

ELECTROSTATICS



Questions
based on

Charge & its properties

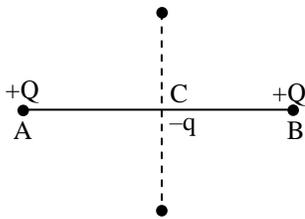
- Q.1** The ratio of electric force (F_e) to gravitational force acting between two electrons situated in vacuum will be-
- (A) 1×10^{36} (B) 2×10^{39}
(C) 6×10^{45} (D) 4×10^{42}
- Q.2** F_g and F_e represent the gravitational and electrostatic force respectively between two protons situated at some distance in vacuum. The ratio of F_g to F_e is of the order of -
- (A) 10^{-43} (B) 10^1 (C) 10^0 (D) 10^{-36}
- Q.3** One quantum of charge should be at least be equal to the charge in coulomb-
- (A) 1.6×10^{-17} C (B) 1.6×10^{-19} C
(C) 1.6×10^{-10} C (D) 4.8×10^{-10} C
- Q.4** The unit of charge is coulomb in SI system and esu of charge (or stat coul) in C.G.S. system 1 coulomb equals-
- (A) 3×10^9 esu (B) $(1/3 \times 10^9)$ esu
(C) $(1/3 \times 10^8)$ esu (D) (9×10^9) esu
- Q.5** If a body is charged by rubbing it, its weight-
- (A) always decreases slightly
(B) always increases slightly
(C) may increase slightly or may decrease slightly
(D) remains precisely the same
- Q.6** An electron at rest has a charge of 1.6×10^{-19} C. It starts moving with a velocity $v = c/2$, where c is the speed of light, then the new charge on it is-
- (A) 1.6×10^{-19} Coulomb
(B) $1.6 \times 10^{-19} \sqrt{1 - \left(\frac{1}{2}\right)^2}$ Coulomb
(C) $1.6 \times 10^{-19} \sqrt{\left(\frac{2}{1}\right)^2 - 1}$ Coulomb
(D) $\frac{1.6 \times 10^{-19}}{\sqrt{1 - \left(\frac{1}{2}\right)^2}}$ Coulomb
- Q.7** If a glass rod is rubbed with silk, it acquires a positive charge because -
- (A) Protons are added to it.
(B) Protons are removed from it.
(C) Electrons are added to it.
(D) Electrons are removed from it.
- Q.8** Which one of the following is the unit of electric charge ?
- (A) Coulomb (B) Newton
(C) Volt (D) Coulomb/Volt
- Q.9** An accelerated or deaccelerated charge produces-
- (A) Electric field only
(B) Magnetic field only
(C) Localised electric and magnetic fields
(D) Electric and magnetic fields that are radiated
- Q.10** Which one of the following statement regarding electrostatics is wrong ?
- (A) Charge is quantized
(B) Charge is conserved
(C) There is an electric field near an isolated charge at rest
(D) A stationary charge produces both electric and magnetic fields
- Q.11** The dielectric constant for water is -
- (A) 1 (B) 40 (C) 81 (D) 0.3
- Q.12** In M.K.S. System, $\frac{1}{4\pi\epsilon_0}$ equals -
- (A) 9×10^9 N-m²/C²
(B) 1 N-m²/C²
(C) 1 dyne - cm² / stat C²
(D) 9×10^9 dyne \times cm² / stat C²
- Q.13** A stationary electric charge produces-
- (A) Only electric fields
(B) Only magnetic field
(C) Both electric as magnetic field
(D) Neither electric Nor magnetic field

THE ACADEMICS

- Q.14** Charges reside on the -
 (A) Outer surface of the charged conductor
 (B) Inner surface of the charged conductor
 (C) Inner as well as outer surface of the charged conductor
 (D) None of the above
- Q.15** An isolated solid metallic sphere is charged with +Q charge .The distribution of their +Q charge on the sphere will be-
 (A) uniform but on the surface alone
 (B) non uniform but on the surface alone
 (C) uniform inside the volume
 (D) non uniform inside the volume

Question based on Coulomb's Law

- Q.16** Two similar charge of +Q , as shown in figure are placed at A and B. -q charge is placed at point C midway between A and B. -q charge will oscillate if-



- (A) It is moved towards A
 (B) It is moved towards B
 (C) It is moved upwards AB
 (D) Distance between A and B is reduced
- Q.17** When the distance between two charged particle is halved, the force between them becomes -
 (A) One fourth (B) One half
 (C) Double (D) Four times
- Q.18** The force between two point charges in vacuum is 15N, if a brass plate is introduced between the two charges, then force between them will-
 (A) Becomes zero
 (B) Remains the same
 (C) Becomes 30 N
 (D) Becomes 60 N

- Q.19** The force between an α -particle and an electron separated by a distance of 1 Å is -
 (A) 2.3×10^{-8} N attractive
 (B) 2.3×10^{-8} N Repulsive
 (C) 4.6×10^{-8} N attractive
 (D) 4.6×10^{-8} repulsive

- Q.20** Two charges are at distance (d) apart in air. Coulomb force between them is F. If a dielectric material of dielectric constant (K) is placed between them, the coulomb force now becomes-
 (A) F/K (B) FK
 (C) F/K² (D) K²F

- Q.21** Two point charges in air at a distance of 20 cm. from each other interact with a certain force. At what distance from each other should these charges be placed in oil of relative permittivity 5 to obtain the same force of interaction -
 (A) 8.94×10^{-2} m (B) 0.894×10^{-2} m
 (C) 89.4×10^{-2} m (D) 8.94×10^2 m

- Q.22** A certain charge Q is divided at first into two parts, (q) and (Q-q). Later on the charges are placed at a certain distance. If the force of interaction between the two charges is maximum then-
 (A) (Q/q) = (4/1) (B) (Q/q) = (2/1)
 (C)(Q/q) = (3/1) (D) (Q/q) = (5/1)

- Q.23** 1 esu charge is placed in vacuum at 1 cm from an equal charge of the same kind. Force between them is -
 (A) 1 Newton (B) 1 dyne
 (C) 2 dyne (D) 4 dyne

- Q.24** The permittivity of vacuum is 8.86×10^{-12} C²/N-m² and the dielectric constant of water is 81. The permittivity of water in C²/N-m² is-
 (A) $81 \times 8.86 \times 10^{-12}$ (B) 8.86×10^{-12}
 (C) $(8.86 \times 10^{-12})/ 81$ (D) $81/(8.86 \times 10^{-12})$

- Q.25** The force between two point charges placed in vacuum at distance 1 mm is 18 N. If a glass plate of thickness 1 mm and dielectric constant 6, be kept between the charges then new force between them would be-
 (A) 18 N (B) 108 N
 (C) 3 N (D) 3×10^{-6} N

THE ACADEMICS

Q.26 Two similar and equal charges repel each other with force of 1.6 N, when placed 3m apart. Strength of each charge is-

- (A) $40 \mu\text{C}$ (B) $20 \mu\text{C}$
(C) $4 \mu\text{C}$ (D) $2 \mu\text{C}$

Q.27 There are two charges +1 micro-coulomb and +5 micro-coulomb, the ratio of force on them will be-

- (A) 10^{43} (B) 1 : 1
(C) 10^0 (D) 10^{-43}

Question
based on

Superposition principle

Q.28 A charge Q is divided in two parts Q_1 and Q_2 and these charges are placed at distance R. there will be maximum repulsion between them, when-

- (A) $Q_2 = (Q/R)$, $Q_1 = Q - (Q/R)$
(B) $Q_2 = (Q/3)$, $Q_1 = (2Q/3)$
(C) $Q_2 = (Q/4)$, $Q_1 = (3Q/4)$
(D) $Q_1 = Q_2 = Q/2$

Q.29 The three charges each of 5×10^{-6} coulomb are placed at vertex of an equilateral triangle of side 10 cm. The force exerted on the charge of $1 \mu\text{C}$ placed at centre of triangle in Newton will be-

- (A) 13.5 (B) zero
(C) 4.5 (D) 6.75

Q.30 A point charge q_1 exerts a force F upon another charge q_2 . If one other charge q_3 be placed quite near to charge q_2 , then the force that charge q_1 exerts on the charge q_2 will be-

- (A) F (B) $>F$ (C) $<F$ (D) zero

Q.31 A mass particle (mass = m and charge = q) is placed between two point charges of charge q separation between these two charge is 2L. The frequency of oscillation of mass particle, if it is displaced for a small distance along the line joining the charges-

- (A) $\frac{q}{2\pi} \sqrt{\frac{1}{m\pi\epsilon_0 L^3}}$ (B) $\frac{q}{2\pi} \sqrt{\frac{4}{m\pi\epsilon_0 L^3}}$
(C) $\frac{q}{2\pi} \sqrt{\frac{1}{4m\pi\epsilon_0 L^3}}$ (D) $\frac{q}{2\pi} \sqrt{\frac{1}{16\pi\epsilon_0 mL^3}}$

Q.32 Two small balls having equal positive charge Q (Coulomb) on each are suspended by two insulating strings of equal length 'L' metre, from a hook fixed to a stand. The whole set up is taken in a satellite in to space where there is no gravity (state of weight lessness) Then the angle (θ) between the two strings is -

- (A) 0° (B) 90°
(C) 180° (D) $0^\circ < \theta < 180^\circ$

Q.33 ABC is a right angle triangle AB=3cm, BC=4cm charges +15, +12, -12 esu are placed at A, B and C respectively. The magnitude of the force experienced by the charge at B in dyne is-

- (A) 125 (B) 35 (C) 22 (D) 0

Q.34 Equal charges of each $2 \mu\text{C}$ are placed at a point $x = 0, 2, 4,$ and 8 cm on the x-axis. The force experienced by the charge at $x=2$ cm is equal to-

- (A) 5 Newton (B) 10 Newton
(C) 0 Newton (D) 15 Newton

Q.35 Three equal charges (q) are placed at corners of a equilateral triangle. The force on any charge

is- $\left(K = \frac{1}{4\pi\epsilon_0} \right)$

- (A) Zero (B) $\sqrt{3} \frac{Kq^2}{a^2}$
(C) $\frac{Kq^2}{\sqrt{3}a^2}$ (D) $3\sqrt{3} \frac{Kq^2}{a^2}$

Q.36 Two identical charges of charge (q) are placed at $(-a,0)$ and $(a, 0)$. Same nature charge particle is placed at origin. It executes S.H.M, if it is displaced -

- (A) In x-direction
(B) In y-direction
(C) at an angle of 45° from the x-axis
(D) along perpendicular to the plane.

Q.37 Two equal negative charge ($-q$) are fixed at the points $(0, a)$ and $(0, -a)$ on the y-axis. A positive charge (Q) is released from rest at the point $(2a, 0)$ on the x-axis. The charge Q will -

THE ACADEMICS

- (A) execute simple harmonic motion about the origin.
- (B) move to the origin and remains at rest
- (C) move to infinity
- (D) execute oscillatory but not simple harmonic motion

Q.38 Five point charges, each of value +q coulomb, are placed on five vertices of a regular hexagon of side L metre. The magnitude of the force on a point charge of value -q coulomb placed at the centre of the hexagon is -

- (A) $\frac{kq^2}{L^2}$
- (B) $\sqrt{5} \frac{kq^2}{L^2}$
- (C) $\sqrt{3} \frac{kq^2}{L^2}$
- (D) Zero

Question based on

Electric field

Q.39 A pendulum bob of mass 80 mg and carrying a charge of 2×10^{-8} coul. is at rest in a horizontal uniform electric field of $20,000 \text{ V m}^{-1}$. Find the tension in the thread of pendulum -

- (A) $8.8 \times 10^{-2} \text{ N}$
- (B) $8.8 \times 10^{-3} \text{ N}$
- (C) $8.8 \times 10^{-4} \text{ N}$
- (D) $8.8 \times 10^{-5} \text{ N}$

Q.40 Two charges 4q and q are placed 30 cm. apart. At what point the value of electric field will be zero-

- (A) 10 cm. away from q and between the charge
- (B) 20 cm. away from q and between the charge
- (C) 10 cm. away from q and out side the line joining the charge.
- (D) 10 cm. away from 4q and out side the line joining them.

Q.41 Unit of electric field intensity is Newton/Coulomb. The other unit of this can be-

- (A) Vm
- (B) Vm^2
- (C) V/m
- (D) V/m^2

Q.42 If $Q = 2$ coulomb and force on it is $F=100$ Newton, then the value of field intensity will be -

- (A) 100 N/C
- (B) 50 N/C
- (C) 200 N/C
- (D) 10 N/C

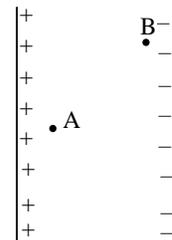
Q.43 Four equal but like charge are placed at four corners of a square. The electric field intensity at the center of the square due to any one charge is E, then the resultant electric field intensity at centre of square will be :

- (A) Zero
- (B) 4E
- (C) E
- (D) 1/2E

Q.44 Two charges 9e and 3e are placed at a distance r. The distance of the point where the electric field intensity will be zero is-

- (A) $\left(\frac{r}{1+\sqrt{3}}\right)$ from 9e charge
- (B) $\left(\frac{r}{1+\sqrt{1/3}}\right)$ from 9e charge
- (C) $\left(\frac{r}{1-\sqrt{3}}\right)$ from 3e charge
- (D) $\left(\frac{r}{1+\sqrt{1/3}}\right)$ from 3e charge.

Q.45 A proton is first placed at A and then at B between the two plates of a parallel plate capacitor charged to a P.D. of V volt as shown. Then force on proton at A is-



- (A) more than at B
- (B) less than at B
- (C) equal to that at B
- (D) nothing can be said

Q.46 An electric field can deflect -

- (A) X-rays
- (B) Neutrons
- (C) α -particles
- (D) γ - rays

Q.47 Which one of the following relations is correct ?

- (A) $1 \text{ N/C} = 10^8 \text{ Volt / m}$
- (B) $1 \text{ N/C} = 10^{-6} \text{ V/m}$
- (C) $1 \text{ N/C} = 1 \text{ V/m}$
- (D) $1 \text{ N/C} = 10^{-8} \text{ V/m}$

THE ACADEMICS

Q.48 If mass of the electron = 9.1×10^{-31} Kg. Charge on the electron = 1.6×10^{-19} coulomb and $g = 9.8 \text{ m/s}^2$. Then the intensity of the electric field required to balance the weight of an electron is-

- (A) $5.6 \times 10^{-9} \text{ N/C}$ (B) $5.6 \times 10^{-11} \text{ N/C}$
 (C) $5.6 \times 10^{-8} \text{ N/C}$ (D) $5.6 \times 10^{-7} \text{ N/C}$

Q.49 Six charges +Q each are placed at the corners of a regular hexagon of side (a), the electric field at the centre of hexagon is-

- (A) Zero (B) $\frac{1}{4\pi\epsilon_0} \cdot \frac{6Q^2}{a^2}$
 (C) $\frac{1}{4\pi\epsilon_0} \cdot \frac{Q^2}{a^2}$ (D) $\frac{1}{4\pi\epsilon_0} \cdot \frac{6Q^2}{a\sqrt{2}}$

Q.50 Two small charged spheres A and B are charged with the charges of +10 and +20 coulomb respectively and separated by a distance of 80 cm. The electric field at a point on the line joining the centers of the two spheres will be zero at a distance from sphere A.

- (A) 20 cm (B) 33 cm
 (C) 55 cm (D) 60 cm.

Q.51 Four charges +q, +q, -q and -q are placed respectively at the corners A, B, C and D of a square of side (a), arranged in the given order. Calculate the intensity at the centre of the square-

- (A) $\frac{4\pi\epsilon_0 \cdot a^2}{4\sqrt{2}q}$ (B) $\frac{4\sqrt{2}q}{4\pi\epsilon_0 \cdot a^2}$
 (C) $\frac{\pi\epsilon_0 \cdot a^2}{4\sqrt{2}q}$ (D) $\frac{4\sqrt{2}q}{\pi\epsilon_0 \cdot a^2}$

Q.52 In electric field, a $6.75\mu\text{C}$ charge experiences 2.5 N force, when placed at distance of 5m from the origin. Then potential gradient at this point will be- (in M.K.S.)-

- (A) 5.71×10^5 (B) 3.71×10^5
 (C) 18.81×10^5 (D) 1.881×10^5

Q.53 A ring of radius (R) carries a uniformly distributed charge + Q. A point charge -q is placed on the axis of the ring at a distance 2R from the centre of the ring and released from rest. The particle

- (A) Becomes in rest condition immediately.
 (B) Executes simple harmonic motion
 (C) Motion is not SHM
 (D) Come at the centre of ring immediately.

Q.54 A small circular ring has a uniform charge distribution. On a far-off axial point distance x from the centre of the ring, the electric field is proportional to-

- (A) x^{-1} (B) $x^{-3/2}$
 (C) x^{-2} (D) $x^{5/4}$

Question based on

Potential & Potential difference

Q.55 When charge of 3 coulomb is placed in a Uniform electric field, it experiences a force of 3000 Newton, within this field, potential difference between two points separated by a distance of 1 cm along electric field is-

- (A) 10 Volt (B) 90 Volt
 (C) 1000 Volt (D) 3000 Volt.

Q.56 A uniform electric field having a magnitude E_0 and direction along positive x-axis exists. If the electric potential(V) is zero at $x = 0$ then its value at $x = +x$ will be-

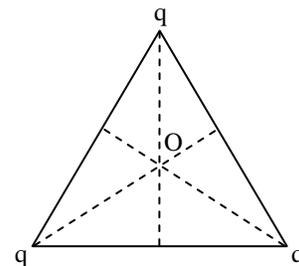
- (A) $V_x = x E_0$ (B) $V_x = -x.E_0$

- (C) $V_x = x^2 E_0$ (D) $V_x = x^2 E_0$

Q.57 The dimensions of potential difference are -

- (A) $\text{ML}^2\text{T}^{-2}\text{Q}^{-1}$ (B) $\text{MLT}^{-2}\text{Q}^{-1}$
 (C) $\text{MT}^{-2}\text{Q}^{-2}$ (D) $\text{ML}^2 \text{T}^{-1} \text{Q}^{-1}$

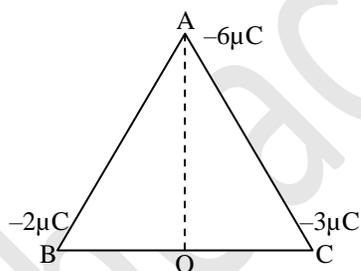
Q.58 Three equal charges are placed at the three corners of an equilateral triangle as shown in the figure. The statement which is true for electric potential V and the field intensity E at the centre of the triangle is-



- (A) $V = 0, E = 0$ (B) $V = 0, E \neq 0$
 (C) $V \neq 0, E = 0$ (D) $V \neq 0, E \neq 0$

THE ACADEMICS

- Q.59** 1 e.s.u. of potential is equal to-
 (A) $1/300$ volt (B) 8×10^{10} volt
 (C) 300 volt (D) 3 volt
- Q.60** The earth's surface is considered to be at -
 (A) Zero potential
 (B) Negative Potential
 (C) Infinite Potential
 (D) Positive Potential
- Q.61** Electric potential is a -
 (A) Vector quantity
 (B) Scalar quantity
 (C) Neither vector Nor scalar
 (D) Fictious quantity
- Q.62** The electric potential V at any point (x, y, z) in space is given by $V = 4x^2$ volt. The electric field E (in V/m) at the point $(1, 0, 2)$ is -
 (A) +8 in x direction
 (B) 8 in $-x$ direction
 (C) 16 in $+x$ direction
 (D) 16 in $-x$ direction
- Q.63** ABC is equilateral triangle of side 1m. Charges are placed at its corners as shown in fig. O is the mid- point of side BC. The potential at point (O) is-



- (A) 2.7×10^3 V (B) 1.52×10^5 V
 (C) 1.3×10^3 V (D) -1.52×10^5 V
- Q.64** In a region where $E = 0$, the potential (V) varies with distance r as-
 (A) $V \propto 1/r$
 (B) $V \propto r$
 (C) $V \propto 1/r^2$
 (D) $V = \text{const.}$ (independent of r)

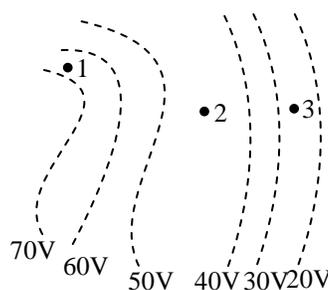
- Q.65** Charges of $+\left(\frac{10}{3}\right) \times 10^{-9}$ are placed at each of the four corners of a square of side 8cm. The potential at the intersection of the diagonals is
 (A) $150\sqrt{2}$ Volt (B) $1500\sqrt{2}$ Volt
 (C) $900\sqrt{2}$ Volt (D) 900 Volt

- Q.66** An equipotential surface is that surface -
 (A) On which each and every point has the same potential
 (B) Which has negative potential
 (C) Which has positive potential
 (D) Which has zero potential

- Q.67** The surface of a conductor -
 (A) is a non-equipotential surface
 (B) has all the points at the same potential
 (C) has different points at different potential
 (D) has at least two points at the same potential

- Q.68** The electron potential (V) as a function of distance (x) [in meters] is given by $V = (5x^2 + 10x - 9)$ Volt. The value of electric field at $x = 1$ m would be-
 (A) 20 Volt/m (B) 6 Volt/m
 (C) 11 Volt/m (D) -23 Volt/m

- Q.69** Some equipotential lines are as shown in fig. E_1 , E_2 and E_3 are the electric fields at points 1, 2 and 3 then -



- (A) $E_1 = E_2 = E_3$
 (B) $E_1 > E_2 > E_3$
 (C) $E_1 > E_2, E_2 < E_3$
 (D) $E_1 < E_2 < E_3$

THE ACADEMICS

- Q.70** Three charges $2q, -q, -q$ are located at the vertices of an equilateral triangle. At the circum center of the triangle.
- (A) The field is zero but potential is not zero.
 (B) The field is non-zero but the potential is zero.
 (C) Both, field and potential are zero.
 (D) Both, field and potential are non- zero

Question based on

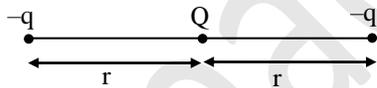
Electric potential energy & work done

- Q.71** A point positive charge of Q' units is moved round another point positive charge of Q units in circular path. If the radius of the circle is r . The work done on the charge Q' in making one complete revolution is -

- (A) $\frac{Q}{4\pi\epsilon_0 r}$ (B) $\frac{QQ'}{4\pi\epsilon_0 r}$
 (C) $\frac{Q'}{4\pi\epsilon_0 r}$ (D) 0

- Q.72** A proton is projected with velocity 7.45×10^5 m/s towards an another proton which is at rest from very large distance. The minimum approach is-
- (A) 10^{-12} m (B) 10^{-14} m
 (C) 10^{-10} m (D) 10^{-8} m

- Q.73** Three charges are placed as shown in fig. If the electric potential energy of system is zero, then $Q : q$ is -



- (A) $\frac{Q}{q} = \frac{-2}{1}$ (B) $\frac{Q}{q} = \frac{2}{1}$
 (C) $\frac{Q}{q} = \frac{-1}{2}$ (D) $\frac{Q}{q} = \frac{1}{4}$

- Q.74** If a unit charge is taken from one point to another over an equipotential surface then-
- (A) Work is done on the charge
 (B) Work is done by the charge
 (C) Work on the charge is constant
 (D) No work is done

- Q.75** In an electric field the work done in moving a unit positive charge between two points is the measures of-
- (A) Resistance
 (B) Potential difference
 (C) Intensity of electric field
 (D) Capacitance

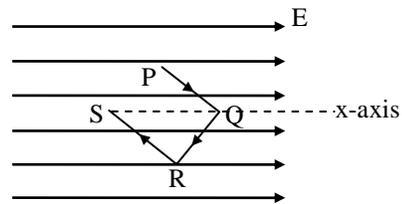
- Q.76** State which one of the following is correct ?
- (A) Joule = Coulomb \times Volt
 (B) Joule = Coulomb / Volt
 (C) Joule = Volt / Ampere
 (D) Joule = Volt \times Ampere

- Q.77** One electron volt (eV) of energy is equal to -
- (A) 1.6×10^{-12} ergs (B) 4.8×10^{-10} ergs
 (C) 9×10^{11} ergs (D) 3×10^9 ergs

- Q.78** The K.E. in electron Volt gained by an α -particle when it moves from rest at point where its potential is 70 to a point where potential is 50 volts, is -
- (A) 20 eV (B) 20 MeV.
 (C) 40 eV (D) 40 MeV.

- Q.79** A α -particle moves towards a rest nucleus, if kinetic energy of α -particle is 10 MeV and atomic number of nucleus is 50. The closest distance of approach will be -
- (A) 1.44×10^{-14} m (B) 2.88×10^{-14} m
 (C) 1.44×10^{-10} m (D) 2.88×10^{-10} m

- Q.80** Point charge (q) moves form point (P) to point (S) along the path PQRS as shown in fig. in a uniform electric field E . Pointing along to the positive direction of the x -axis. The co-ordinates 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 -



- (A) $q E a$ (B) $-q E a$
 (C) $q E a \sqrt{2}$ (D) $qE \sqrt{(2a)^2 + b^2}$

THE ACADEMICS

Q.81 Two identical thin rings, each of radius R metres, are coaxially placed at a distance (R) metres apart. If Q_1 coul and Q_2 coul 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 other is -

- (A) zero
(B) $\frac{q(Q_1 - Q_2)(\sqrt{2}-1)}{(\sqrt{2}.4\epsilon_0\pi R)}$
(C) $\frac{q\sqrt{2}(Q_1 + Q_2)}{(4\epsilon_0\pi R)}$
(D) $\frac{q(Q_1 + Q_2)(\sqrt{2}+1)}{(\sqrt{2}.4\epsilon_0\pi R)}$

Question based on

Electric Flux and Gauss Law

Q.82 The tangent drawn at a point on a line of electric force shows the-

- (A) intensity of gravity field
(B) intensity of magnetic field
(C) intensity of electric field
(D) direction of electric field

Q.83 Which of the following statements concerning the electrostatics is correct-

- (A) electric line of force never intersect each other
(B) electric lines of force start from positive charge and end at the negative charge
(C) electric lines of force start or ends perpendicular to the surface of a charged metal.
(D) all of the above

Q.84 When no charge is confined with in the Gauss's surface, it implies that on the surface-

- (A) E must be zero
(B) \vec{E} and $d\vec{s}$ are parallel
(C) \vec{E} and $d\vec{s}$ are mutually perpendicular
(D) \vec{E} and $d\vec{s}$ are inclined at some angle

Q.85 If electric field flux coming out of a closed surface is zero, the electric field at the surface will be-

- (A) zero
(B) same at all places
(C) dependent upon the location of points
(D) infinite

Q.86 If three electric dipoles are placed in some closed surface, then the electric flux emitting from the surface will be-

- (A) zero (B) positive
(C) negative (D) None

Q.87 For which of the following fields, Gauss's law is valid-

- (A) fields following inverse square law
(B) uniform field inverse square law
(C) all types of field
(D) this law has no concern with the field

Q.88 The electric flux coming out of the equi-potential surface is-

- (A) perpendicular to the surface
(B) parallel to the surface
(C) in all directions
(D) zero

Q.89 A charge of Q coulomb is located at the centre of a cube. If the corner of the cube is taken as the origin, then the flux coming out from the faces of the cube in the direction of X - axis will be-

- (A) $4\pi Q$ (B) $Q/6\epsilon_0$
(C) $Q/3\epsilon_0$ (D) $Q/4\epsilon_0$

Q.90 A rectangular surface of 2 metre width and 4 metre length, is placed in an electric field of intensity 20 Newton/C, there is an angle of 60° between the perpendicular to surface and electrical field intensity. Then total flux emitted from the surface will be- (In Volt- metre)

- (A) 80 (B) 40
(C) 20 (D) 160

Q.91 A charge q is inside a closed surface and charge $-q$ is outside. The out going electric flux is-

- (A) $-q/\epsilon_0$ (B) zero
(C) q/ϵ_0 (D) $2q/\epsilon_0$

THE ACADEMICS

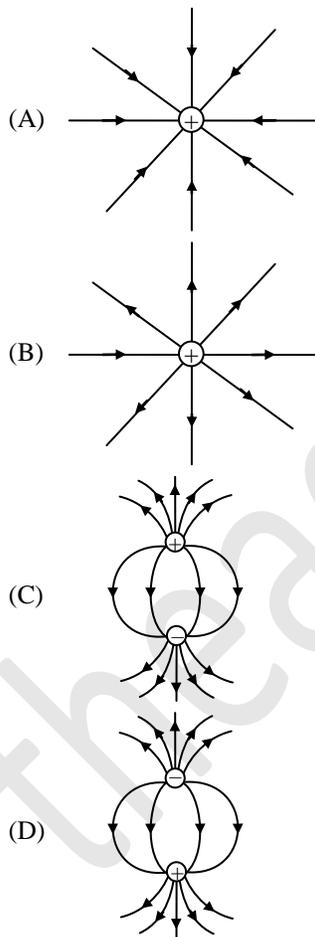
Q.92 If the electric field is uniform, then the electric lines of forces are-

- (A) Divergent
- (B) Convergent
- (C) Circular
- (D) Parallel

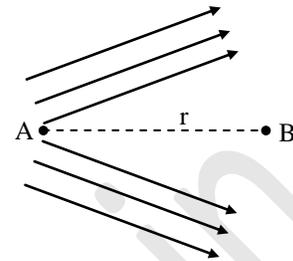
Q.93 Electric lines of forces-

- (A) Exist everywhere
- (B) Are imaginary
- (C) Exist only in the immediate vicinity of electric charges
- (D) None of the above

Q.94 Which one of the following diagrams shows the correct lines of force ?



Q.95 In fig. shown the electric lines of force emerging from a charged body. If the electric fields at A and B are E_A and E_B are respectively and the distance between A and B is r then -

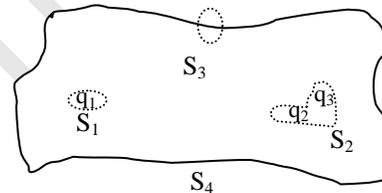


- (A) $E_A > E_B$
- (B) $E_A < E_B$
- (C) $E_A = E_B$
- (D) $E_A = (E_B)/r^2$

Question based on

Application of Gauss Law

Q.96 Three charges $q_1 = 1\mu\text{C}$, $q_2 = 2\mu\text{C}$ and $q_3 = -3\mu\text{C}$ and four surfaces S_1 , S_2 , S_3 and S_4 are shown. The flux emerging through surface S_2 in $\text{N}\cdot\text{m}^2/\text{C}$ is -



- (A) $36\pi \times 10^3$
- (B) $-36\pi \times 10^3$
- (C) $36\pi \times 10^9$
- (D) $-36\pi \times 10^9$

Q.97 A surface enclosed an electric dipole, the flux through the surface is-

- (A) Infinite
- (B) Positive
- (C) Negative
- (D) Zero

Q.98 Total flux coming out of some closed surface in vacuum which encloses a point charge $8.85\mu\text{C}$ is-

- (A) $10^6 \text{ V}\cdot\text{m}$
- (B) $2 \times 10^6 \text{ V}\cdot\text{m}$
- (C) $10^{12} \text{ V}\cdot\text{m}$
- (D) $2 \times 10^{12} \text{ V}\cdot\text{m}$

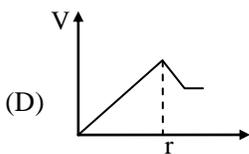
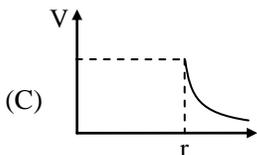
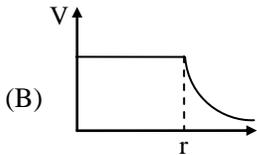
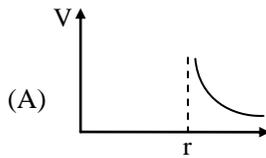
Q.99 A square of side 20 cm is enclosed by a surface of sphere of radius 80 cm. Square and sphere have the same centre. Four charges $+2 \times 10^{-6} \text{ C}$, $-5 \times 10^{-6} \text{ C}$, $-3 \times 10^{-6} \text{ C}$, $+6 \times 10^{-6} \text{ C}$ are located at the four corners of a square, Then outgoing total flux from spherical surface in $\text{N}\cdot\text{m}^2/\text{C}$ will be-

THE ACADEMICS

- (A) zero (B) $(16\pi) \times 10^{-6}$
 (C) $(8\pi) \times 10^{-6}$ (D) $(36\pi) \times 10^{-6}$
- Q.100** The flux emerging out from any one face of the cube when a point charge q is placed at its centre -
 (A) $\frac{q}{6\epsilon_0}$ (B) $\frac{q}{3\epsilon_0}$ (C) $\frac{q}{\epsilon_0}$ (D) $\frac{q}{4\epsilon_0}$
- Q.101** A charge Q is distributed over two concentric hollow spheres of radii r and R ($> r$) such that their surface charge densities are equal. Find the potential at the common centre-
 (A) $\frac{Q}{4\pi\epsilon_0} \times \frac{(r+R)}{(R+r)^2}$ (B) $\frac{Q(R^2+r)^2}{4\pi\epsilon_0(r+R)}$
 (C) $\frac{Q(r+R)}{4\pi\epsilon_0(R^2+r^2)}$ (D) none of these
- Q.102** The electric field inside a spherical shell of uniform surface charge density is -
 (A) Zero
 (B) Constant, different from zero
 (C) Proportional to the distance from the centre
 (D) None of the above
- Q.103** The earth has a net charge equivalent to 1 electron/m² on the surface area of radius 6.4×10^6 m. Its potential would be-
 (A) + 0.12 volt (B) - 0.12 volt
 (C) + 1.2 volt (D) - 1.2 volt
- Q.104** The electric potential at the surface of an atomic nucleus ($Z = 50$) of radius 9×10^{-15} m is -
 (A) 80V (B) 8×10^6 V
 (C) 8×10^4 V (D) 8×10^2 V
- Q.105** A cubical box of side 1m is immersed a uniform electric field of strength 10^4 N/C. The flux through the cube is-
 (A) 10^4 (B) 6×10^4
 (C) 2×10^4 (D) Zero
- Q.106** A charge (q) is located at one corner of a cube. The total electric flux through the cube is-
 (A) $\frac{q}{\epsilon_0}$ (B) $\frac{q}{24\epsilon_0}$ (C) $\frac{q}{6\epsilon_0}$ (D) $\frac{q}{8\epsilon_0}$
- Q.107** A large isolated metal sphere of radius (R) carries a fixed charge. A small charge is placed at a distance (r) from its surface experiences a force which is -
 (A) Proportional to R
 (B) Independent of R and
 (C) Inversely proportional to $(R+r)^2$
 (D) inversely proportional to r^2
- Q.108** A hollow sphere of charge does not produce an electric field at any-
 (A) Interior point
 (B) Outer point
 (C) Surface point
 (D) None of the above
- Q.109** A spherical conductor of radius 50 cm has a surface charge density of 8.85×10^{-6} C/m². The electric field near the surface in N/C is-
 (A) 8.85×10^{-6} (B) 8.85×10^6
 (C) 1×10^6 (D) Zero
- Q.110** A hollow metal sphere of radius 5cm is charged such that the potential on its surface is 10V. The potential at the centre of the sphere is -
 (A) 0V
 (B) 10V
 (C) Same as at point 5cm away from the surface
 (D) Same as at point 25cm away from the surface
- Q.111** A solid conducting sphere having a charge Q is surrounded by an uncharged concentric conducting hollow spherical shell. Let the potential difference between the surface of the solid sphere and that of the outer surface of the hollow shell be V . If the shell is now given a charge of $3Q$, the new potential difference between the same two surfaces is
 (A) V (B) $2V$
 (C) $4V$ (D) $-2V$
- Q.112** The electric field intensity at a point located at distance r ($r < R$) from the center of a spherical conductor (radius R) charged Q will be -
 (A) kQR/r^3 (B) kQr/R^3
 (C) kQ/r^2 (D) zero.

THE ACADEMICS

Q.113 The dependence of electric potential V on the distance ' r ' from the centre of a charged spherical shell is shown by.



Question based on

Electric dipole

Q.114 If an electric dipole is kept in a uniform electric field. Then it will experience-

- (A) a force
- (B) a couple and moves
- (C) a couple and rotates
- (D) a force and moves.

Q.115 An electric dipole consists of two opposite charges each of magnitude 1×10^{-6} C separated by a distance 2 cm. The dipole is placed in an external field of 10×10^5 N/C. The maximum torque on the dipole is -

- (A) 0.2×10^{-3} N-m
- (B) 1.0×10^{-3} N-m
- (C) 2×10^{-2} N-m
- (D) 4×10^{-3} N-m

Q.116 The ratio of the electric field due to an electric dipole on its axis and on the perpendicular bisector of the dipole is-

- (A) 1 : 2
- (B) 2 : 1
- (C) 1 : 4
- (D) 4 : 1

Q.117 The region surrounding a stationary electric dipole has-

- (A) electric field only
- (B) magnetic field only
- (C) both electric and magnetic fields
- (D) neither electric nor magnetic field

Q.118 The electric potential at distance r due to an electric dipole of moment \vec{p} will be-

- (A) $k \frac{\vec{p} \cdot \vec{r}}{r^3}$
- (B) $k \frac{\vec{p} \cdot \vec{r}}{r^2}$
- (C) $k \frac{(\vec{p} \times \vec{r})}{r}$
- (D) $k \frac{(\vec{p} \times \vec{r})}{r^2}$

ANSWER KEY