners A, B and C of an equilateral triangle of side a as shown in the adjoining figure. Then the dipole moment of this combination is



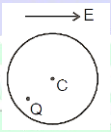
(1) $\frac{Qa}{\sqrt{13}}$ (2) zero (3) $Qa\sqrt{13}$ (4) $\frac{2}{\sqrt{13}}Qa$

Q.4 An electrical dipole of moment 'p' is placed in an electric field of intensity 'E'. The dipole acquired a position such that the axis of the dipole makes an angle θ with the direction of the field. Assuming the potential energy of the dipole to be zero when θ = 90°, the torque and the potential energy of the dipole will respectively be :
(1) pE sinθ, 2pE cosθ (2) pE cosθ, –pE sinθ
(3) pE sinθ, –pE cosθ (4) pE sinθ, –2pE cosθ

Q.5 An electric dipole when placed in a uniform electric field E will have minimum potential energy,, if the positive direction of dipole moment makes the following angle with E
(1) π (2) π/ 2 (3) Zero (4) 3π/ 2

Q.6 An electric dipole consisting of two opposite charges of 2×10^{-6} C each separated by a distance of 3 cm is placed in an electric field of 2×10^{5} N/C. The maximum torque on the dipole will be
(1) 12×10^{-1} Nm (2) 12×10^{-3} Nm (3) 24×10^{-1} Nm (4) 24×10^{-3} Nm

Q.7 A positive point charge Q is kept (as shown in the figure) inside a neutral conducting shell whose centre is at C. An external uniform electric field E is applied. Then :



(1) Force on Q due to E is zero
(2) Net force on Q is zero
(3) Net force acting on Q and conducting shell considered as a system is zero
(4) Net force acting on the shell due to E is zero.

Q.8 A conducting sphere of radius r has a charge. Then
(1) The charge is uniformly distributed over its surface, if there is an external electric field.
(2) Distribution of charge over its surface will be non-uniform if no external electric field exist in space.
(3) Electric field strength inside the sphere will be equal to zero only when no external electric field exists.
(4) Potential at every point of the sphere must be same

ANSWER KEY

PRACTICE SECTION-01

Que.	1	2	3	4	5	6	7	8	9	10
Ans:	4	2	4	3	1	3	4	1	2	1

PRACTICE SECTION-02

Que.	1	2	3	4	5	6	7	8	9	10
Ans:	1	2	3	1	4	1	2	1	2	3

PRACTICE SECTION-03

Que.	1	2	3	4	5	6	7	8
Ans:	4	1	3	3	3	2	4	4