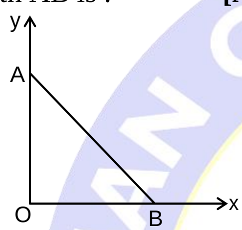
Chapter 01 Electrostatics

NEET-FLASHBACK

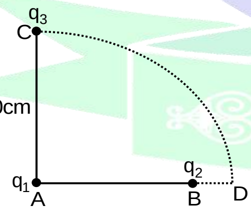
Q.1 As per this diagram a point charge +q is placed at the origin O. Work done in taking another point charge –Q from the point A [co-ordiantes (o,a)] to another point B [co-ordinates(a,o)] along the straigth path AB is : **[AIPMT - 2005]**



(1) zero (2) $\left(\frac{-qQ}{4\pi\varepsilon_0}\frac{1}{a^2}\right)\sqrt{2}a$

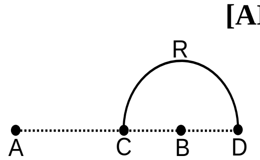
(3) $\left(\frac{qQ}{4\pi\varepsilon_0}\frac{1}{a^2}\right)\cdot\frac{a}{\sqrt{2}}$ (4) $\left(\frac{qQ}{4\pi\varepsilon_0}\frac{1}{a^2}\right)\sqrt{2}a$

Q.2 Two charges q_1 and q_2 are placed 30 cm apart, as shown in the figure. A third charge q_3 is moved along the arc of a circle of radius 40 cm from C to D. The change in the potential energy of the system is $\frac{q_3 k}{4\pi\varepsilon_0}$ where k is : **[AIPMT - 2005]**



(1) $8q_2$ (2) $8q_1$ (3) $6q_2$ (4) $6q_1$

Q.3 Charges +q and –q are placed at points A and B respectively which are a distance2 L apart, C is the midpoint between A and B. The work done in moving a charge +Q along the semicircle CRD is: **[AIPMT - 2007]**



(1) $\frac{qQ}{4\pi\varepsilon_0 L}$ (2) $\frac{qQ}{2\pi\varepsilon_0 L}$

(3) $\frac{qQ}{6\pi\varepsilon_0 L}$ (4) $-\frac{qQ}{6\pi\varepsilon_0 L}$

Q.4 Three point charges +q, –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 : **[AIPMT-2007]**

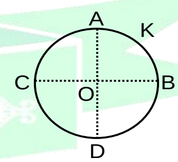
(1) $\sqrt{2}$ qa along + y direction.

(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.

Q.5 A thin conducting ring of radius R is given a charge +Q. The electric field at the centre O of the ring due to the charge on the part AKB of the ring is E. The electric field at the centre due to the charge on the part ACDB of the ring is : **[AIPMT - 2008]**



(1) 3E along KO (2) E along OK

(3) E along KO (4) 3 E along OK

Q.6 The electric potential at a point (x, y, z) is given by $V = -x^2 y - xz^3 + 4$

The electric field $\vec{E}$ at that point is : **[AIPMT 2009]**

(1) $\vec{E} = \hat{i}(2xy + z^3) + \hat{j}x^2 + \hat{k}\,3xz^2$

(2) $\vec{E} = \hat{i}\,2xy + \hat{j}(x^2 + y^2) + \hat{k}(3xz - y^2)$

(3) $\vec{E} = \hat{i}z^3 + \hat{j}xyz + \hat{k}z^2$

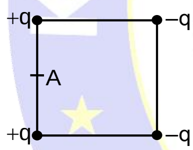
(4) $\vec{E} = \hat{i}\ (2xy - z^3) + \hat{j}\ xy^2 + \hat{k}\ 3z^2x$

Q.7 The electric field at a distance $\frac{3R}{2}$ from the centre of a charged conducting spherical shell of radius R is E. Theelectric field at a distance $\frac{R}{2}$ from the centre of the sphere is :
[AIPMT - 2010]

(1) zero (2) E (3) $\frac{E}{2}$ (4) $\frac{E}{3}$

Q.8 A charge Q is enclosed by a Gaussian spherical surface of radius R. If the radius is doubled, then the outward electric flux will: **[AIPMT- 2011]**
(1) increase four times
(2) be reduced to half
(3) remain the same
(4) be doubled

Q.9 Four electric charges +q, +q, –q and –q are placed at the corners of a square of side 2L (see figure). The electric potential at point A, midway between the two charges +q and +q, is:
[AIPMT- 2011]



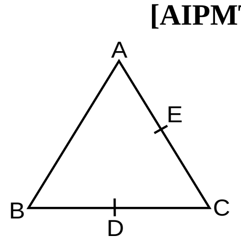
(1) $\frac{1}{4\pi\epsilon_0}\frac{2q}{L}(1+\sqrt{5})$

(2) $\frac{1}{4\pi\epsilon_0}\frac{2q}{L}\left(1+\frac{1}{\sqrt{5}}\right)$

(3) $\frac{1}{4\pi\epsilon_0}\frac{2q}{L}\left(1-\frac{1}{\sqrt{5}}\right)$

(4) Zero

Q.10 Three charges, each +q, are placed at the corners of an isosceles triangle ABC of sides BC and AC, 2a. D and E are the mid points of BC and CA. The work done in taking a charge Q from D to E is:
[AIPMT Mains 2011]



(1) $\frac{3qQ}{8\pi\epsilon_0 a}$ (2) $\frac{qQ}{4\pi\epsilon_0 a}$

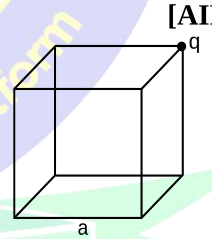
(3) zero (4) $\frac{3qQ}{4\pi\epsilon_0 a}$

Q.11 An electricdipole of moment ´p´ is placed in an electric field of intensity ´E´. The dipole acquires a position such that the axis of the dipole makes an angle θ with the direction of the field. Assuming that the potential energy of the dipole to be zero when θ = 90º , the torque and the potential energy of the dipole will respectively be: **[AIPMT-Pre-2012]**
(1) p E sinθ, – p E cosθ
(2) p E sin θ, – 2 p E cos θ
(3) p E sinθ, 2 p Ecosθ
(4) p E cos θ, – p Ecosθ

Q.12 Fourpoint charges –Q, –q, 2q and 2Q are placed, one at each corner of the square. The relation between Q and q for which the potential at the centre of the square is zero is :
[AIPMT-Pre-2012]

(1) Q = –q (2) Q = – 1/q
(3) Q = q (4) Q = 1/q

Q.13 What is the flux through a cube of side 'a' if a point charge of q is at one of its corner:
[AIPMT-Pre-2012]

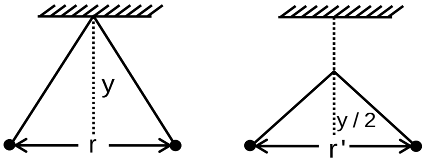


(1) $\frac{2q}{\varepsilon_0}$ (2) $\frac{q}{8\varepsilon_0}$ (3) $\frac{q}{\varepsilon_0}$ (4) $\frac{q}{2\varepsilon_0}6a^2$

Q.14 Two metallic spheres of radii 1 cm and 3 cm are given charges of -1×10^{-2} C and 5×10^{-2} C, respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is : **[AIPMT 2012 (Mains)]**

(1) 2×10^{-2} C (2) 3×10^{-2} C
(3) 4×10^{-2} C (4) 1×10^{-2} C

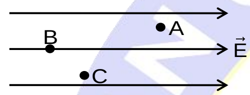
Q.15 Two pith balls carrying equal charges are suspended from a common point by strings of equal length, the equilibrium separation between them is r. Now the strings are rigidly clamped at half the height. The equilibrium separation between the balls now become : [AIPMT_2013]



(1) $\left(\frac{r}{\sqrt[3]{2}}\right)$ (2) $\left(\frac{2r}{\sqrt{3}}\right)$

(3) $\left(\frac{2r}{3}\right)$ (4) $\left(\frac{r}{\sqrt{2}}\right)^2$

Q.16 A, B and C are three points in a uniform electric field. The electric potential is : AIPMT_2013]



(1)maximum at B
(2) maximum at C
(3) same at all the three points A, B and C
(4) maximum at A

Q.17 A conducting sphere of radius R is given a charge Q. The electric potential and the electric field at the centre of the sphere respectively are : [AIPMT-2014]

(1) Zero and $\frac{Q}{4\pi \in_0 R^2}$

(2) $\frac{Q}{4\pi \in_0 R}$ and zero

(3) $\frac{Q}{4\pi \in_0 R}$ and $\frac{Q}{4\pi \in_0 R^2}$

(4) Both are zero

Q.18 In a region, the potential is represented by V (x, y, z) = 6x – 8xy –8y + 6yz, where V is in volts and x, y, z are in metres. The electric force experienced by a charge of 2 coulomb situated at point (1, 1, 1) is: [AIPMT-2014]

(1) $6\sqrt{5}$N (2) 30 N

(3) 24 N (4) $4\sqrt{35}$N

Q.19 The electric field in a certain region is acting radially outward and is given by E = Ar. A charge contained in a sphereof radius 'a' centred at the origin of the field, will be given by : [AIPMT-2015]

(1) A ε_0 a^2 (2) 4 $\pi\varepsilon_0$ Aa^3

(3)ε_0 Aa^3 (4) 4 $\pi\varepsilon_0$ Aa^2

Q.20 If potential (in volts) in a region is expressed as V (x, y, z) = 6xy – y + 2yz, the electric field (in N/C) at point (1, 1, 0) is : [AIPMT-2015]

(1) $-\left(6\hat{i}+9\hat{j}+\hat{k}\right)$ (2) $-\left(3\hat{i}+5\hat{j}+3\hat{k}\right)$

(3) $-\left(6\hat{i}+5\hat{j}+2\hat{k}\right)$ (4) $-\left(2\hat{i}+3\hat{j}+\hat{k}\right)$

Q.21 Two identical charged spheres suspended from a common point by two massless strings of lengths ℓ, are initially at a distance ($d<<\ell$) apart because to their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity v. Then v varies as a function of the distance x between the spheres, as: [NEET-2016]

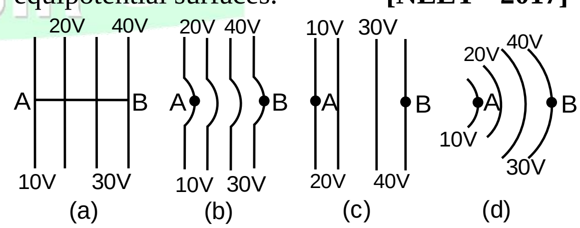
(1) $v \propto x^{\frac{1}{2}}$ (2) $v \propto x$

(3) $v \propto x^{-\frac{1}{2}}$ (4) $v \propto x^{-1}$

Q.22 Suppose the charge of a proton and an electron differ slightly. One of them is –e, the other is (e +Δe). If the net of electrostatic force and gravitational force between two hydrogen atoms placed at a distance d (much greater than atomic size) apart is zero, then Δe is of the order of [Given mass of hydrogenm_h = 1.67 × 10^{-27} kg] [NEET - 2017]

(1) 10^{-20} C (2) 10^{-23} C
(3) 10^{-37} C (4) 10^{-47} C

Q.23 The diagrams below show regions of equipotential surfaces. [NEET - 2017]



A positive charge is moved from A to B in each diagram, then for q moving from A to B:
(1) Maximum work is required to move q in figure (c)
(2) In all the four cases the work done is the same

(3) Minimum work is requried to move q in figure (a)

(4) Maximum work is required to move q in figure (b)

Q.24 An electron falls from rest through a vertical distance h in a uniform and vertically upward directed electric field E. The direction of electrical field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest in through the same vertical distance h. The time fall of the electron, in comparison to the time fall of the proton is **[NEET-2018]**

(1) smaller (2) 5 times greater

(3) 10 times greater (4) equal

Q.25 A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field E Due to the force qE, its velocity increases from 0 to 6 m/sec in one second duration. At that instant the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively **[NEET-2018]**

(1) 2 m/sec , 4 m/sec

(2) 1 m/sec , 3 m/sec

(3) 1 m/sec , 3.5 m/sec

(4) 1.5 m/sec , 3 m/sec

Q.26 A hollow metal sphere of radius R is uniformly charged. Theelectric field due to the sphere at a distance r from the centre **[NEET-2019]**

(1) Increases as r increases for r < R and for r > R

(2) Zero as r increases for r < R, decreases as r increases for r > R

(3) Zero as r increases for r < R, increases as r increases for r > R

(4) Decreases as r increases for r < R and for r > R

Q.27 Two parallel infinite line charges with linear charge densities +λ C/m and – λ C/m are placed at a distance of 2R in free space. What is the electric field mid-way between the two line charges? **[NEET-2019]**

(1) Zero (2) $\frac{2\lambda}{\pi\varepsilon_0 R}$ N / C

(3) $\frac{\lambda}{\pi\varepsilon_0 R}$ N / C (4) $\frac{\lambda}{2\pi\varepsilon_0 R}$ N / C

Q.28 Two point charges A and B, having charges +Q and –Q respectively, are placed at certain distance apart and force acting between them is F. If 25% charge of A is transferred to B, then force between the charges becomes : **[NEET-2019]**

(1) F (2) $\frac{9F}{16}$

(3) $\frac{16F}{9}$ (4) $\frac{4F}{3}$

Q.29 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, $\in_0$ – permittivity of free space) **[2020 Covid Re-NEET]**

(1) $\vec{E} = \frac{2\vec{P}}{4\pi\in_0 r^3}$ (2) $\vec{E} = \frac{\vec{P}}{4\pi\in_0 r}$

(3) $\vec{E} = \frac{\vec{P}}{4\pi\in_0 r^3}$ (4) $\vec{E} = -\frac{\vec{P}}{4\pi\in_0 r^3}$

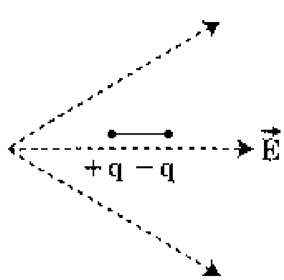
Q.30 A spherical conductor of radius 10 cm has a charge of 3.2×10^{-7} C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere?

$\left(\frac{1}{4\pi\in_0} = 9\times10^9 \frac{N-m^2}{c^2}\right)$ **[NEET-2020]**

(1) 1.28×10^5 N/C (2) 1.28×10^6 N/C

(3) 1.28×10^7 N/C (4) 1.28×10^4 N/C

Q.31 A dipole is placed in an electric field as shown. In which direction will it move ? **[NEET-2021]**



(1) towards the left as its potential energy will increase.
(2) towards the right as its potential energy will decrease.
(3) towards the left as its potential energy will decease.
(4) towards the right as its potential energy will increase.

Q.32 Two charged spherical conductors of radius R_1 and R_2 are connected by a wire. Then the ratio surface charge densities of the spheres (σ_1/σ_2) is **[NEET-2021]**

(1) $\frac{R_1}{R_2}$ (2) $\frac{R_2}{R_1}$
(3) $\sqrt{\left(\frac{R_1}{R_2}\right)}$ (4) $\frac{R_1^2}{R_2^2}$

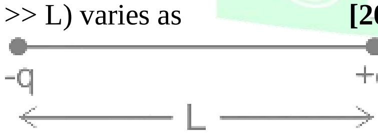
Q.33 Polar molecules are the molecules : **[NEET-2021]**

(1) Having zero dipole moment.
(2) Acquire a dipole moment only in the presence of electric field due to displacement of charges.
(3) Acquire a dipole moment only when magnetic field is absent.
(4) Having a permanent electric dipole moment.

Q.34 Twenty seven drops of same size are charged at 220 V each. They combine to form a bigger drop. Calculate the potential of the bigger drop. **[NEET-2021]**

(1) 660V (2) 1320V (3) 1520V (4) 1980V

Q.35 Two point charges – q and +q are placed at a distance of L, as shown in the figure. The magnitude of electric field intensity at a distance R(R >> L) varies as **[2022-NEET]**



(1) $\frac{1}{R^2}$ (2) $\frac{1}{R^3}$
(3) $\frac{1}{R^4}$ (4) $\frac{1}{R^6}$

Q.36 Two hallow conducting spheres of radii R_1 and R_2 ($R_1 >> R_2$) have equal charges. The potential would be **[2022-NEET]**

(1) more on bigger sphere
(2) more on smaller sphere
(3) equal on both the spheres
(4) dependent on the material property of the sphere.

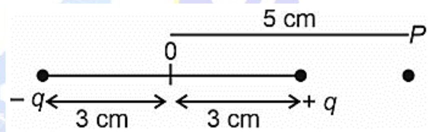
Q.37 The angle between the electric lines of force and the equipotential surface is **[2022-NEET]**

(1) 0° (2) 45° (3) 90° (4) 180°

Q.38 An electric dipole is placed at an angle of 30° with an electric field of intensity 2×10^5 N C^{-1}. It experiences a torque equal to 4 N m. Calculate the magnitude of charge on the dipole, if the dipole length is 2 cm. **[NEET-2023]**

(1) 6 mC (2) 4 mC
(3) 2 mC (4) 8 mC

Q.39 An electric dipole is placed as shown in the figure.



The electric potential (in 10^2 V) at point P due to the dipole is (ϵ_0 = permittivity of free space and $\frac{1}{4\pi\epsilon_0} = K$) **[NEET-2023]**

(1) $\left(\frac{5}{8}\right)qK$ (2) $\left(\frac{8}{5}\right)qK$
(3) $\left(\frac{8}{3}\right)qK$ (4) $\left(\frac{3}{8}\right)qK$

Q.40 If $\oint \vec{E}\cdot\vec{dS} = 0$ over a surface, then **[NEET-2023]**

(1) The magnitude of electric field on the surface is constant
(2) All the charges must necessarily be inside the surface
(3) The electric field inside the surface is necessarily uniform

(4) The number of flux lines entering the surface must be equal to the number of flux lines leaving it

ANSWER KEY

NEET-FLASHBACK

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ans.	1	1	4	2	2	1	1	3	3	3	1	1	2	2	1
Que.	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	1	2	4	2	3	3	3	2	1	2	2	3	2	4	1
Que.	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	40					
Ans.	2	2	4	4	**2**	2	3	3	4	4					