EXERCISE # 2

Based on Charge and It's properties

Q.1 Which of the following charge is not posible :

[1] 1.6×10^{-18} C [2] 1.6×10^{-19} C [3] 1.6×10^{-20} C [4] None of these

Q.2 A body has 80 microcoulomb of charge. Number of additional electrons on it will be :

[1] 8×10^{-5} [2] 80×10^{15} [3] 5×10^{14} [4] 1.28×10^{-17}

Q.3 The electric charge in uniform motion produces -

[1] an electric field only [2] a magnetic field only

[3] both electric and magnetic fields [4] neither electric nor magnetic fields

Based on Coulomb's law

Q.4 Two identical metallic sphere are charged with 10 and -20 units of charge. If both the spheres are first brought into contact with each other and then are placed to their previous positions, then the ratio of the force in the two situations will be :-

[1] -8 : 1 [2] 1 : 8 [3] -2 : 1 [4] 1 : 2

Q.5 Two equal and like charges when placed 5 cm apart experience a repulsive force of 0.144 newton. The magnitude of the charge in microcoloumb will be :

[1] 0.2 [2] 2 [3] 20 [4] 12

Q.6 Two charges of +1 μC & + 5 μC are placed 4 cm apart, the ratio of the force exerted by both charges on each other will be -

[1] 1 : 1 [2] 1 : 5 [3] 5 : 1 [4] 25 : 1

Q.7 Two infinite linear charges are placed parallel at 0.1 m apart. If each has charge density of 5μ C/m, then the force per unit length of one of linear charges in N/m is :

[1] 2.5 [2] 3.25 [3] 4.5 [4] 7.5

Q.8 Three small spheres each carrying a charge q are placed on the circumference of a circle of radius R, forming an equilateral triangle. If we place another charge Q at the centre of the circle, the force on Q will be

[1] zero [2] $\frac{1}{4\pi\varepsilon_0} \times \frac{qQ}{R^2}$ [3] $\frac{1}{4\pi\varepsilon_0} \times \frac{2qQ}{R^2}$ [4] $\frac{1}{4\pi\varepsilon_0} \times \frac{3qQ}{R^2}$

Q.9 Three charges each equal to +2μ C are placed at the corners of an equilateral triangle. If the force between any two charges be F, then the net force on either will be

[1] 3 F [2] 2 F [3] $\sqrt{2}$.F [4] $\sqrt{3}$.F

Q.10 $\sqrt{3} \times 10^{-19}$ C and -10^{-6}C are placed at (0, 0, 0) and (1, 1, 1) respectively. Find the force on second in vector form

[1] $3 \times 10^{-6}(\hat{i} + \hat{j} + \hat{k})$N [2] $-3 \times 10^{-6}(\hat{i} + \hat{j} + \hat{k})$N

[3] $3 \times 10^{-6}(\hat{i} - \hat{j} + \hat{k})$N [4] none of these

Based on Absolute & Relative Permittivity (Dielectric const.)

Q.11 Relative permittivity of mica is :

[1] one [2] less than one [3] more then one [4] infinite

Q.12 The dielectric constant for water is -

[1] 1 [2] 40 [3] 81 [4] 0.3

Based on Electric field, Intensity, Electric Potential & Potential Energy

Q.13 If an electron is placed in a uniform electric field, then the electron will :

[1] experience no force.

[2] moving with constant velocity in the direction of the field.

[3] move with constant velocity in the direction opposite to the field.

[4] accelerate in direction opposite to field.

Q.14 If Q = 2 coloumb and force on it is F = 100 newton, then the value of field intensity will be :

[1] 100 N/C [2] 50 N/C [3] 200 N/C [4] 10 N/C

Q.15 A force of 3000 N is acting on a charge of 3 coloumb moving in a uniform electric field. The potential difference between two point at a distance of 1 cm in this field is :

[1] 10V [2] 90V [3] 1000V [4] 9000V

Q.16 The intensity of an electric field at some point distant r from the axis of infinite long pipe having charges per unit length as q wil be :

[1] proportional to r^2 [2] proportional to r^3

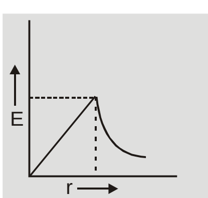
[3] inversely proportional to r. [4] inversely proportional to r^2.

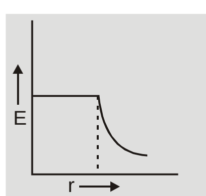
Q.17 The electric field intensity due to a uniformly charged sphere is zero :

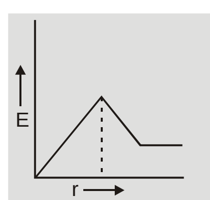
[1] at the centre [2] at infinity

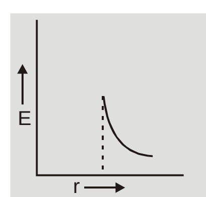
[3] at the centre and at infinite distance [4] on the surface

Q.18 Which of the following represents the correct graph for electric field intensity and the distance r from the centre of a hollow charged metal sphere or solid metallic conductor of radius R :

[1] 

[2] 

[3] 

[4] 

Q.19 Total charge on a sphere of radii 10 cm is 1 μC. The maximum electric field due to the sphere in N/C will be -

[1] 9×10^{-5} [2] 9×10^{3} [3] 9×10^{5} [4] 9×10^{15}

Q.20 A charged water drop of radius 0.1 μm is under equilibrium in some electric field. The charge on the drop is equivalent to electronic charge. The intensity of electric field is (g = 10 m/s^2)-

[1] 1.61 NC^{-1} [2] 26.2 NC^{-1} [3] 262 NC^{-1} [4] 1610 NC^{-1}

Q.21 The distance between two plates is 2 cm, when an electric potential of 10 volt is applied to both the plates, then the value of electric field will be -

[1] 20 N/C [2] 500 N/C [3] 5 N/C [4] 250 N/C

Q.22 The charge density of an insulating infinite surface is (e/π) C/m^2 then the field intensity at a nearby point in volt/meter will be -

[1] 2.88×10^{-12} [2] 2.88×10^{-10} [3] 2.88×10^{-9} [4] 2.88×10^{-19}

Q.23 Two objects A and B are charged with equal charge Q. The potential of A relative to B will be -

[1] more [2] equal [3] less [4] indefinite

Q.24 In electrostatics the potential is equivalent to -

[1] temperature in heat [2] height of levels in liquids

[3] pressure in gases [4] all of the above

Q.25 The potential due to a point charge at distance r is -

[1] proportional to r. [2] inversely proportional to r.

[3] proportional to r^2. [4] inversely proportional to r^2

Q.26 The dimensions of potential difference are -

[1] $ML^2T^{-2}Q^{-1}$ [2] $MLT^{-2}Q^{-1}$ [3] $MT^{-2}Q^{-2}$ [4] $ML^2T^{-1}Q^{-1}$

Q.27 Two parallel plates have charges + Q and - Q, with potential difference V between them. If the distance between the plates is increased then the potential difference will -

[1] decrease [2] increase

[3] be same as before. [4] depend upon the metal of plates

Q.28 An object is charged with positive charge. The potential at that object will be -

[1] positive only [2] negative only

[3] zero always [4] may be positive, negative or zero.

Q.29 An uncharged conductor A is brought close to another charged conductor B, then the charge on B -

[1] will increase but potential will be constant. [2] will be constant but potential will increase

[3] will be constant but potential decreases. [4] and the potential both are constant.

Q.30 In H atom, an electron is rotating around the proton in an orbit of radius r. Work done by an electron in moving once around the proton along the orbit will be -

[1] ke/r [2] ke^2/r^2 [3] $2\pi re$ [4] zero

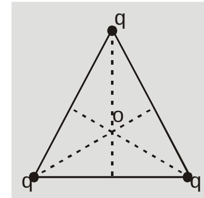
Q.31 Two points (0, a) and (0, -a) have charges q and -q respectively then the electrical potential at origin will be-

[1] zero [2] kq/a [3] kq/2a [4] $kq/4a^2$

Q.32 The charges of same magnitude q are placed at four corners of a square of side a. The value of potential at the centre of square will be -

[1] 4kq/a [2] $4\sqrt{2}kq/a$ [3] $4kq\sqrt{2a}$ [4] $kq/a\sqrt{2}$

Q.33 Three equal charges are placid at the three corners of an isosceles triangle as shown in the figure. The statement which is true for electric potential V and the field intensity E at the centre of the triangle



[1] V = 0, E = 0 [2] V = 0, E $\neq$ 0

[3] V $\neq$ 0, E = 0 [4] V $\neq$ 0, E $\neq$ 0

Q.34 The potential at 0.5 Å from a proton is -

[1] 0.5 volt [2] 8μ volt [3] 28.8 volt [4] 2 volt

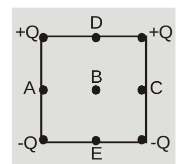
Q.35 A wire of 5 m length carries a steady current. If it has an electric field of 0.2 V/m, the potential difference across the wire in volt will be -

[1] 25 [2] 0.04 [3] 1.0 [4] none of the above

Q.36 A nucleus has a charge of + 50e. A proton is located at a distance of 10^{-12} m. The potential at this point in volt will be -

[1] 14.4×10^4 [2] 7.2×10^4 [3] 7.2×10^{-12} [4] 14.4×10^8

Q.37 For the arrangement of charges shown in the figure, potential is zero at -



[1] A, B and C [2] D, B and E

[3] B only [4] A, B, C, D, and E

Q.38 An infinite number of charges of equal magnitude q, but of opposite sign are placed along the x-axis at x = 1, x = 2, x = 4, x =8,... and so on. The electric potential at the point x = 0 due to all these charges will be -

[1] kq/2 [2] kq/3 [3] 2kq/3 [4] 3kq/2

Q.39 The electric potential inside a uniformly charged sphere has the value which -

[1] increase with distance from the centre. [2] decreases with distance from the centre.

[3] is equal at all the points. [4] is zero at all the points.

Q.40 Two metallic spheres which have equal charges, but their radii are different, are made to touch each other and then separated apart. The potential the spheres will be -

[1] same as before [2] more for bigger [3] more for smaller [4] equal

Q.41 Two spheres of radii R and 2R are charged and then connected by a conducting wire, then the charge will

[1] flow from smaller sphere to the bigger sphere. [2] flow from bigger sphere to the smaller sphere

[3] not flow. [4] oscillate between the spheres.

Q.42 The potential difference between two spheres of radii r_1 and r_2 is zero. The ratio of their charges Q_1/Q_2 will be-

[1] r_1/r_2 [2] r_2/r_1 [3] r_1^2/r_2^2 [4] r_1^3/r_2^3

Q.43 The potential on the conducting spheres of radii r_1 and r_2 is same, the ratio of their charge densities will be-

[1] r_1/r_2 [2] r_2/r_1 [3] r_1^2/r_2^2 [4] r_2^2/r_1^2

Q.44 The electric potential outside a uniformly charged sphere at a distance ‘r’ is (‘a’ being the radius of the sphere)-

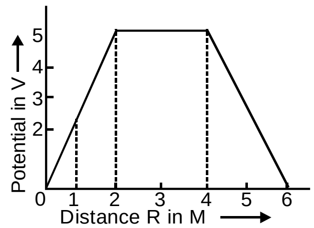
[1] directly proportional to a^3 [2] directily proportional to r.

[3] inversely proportional to r. [4] inversely proportional to a^3.

Q.45 A conducting shell of radius 10 cm is charged with 3.2×10^{-1} C. The electric potential at a distance 4cm from its centre in volt be -

[1] 9×10^{-9} [2] 288 [3] 2.88×10^{-8} [4] zero

Q.46 The variation of potential with distance R from fixed point is shown in fig. The electric field at R = 5m is -



[1] 2.5 V/m [2] –2.5 V/m [3] 2/5 V/m [4] –2/5 V/m

Q.47 Charges of + (10/3) x 10^{-9} C are placed at each of the four corners of a square of side 8 cm. The potential at the intersection of the diagonals is -

[1] $150\sqrt{2}$ volt [2] $1500\sqrt{2}$ volt [3] $900\sqrt{2}$ volt [4] 900 volt

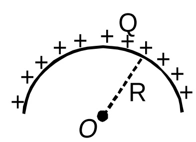
Q.48 If an electron has an initial velocity in a direction different from that of an electric field the path of the electron is-

[1] a straight line [2] a circle [3] an ellipse [4] a parabola

Q.49 Two plastic rods of equal lengths ($L = \pi R$) one of charge q and other of charge -q, form a circle of radius R in an xy plane. The charge is distributed uniformly on both rods. Then the electric field at the centre of circle is-

[1] zero [2] $q/4\pi\varepsilon_0 R^2$ [3] $q/2\pi^2\varepsilon_0 R^2$ [4] $q/\pi^2\varepsilon_0 R^2$

Q.50 A semicircular ring of radius R is given a uniform charge Q. Then the electric field and electric potential at its centre will be -



[1] $\dfrac{Q}{4\pi \epsilon_0 R^2}, \dfrac{Q}{4\pi \epsilon_0 R}$ [2] $\dfrac{Q}{2 \epsilon_0 \pi^2 R^2}, \dfrac{Q}{4\pi \epsilon_0 R}$ [3] $\dfrac{Q}{4\pi \epsilon_0 R}, \dfrac{Q}{2\pi \epsilon_0 R}$ [4] zero, zero

Q.51 When a charge of 0.33 μC is placed in an uniform electric field, it experiences a force of 1×10^{-5} newton. Then the electric field intensity is (in SI units) -

[1] 0.33×10^{-11} [2] 0.033 [3] 30.3 [4] 30.3×10^{10}

Q.52 Charges of 3e and 9e are placed at a distance r. What is the distance of the point from 9e where electric field is zero.

[1] $x = \dfrac{\sqrt{2}\,r}{\sqrt{3}-1}$ is not possible since x > r [2] $x = \dfrac{\sqrt{3}\,r}{\sqrt{3}-1}$ is not possible since x < r

[3] $x = \dfrac{\sqrt{3}\,r}{\sqrt{2}-1}$ is not possible since x < r [4] $x = \dfrac{\sqrt{3}\,r}{\sqrt{3}-1}$ is not possible since x > r

Q.53 Infinite number of same charge q are placed at x = 1, 2, 4, 8 ...... What is the potential at x = 0 ?

[1] $\dfrac{q}{\pi\varepsilon_0}$ [2] $\dfrac{q}{3\pi\varepsilon_0}$ [3] $\dfrac{q}{2\pi\varepsilon_0}$ [4] none of these

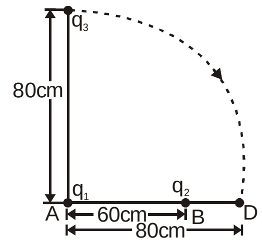
Q.54 If the alternative charges are unlike, then what will be the potential ?

[1] $\dfrac{1}{4\pi\epsilon_0}\dfrac{q}{3}$ [2] $\dfrac{1}{4\pi\epsilon_0}\dfrac{2q}{3}$ [3] $\dfrac{1}{2\pi\epsilon_0}\dfrac{2q}{3}$ [4] $\dfrac{1}{3\pi\epsilon_0}\dfrac{2q}{3}$

Q.55 A charge + q is fixed at each of the points $x = x_0$, $x = 3x_0$, $x = 5x_0$... ad inf. on the x-axis, and a charge –q is fixed at each of the points $x = 2x_0$, $x = 4x_0$, $x = 6x_0$ .... an inf. Here x_0 is a positive constant. Take the electric potential at a point due to a charge Q at a distance r from it be $Q/4\pi\epsilon_0 r$. Then, the potential at the origin due to the above system of charge is

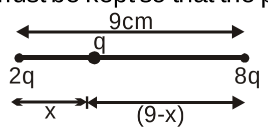
[1] 0 [2] $\frac{q}{8\pi\epsilon_0 x_0 \log 2}$ [3] ∞ [4] $\frac{q\log 2}{4\pi\epsilon_0 x_0}$

Q.56 According to fig., the value of q_1 and q_2 are respectively 2×10^{-8}C and 0.4×10^{-8}C. What will be change in potential energy of $q_3 = 0.2 \times 10^{-8}$C , in moving it along CD for the following fig.



[1] 2.88×10^7 J [2] 2.88×10^6 J [3] 2.88×10^{-7} J [4] none of these

Q.57 In the following fig. where the change 'q' must be kept so that the potential energy of the system will be minimum ?



[1] 3 cm [2] 2 cm [3] 4 cm [4] none of these

Based on Electric line of force

Q.58 For an electrostatic system which of the statement is always true :

[a] electric lines are parallel to metallic surface.

[b] electric field inside a metallic surface is zero.

[c] electric lines of force are perpendicular to equi-potential surface.

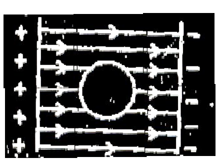
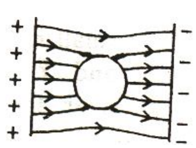
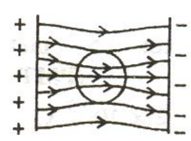
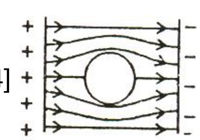
[1] (a) and (b) only [2] (b) and (c) only [3] (a) and (c) only [4] (a), (b) and (c)

Q.59 If we move in a direction opposite to the electric lines of force :

[1] electrical potential decreases. [2] electrical potential increases.

[3] electrical potential remains uncharged [4] nothing can be said.

Q.60 An uncharged metal sphere is placed between two equal and oppositely charged metal plates. The nature of lines of force will be -

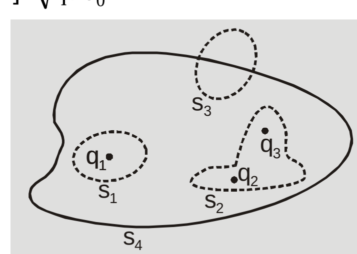
[1]  [2]  [3]  [4] 

Based on Gauss law & Applications

Q.61 Total flux coming out of some closed surface is :

[1] q/ε_0 [2] ε_0/q [3] $q\varepsilon_0$ [4] $\sqrt{q/\varepsilon_0}$

Q.62 Three charges $q_1 = 1 \times 10^{-6}$, $q_2 = 2 \times 10^{-6}$, $q_3 = -3 \times 10^{-6}$ C have been placed, as shown in figure, in four surfaces S_1, S_2, S_3 and S_4 electrical flux emitted from the surface S_2 in N–m²/C will be -



[1] $36\pi \times 10^3$ [2] $-36\pi \times 10^3$

[3] $36\pi \times 10^9$ [4] $-36\pi \times 10^9$

Q.63 The electric field near the conducting surface of a uniform charge density σ will be -

[1] σ/ϵ_0 and parallel to surface. [2] $2\sigma/\epsilon_0$ and parallel to surface.

[3] σ/ϵ_0 and perpendicular to surface. [4] $2\sigma/\epsilon_0$ and perpendicular to surface.

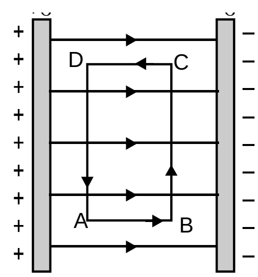
Q.64 Two large sized charged plates have a charge density of $+\sigma$ and $-\sigma$. The resultant force on the proton located midway between them will be -

[1] $\sigma e/\epsilon_0$ [2] $\sigma e/2\epsilon_0$ [3] $2\sigma e/\epsilon_0$ [4] zero

Q.65 Two parallel charged plates have a charge density $+\sigma$ and $-\sigma$. The resultant force on the proton located outside the plates at some distance will be -

[1] $2\sigma e/\epsilon_0$ [2] $\sigma e/\epsilon_0$ [3] $\sigma e/2\epsilon_0$ [4] zero

Q.66 Consider equal and oppositely charged oppositely charge large parallel plates, with charge density $\pm\sigma$. A small charge q_0 is moved along the rectangular path ABCDA where side AB = x and side BC = y. Then correct statement(s) is (are) -



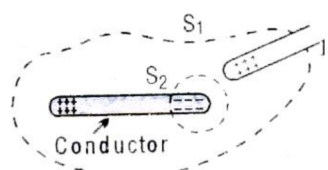
[1] work done by electric field along path AB is positive and equal to $q_0\sigma x/\varepsilon_0$.

[2] work done by electric field along path BC is zero

[3] work done by electric field along the path ABCDA is zero

[4] all of the above

Q.67 Charge on an originally uncharged conductor is separated by holding a positively charged rod very closely nearby, as in Fig. Assume that the induced negative charge on the conductor is equal to the positive charge q on the rod then, flux through surface S_1 is -



[1] zero [2] q_0/ε_0 [3] $-q_0/\varepsilon_0$ [4] none of the above

Q.68 Eight charges, $1\mu C$,. $-7\mu C$, $-4\mu C$, $10\mu C$, $2\mu C$, $-5\mu C$, $-3\mu C$ and $6\mu C$ are situated at the eight corners of a cube of side 20 cm. A spherical surface of radius 80 cm encloses this cube. The centre of the sphere coincides with the centre of the cube. Then the total outgoing flux from the spherical surface (in unit of volt meter) is-

[1] $36\pi \times 10^3$ [2] $684\pi \times 10^3$ [3] zero [4] none of the above

Q.69 A charge q is situated at the centre of a square of side d. The electric field intensity at the mid-point of a side is E_1 and at one corner of the square is E_2. Then the ratio $E_1 : E_2$ is-

[1] 0.50 [2] 0.71 [3] 1.41 [4] 2.00

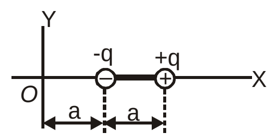
Q.70 When a positive charge is given to soap bubble, its size is found to increase. What happens to the size, if negative charge is given to a similar uncharged soap bubble ?

[1] increases [2] decreases [3] remains the same [4] nothing can be predicted

Q.71 A closed cylinder of radius R and length L is placed in a uniform electric field E, parallel to the axis of the cylinder. Then the electric flux through the cylinder must be -

[1] $2\pi R^2E$ [2] $(2\pi R^2 + 2\pi RL)E$ [3] $2\pi RLE$ [4] zero

Q.72 Two equal and opposite charges –q and +q are fixed at the ends of a massless insulating rod of length a. It is placed along the X-axis as shown. In this region the electric field varies as $E = K/x^2$ along the X-axis. Then the net force on the system is -



[1] zero [2] $\frac{3Kq}{4a^2}$ towards origin [3] $\frac{3Kq}{a^2}$ away from origin [4] $\frac{Kq}{2.25a^2}$ away from origin

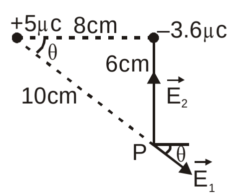
Q.73 A sphere of radius R has a uniform distribution of electric charge in its volume. At a distance x from its centre, for x < R, the electric field is directly proportional to

[1] $1/x^2$ [2] $1/x$ [3] x [4] x^2

Q.74 Two concentric spheres of radii R and r have smilar charges with equal surface densities (σ). What is the electric potential at their common centre

[1] σ/ε_0 [2] $\frac{\sigma}{\varepsilon_0}(R - r)$ [3] $\frac{\sigma}{\varepsilon_0}(R + r)$ [4] none of the above

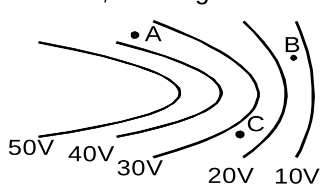
Q.75 Find $\vec{E}$ at point P



[1] 7.3×10^{-6} N/C [2] 7.3×10^{5} N/C [3] 3.7×10^{6} N/C [4] 7.3×10^{6} N/C

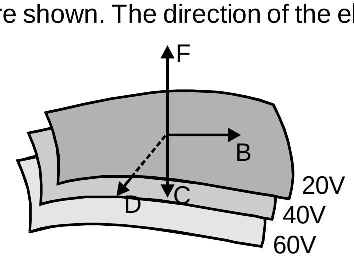
Based on Equipotential Surface

Q.76 The fig. shows lines of constant potential in a region in which an electric field is present. The value of the potential are written in brackets of the points A, B and C, the magnitude of the electric field is greatest at the point -



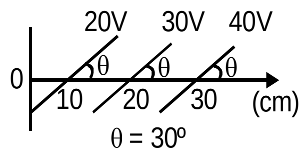
[1] A [2] B [3] C [4] A & C

Q.77 A family of equipotential surfaces are shown. The direction of the electric field at point A is along -



[1] AB [2] AC [3] AD [4] AF

Q.78 Some equipotential surfaces are shown in the figure. The magnitude and direction of the electric field is-



[1] 100 V/m making angle 120^0 with the x-axis [2] 100 V/m making angle 60^0 with the x-axis

[3] 200 V/m making angle 120^0 with the x-axis [4] none of the above

Based on Electric Dipole

Q.79 If an electric dipole is kept in a non-uniform electric field, then it will experience -

[1] only torque [2] no torque

[3] a resultant force and a torque [4] only a force

Q.80 The force on a charge situated on the axis of a dipole is F. If the charge is shifted to double the distance, the acting force will be -

[1] 4F [2] F/2 [3] F/4 [4] F/8

Q.81 A dipole of dipole moment p, is placed in an electric field $\vec{E}$ and is in stable equilibrium. The torque required to rotate the dipole from this position by angle θ will be -

[1] pE cos θ [2] pE sin θ [3] pE tan θ [4] –pE cosθ

Q.82 The electric potential at a point due to an electric dipole will be -

[1] $\frac{k(\vec{p}.\vec{r})}{r^3}$ [2] $\frac{k(\vec{p}.\vec{r})}{r^2}$ [3] $\frac{k(\vec{p} \times \vec{r})}{r}$ [4] $\frac{k(\vec{p} \times \vec{r})}{r^2}$

Q.83 The ratio of electric fields due to an electric dipole on the axis and on the equatorial line at equal distance will be -

[1] 4 : 1 [2] 1 : 2 [3] 2 : 1 [4] 1 : 1

Q.84 An electric dipole is made up of two equal and opposite charges of 2×10^{-6} coulomb at a distance of 3 cm. This is kept in an electric field of 2×10^5 N/C, then the maximum torque acting on the dipole -

[1] 12×10^{-1} Nm [2] 12×10^{-3} Nm [3] 24×10^{-3} Nm [4] 24×10^{-1} Nm

Q.85 The distance between two singly ionised atoms is 1Å. If the charge on both ions is equal and opposite then the dipole moment. in coulomb metre is -

[1] 1.6×10^{-29} [2] 0.16×10^{-29} [3] 16×10^{-29} [4] $1.6 \times 10^{-29} / 4\pi \in_0$

Q.86 The electric potential in volt at a distance of 0.01 m on the equatorial line of an electric dipole of dipole moment p is -

[1] $p / 4\pi \in_0 \times 10^{-4}$ [2] zero [3] $4\pi \in_0 p \times 10^{-4}$ [4] $4\pi \in_0 /p \times 10^{-4}$

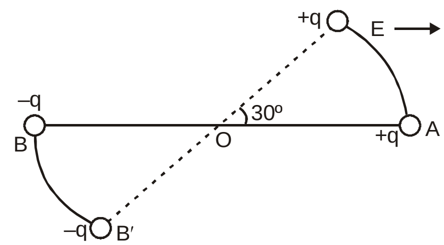
Q.87 The electric potential in volt due to an electric dipole of dipole moment 2×10^{-8} C-m at a distance of 3m on a line making an angle of 60^0 with the axis of the dipole is -

[1] 0 [2] 10 [3] 20 [4] 40

Q.88 For a point situated on the equatorial line of electric dipole, the direction of electric field intensity is -

[1] parallel to the dipole moment
[2] opposite to the dipole moment
[3] perpendicular to the dipole moment
[4] not related to the dipole moment

Q.89 A dipole with dipole moment p is placed in an. electric field E. The dipole is displaced from its equilibrium position AB to A'B' as shown in fig. Now what will be the work required, so that the point A' coincides with B.



[1] $\frac{2pE(2+\sqrt{3})}{2}$
[2] $\frac{pE(2+\sqrt{3})}{2}$
[3] $\frac{2pE(2-\sqrt{3})}{2}$
[4] $\frac{pE(2-\sqrt{3})}{2}$

Miscellaneous Questions

Q.90 A negative charge is placed at some point on the line joining the two +Q charges at rest. The direction of motion of negative charge will depend upon the :

[1] position of negative charge alone

[2] magnitude of negative charge alone

[3] both on the magnitude and position of negative charge

[4] magnitude of positive charge.

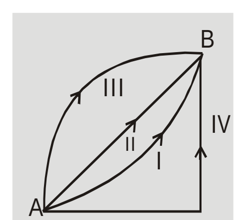
Q.91 Two spheres of radii 2 cm and 4 cm are charged equally, then the ratio of charge density on the surfaces of the spheres will be -

[1] 1 : 2
[2] 4 : 1
[3] 8 : 1
[4] 1 : 4

Q.92 64 charged drops coalesce to from a bigger charged drop. The potential of bigger drop will be times that of smaller drop -

[1] 4
[2] 16
[3] 64
[4] 8

Q.93 Under the influence of charge, a point charge q is carried along different paths from a point A to point B, then work done will be -

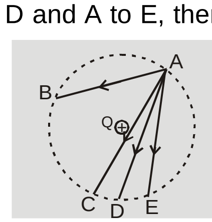


[1] maximum for path four.
[2] maximum for path one.
[3] equal for all paths
[4] minimum for path three.

Q.94 An electron moving in a electric potential field V_1 enters a higher electric potential field V_2, then the change is kinetic energy of the electron is proportional to -

[1] $(V_2 — V_1)^{1/2}$
[2] $V_2 — V_1$
[3] $(V_2 — V_1)^2$
[4] $\frac{(V_2 - V_1)}{V_2}$

Q.95 In the electric field of charge Q, another charge is carried from A to B. A to C, A to D and A to E, then work done will be -

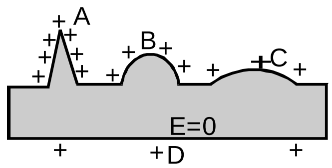


[1] minimum along path AB.
[2] minimum along path AD.
[3] minimum along path AE.
[4] zero along all the paths.

Q.96 The work done to take an electron from rest where potential is – 60 volt to another point where potential is – 20 volt is given by -

[1] 40 eV [2] –40 eV [3] 60 eV [4] –60 eV

Q.97 In the following figure an isolated charged conductor is shown. The correct statement will be -



[1] $E_A > E_B > E_C > E_D$ [2] $E_A < E_B < E_C < E_D$ [3] $E_A = E_B = E_C = E_D$ [4] $E_B = E_C$ and $E_A > E_D$

Q.98 If the above question, the potential has correct relations as given -

[1] $V_A > V_B > V_C > V_D$ [2] $V_A > V_B \geq V_C > V_D$ [3] $V_D = V_C = V_B = V_A$ [4] $V_C < V_B > V_A > V_D$

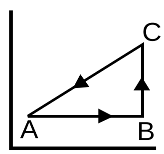
Q.99 In the above question, the surface charge densities have the correct relation is -

[1] $\sigma_A > \sigma_B > \sigma_C > \sigma_D$ [2] $\sigma_A = \sigma_B = \sigma_C = \sigma_D$ [3] $\sigma_D > \sigma_C > \sigma_B > \sigma_A$ [4] $\sigma_C < \sigma_B > \sigma_A > \sigma_D$

Q.100 Two small spheres which have mass of 0.1 kg each, also have equal charges of 10^{-9}C. These sphere are suspended by two equally long threads from a point. If the centres of the spheres are 3cm apart, then the vertical strings will make angle with vertical as -

[1] 0.1º [2] 2º. [3] 1.5º [4] 0.6º

Q.101 As shown in the figure, on bringing a charge Q from point A to B and from B to C, the work done are 2 joules and –3 joules respectively. The work done in bringing the charge from C to A will then be-



[1] –1 J [2] 1 J [3] 2 J [4] 5 J

Q.102 The electric potential at the surface of a cloud is 10^5V. If the cloud is at a height 0.75 km above the surface of earth the energy of electric field in the region between cloud and earth will be [Area = 25×10^6 m^2] -

[1] 250 J [2] 750 J [3] 1225 J [4] 1475 J

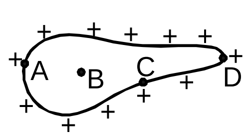
Q.103 Two identical pith-balls of mass m and having charge q are suspended from a point by weight-less strings of length 'ℓ'. If both the strings make an angle of 'θ' with the vertical, then the distance between the balls will be (tanking θ to be small) -

[1] $(q^2\ell/2\pi \in_0 mg)^{1/3}$ [2] $(q^2\ell/4\pi \in_0 mg)^{1/3}$ [3] $(q\ell^2/4\pi \in_0 mg)^{1/3}$ [4] $(q\ell^2/2\pi \in_0 mg)^{1/3}$

Q.104 The electric potential in some region is expressed by $V = 6x - 8xy^2 - 8y + 6yz - 4z^2$. The magnitude of force acting on a charge of 2 C situated at the origin will be -

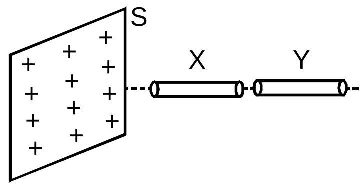
[1] 2N [2] 6N [3] 8N [4] 20N

Q.105 For the isolated charged conductor shown in fig. the potential at points A, B, C and D are V_A, V_B, V_C and V_D respectively. Then -



[1] $V_A = V_B > V_C > V_D$ [2] $V_D > V_C > V_B = V_A$ [3] $V_D > V_C > V_B > V_A$ [4] $V_D = V_C = V_B = V_A$

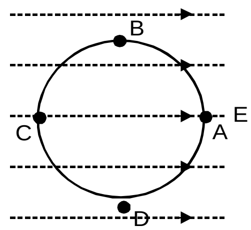
Q.106 A non conducting sheet S is given a uniform charge density σ. Two uncharged thin and small metal rods X and Y are placed near the sheet as shown. Then, the correct statement is -



[1] S attracts both X and Y　　[2] X attracts both S and Y

[3] Y attracts both S and X　　[4] all of the above

Q.107 The electric field in a region surrounding the origin is uniform and along the x-axis. A small circle is drawn with the centre at the origin cutting the axes at points A, B, C, D having coordinates (a, 0); (0, a); (–a, 0); (0, –a) respectively as shown in fig. Then the potential is minimum at -

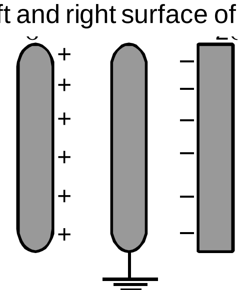


[1] A　　[2] B　　[3] C　　[4] D

Q.108 Two uniformly charge metal spheres A and b experience a force of 2×10^{-5} newton of repulsive nature. Another similar uncharged metal sphere C is brought near A and after contact with A it is separated and now placed midway between the A and B. The total force on this new sphere C in newton will be-

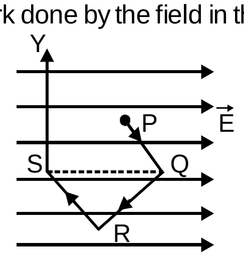
[1] 1×10^{-5}　　[2] 2×10^{-5}　　[3] 0.5×10^{-5}　　[4] 4×10^{-5}

Q.109 The metal plate on the left in fig. carries a surface charge of $+\sigma$ per unit area. The metal plate on the right has a surface charge of -2σ per unit area. It is assumed that the plates are large and the central plate is connected to zero. Then the charge densities on the left and right surface of the central plate are, respectively -



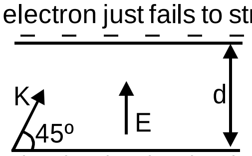
[1] $-\sigma, +\sigma$　　[2] $-2\sigma, +2\sigma$　　[3] $-\sigma, +2\sigma$　　[4] none of the above

Q.110 Point charge q moves from point P to point S along the path PQRS (as shown in Fig.) in a uniform electric field E pointing co-parallel to the positive direction of X-axis. The coordinates of the points P, Q, R, and S are (a, b, 0), (2a, 0, 0), (a, -b. 0) and (0, 0, 0) respectively. The work done by the field in the above process is given by the expression-



[1] qEa　　[2] –qEa　　[3] $qEa\sqrt{2}$　　[4] $qE\sqrt{(2a)^2 + b^2}$

Q.111 An electron is projected as in fig. with kinetic energy K, at an angle $\theta = 45^0$ between two charged plates. The magnitude of the electric field so that the electron just fails to strike the upper plate, should be greater than -

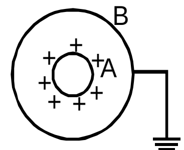


[1] K/qd　　[2] 2K/qd　　[3] K/2qd　　[4] infinite

Q.112 Two identical thin rings, each of radius R metre are coaxially placed at distance R metre apart. If Q_1 and Q_2 coulomb are respectively the charges uniformly spread on the two rings, the work done in moving a charge q from the centre of one ring to that of the other is-

[1] zero
[2] $q(Q_1 - Q_2)\left(\sqrt{2}-1\right)/\sqrt{2}\left(4\pi\varepsilon_0 R\right)$
[3] $q\sqrt{2}(Q_1 - Q_2)/4\pi\varepsilon_0 R$
[4] $q(Q_1 + Q_2)\left(\sqrt{2}+1\right)/\sqrt{2}\,4\pi\varepsilon_0 R$

Q.113 A and B are concentric conducting spherical shells. A is given a positive charge while B is earthed. Then-



[1] A and B both will have the same charge densities
[2] the potential inside A and outside B will zero
[3] the electric field between A and B is none zero
[4] the electric field inside A and outside B is non zero.

Q.114 The electric potential due to a small dipole depends on the distance r, as r^n. The value of n is -

[1] 1 [2] 2 [3] -1 [4] -2

Q.115 Mark the wrong statement -

[1] Equipotential surface never cross and other

[2] For a uniformly charged nonconducting sphere, the electric potential at the centre of the sphere is 1.5 times that at the surface

[3] If potential in a certain region in non zero constant, then the electric field in that region will also be non zero constant

[4] Inside a spherical charged shell, the electric field is zero but the electric potential is the same as that at the surface.

Q.116 Two particles of masses m and 2m with charges q and 2q are placed in an uniform electric field E and allowed to move for the same time. The ratio of their kinetic energies will be

[1] 2 : 1 [2] 8 : 1 [3] 4 : 1 [4] 1 : 4

Q.117 Two sphere A and B of radii 17 cm each and having charges of 1 and 2 coulombs respectively are separated by a distance of 80 cm. The electric field at a point on the line joining the centres of two spheres is approximately zero at some distance from the sphere A. The electric potential at this point is

[1] 6.56×10^{10} V [2] 8.12×10^{7} V [3] 2.03×10^{9} V [4] 1.2×10^{11} V

Q.118 A ring of radius R carries a charge + q. A test charge $-q_0$ is released on its axis at a distance $\sqrt{3}R$ from its centre. How much kinetic energy will be acquired by the test charge when it reaches the centre of the ring ?

[1] $\frac{1}{4\pi\varepsilon_0} \times \frac{qq_0}{R}$ [2] $\frac{1}{4\pi\varepsilon_0} \times \frac{qq_0}{2R}$ [3] $\frac{1}{4\pi\varepsilon_0} \times \frac{qq_0}{\sqrt{3}R}$ [4] $\frac{1}{4\pi\varepsilon_0} \times \frac{qq_0}{3R}$

Q.119 A mass particle (mass = m and charge = q) is placed between two point charges of charge q. If these charges displaced 2L. distance the frequaency of oscillication of mass particle if it is displaced for a small distance

[1] $\frac{q}{2\pi}\sqrt{\frac{1}{m\pi\varepsilon_0 L^3}}$ [2] $\frac{q}{2\pi}\sqrt{\frac{4}{m\pi\varepsilon_0 L^3}}$ [3] $\frac{q}{2\pi}\sqrt{\frac{1}{4m\pi\varepsilon_0 L^3}}$ [4] $\frac{q}{2\pi}\sqrt{\frac{1}{16m\pi\varepsilon_0 L^3}}$

Q.120 A particle having a charge of 1.6×10^{-19}C enters midway between the plates of a parallel plate capacitor. The initial velocity of particle is parallel to the plates. A potential difference of 300 volts is applied to the capacitor plates. If the length of the capacitor plate is 10cm and they and separated by 2cm. Calculate the greatest initial velocity for which the particle will not be able to come out of the plates. The mass particle is 12×10^{-24} kg.

[1] 10^6 m/s [2] 10^4 m/s [3] 10^{-6} m/s [4] 10^7 m/s

Q.121 A copper atom consists of copper nucleus surrounded by 29 electrons. The atomic weight of copper is 63.5g/mole. Let us now take two pieces of copper each wieghing 10g. Let us transfer one electron from one piece to another for every 1000 atoms in that piece. What will be the coulomb force between the two pieces after the transfer of electron if they are 1cm. apart.

[Avogadro number N = 6×10^{23}/g mole, Charge on an electron = -1.6×10^{-19} coulomb]

[1] 2.057×10^{16} N [2] 2.057×10^{17} N [3] 2.057×10^{18} N [4] none of these

Q.122 A circular ring of radius R with uniform positive charge density 'λ' per unit length is located in the y-z plane with its centre at the origin O. A particle of mass m and positive charge q is projected from the point $P(\sqrt{3}R, 0, 0)$ on the positive x-axis directly towards O, with an initial speed v. Find the smallest (non-zero) value of speed v such that the particle does not return P

[1] $v = \sqrt{\frac{\lambda q}{2\varepsilon_0 m}}$ [2] $v = \sqrt{\frac{\lambda}{2\varepsilon_0 m}}$ [3] $v = \sqrt{\frac{q\lambda}{\varepsilon_0 m}}$ [4] none of these

Q.123 The radii of internal and external spheres of concentric spherical air capacitor are 1 cm and 4 cm respectively. A potential difference of 3000 volts is applied between the spheres. What velocity will be imparted to an electron. when it approches from a distance of r_1 = 3 cm to r_2 = 2cm as measured from the centre of spheres.

[1] 1.54×10^5 m/s [2] 1.54×10^7 m/s [3] 1.54×10^{-7} m/s [4] none of these

ANSWER KEY **EXERCISE # 2**

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	3	3	3	1	1	1	3	1	4	2	3	3	4	2	1
Qus.	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	3	3	4	3	3	2	3	4	4	2	1	2	4	3	4
Qus.	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**
Ans.	1	2	3	3	3	2	1	3	2	4	1	1	2	3	3
Qus.	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Ans.	1	2	4	4	2	3	2	3	2	4	3	1	2	2	2
Qus.	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**
Ans.	1	2	3	1	4	4	2	3	4	1	4	2	3	3	4
Qus.	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**
Ans.	2	4	3	3	4	2	1	3	2	1	2	2	2	**2**	1
Qus.	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**	**101**	**102**	**103**	**104**	**105**
Ans.	2	2	3	2	4	2	1	3	1	4	2	4	1	4	4
Qus.	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**
Ans.	4	1	2	3	2	3	2	3	4	3	1	1	2	1	2
Qus.	**121**	**122**	**123**												
Ans.	1	1	2												

LIST OF IMPORTANT QUESTION

Q. No. 4, 8, 9, 10, 15, 16, 18, 19, 20, 24, 31, 33, 38, 41, 46, 48, 55, 57, 68, 71, 74, 76, 77, 78, 94, 96, 97, 98, 99, 101, 104, 113, 119,