PHYSICS

Electrostatics

Q.1 If a body has positive charge on it, then it means it has

(a) Gained some protons

(b) Lost some protons

(c) Gained some electrons

(d) Lost some electrons

Q.2 Sure check for presence of electric charge is

(a) Process of induction

(b) Repulsion between bodies

(c) Attraction between bodies

(d) Frictional force between bodies

Q.3 Two equal point charges A and B are R distance apart. A third point charge placed on the perpendicular bisector at a distance 'd' from the centre will experience maximum electrostatic force when

(a) $d = \frac{R}{2\sqrt{2}}$ (b) $d = \frac{R}{\sqrt{2}}$

(c) $d = R\sqrt{2}$ (d) $d = 2\sqrt{2}R$

Q.4 If a solid and a hollow conducting sphere have same radius then

(a) Hollow sphere will hold more maximum charge

(b) Solid sphere will hold more maximum charge

(c) Both the spheres will hold same maximum charge

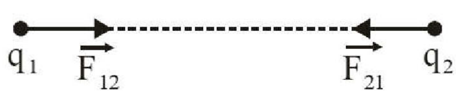
(d) Both the sphere can't hold charge

Q.5 Four charges each equal to Q are placed at the four corners of a square and a charge q is placed at the centre of the square. If the system is in equilibrium then the value of q is

(a) $\frac{Q}{2}(1+2\sqrt{2})$ (b) $\frac{-Q}{4}(1+2\sqrt{2})$

(c) $\frac{Q}{4}(1+2\sqrt{2})$ (d) $\frac{-Q}{2}(1+2\sqrt{2})$

Q.6 According to Coulomb's Law, which is correct relation for the following diagram?



(a) $q_1 q_2 < 0$ (b) $q_1 q_2 > 0$

(c) $q_1 q_2 = 0$ (d) $q_1 q_2 >> 100$ C

Q.7 A point charge q_1 exerts an electric force on a second point charge q_2. If third charge q_3 is brought near, the electric force of q_1 exerted on q_2

(a) Decreases

(b) Increases

(c) Remains unchanged

(d) Increases if q_3 is of same sign as q_1 and decreases if q_3 is of opposite sign

Q.8 The electric field intensity at a point in vacuum is equal to

(a) Zero

(b) Force a proton would experience there

(c) Force an electron would experience there

(d) Force a unit positive charge would experience there

Q.9 The electric field at 2R from the centre of a uniformly charged non-conducting sphere of radius R is E. The electric field at a distance $\frac{R}{2}$ from the centre will be

(a) Zero (b) 2E

(c) 4E (d) 16E

Q.10 In a uniform electric field if a charge is fired in a direction different from the line of electric field then the trajectory of the charge will be a

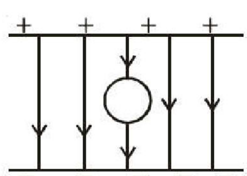
(a) Straight line

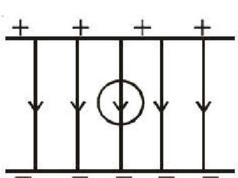
(b) Circle

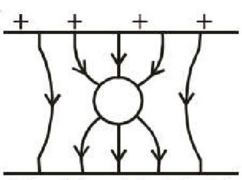
(c) Parabola

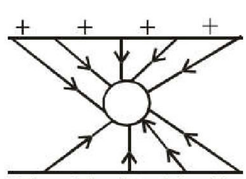
(d) Ellipse

Q.11 An uncharged sphere of metal is placed in a uniform electric field produced by two oppositely charged plates. The lines of force will appear as

(a) 

(b) 

(c) 

(d) 

Q.12 **Two charges of $+25 \times 10^{-9}$ coulomb and -25×10^{-9} coulomb are placed 6 m apart. Find the electric field intensity ratio at points 4 m from the centre of the electric dipole (i) on axial line (ii) on equatorial line**

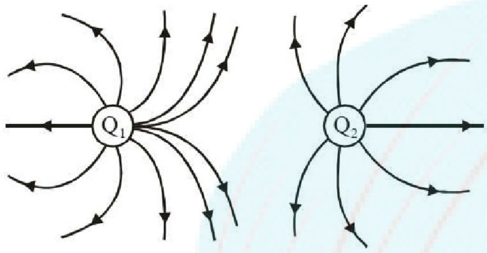
(a) $\frac{1000}{49}$

(b) $\frac{49}{1000}$

(c) $\frac{500}{49}$

(d) $\frac{49}{500}$

Q.13 **Figure shows electric lines of forces due to charges Q_1 and Q_2. Hence**



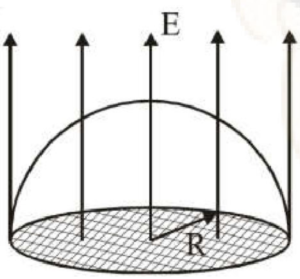
(a) Q_1 and Q_2 both are negative

(b) Q_1 and Q_2 both are positive

(c) $Q_1 > Q_2$

(d) Both (b) & (c)

Q.14 **A hemispherical surface of radius R is kept in a uniform electric field E as shown in figure. The flux through the curved surface is**



(a) $E2\pi R^2$ (b) $E\pi R^2$

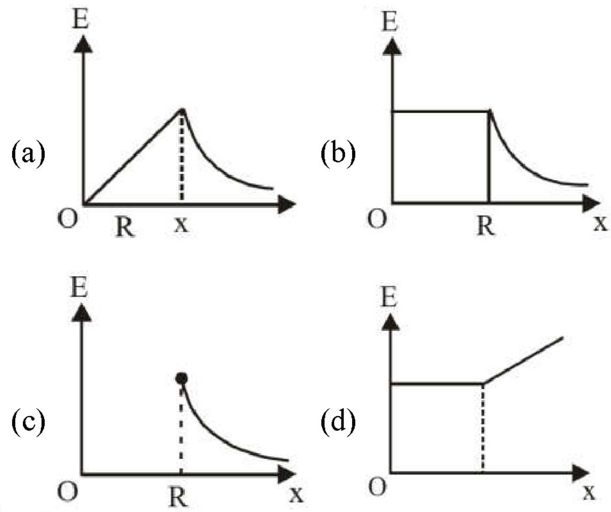
(c) $E4\pi R^2$ (d) Zero

Q.15 **If an electric field is given by $10\hat{i} + 3\hat{j} + 4\hat{k}$, calculate the electric flux through a surface of area 10 units lying in yz plane**

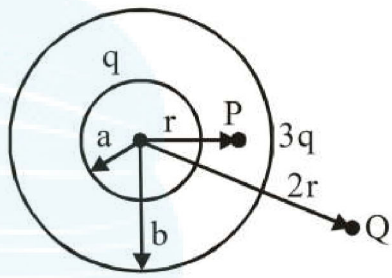
(a) 100 units (b) 10 units

(c) 30 units (d) 40 units

Q.16 **An isolated solid metal sphere of radius R is given an electric charge. Which of the graphs below best shows the way in which the electric field E varies with distance x from the centre of the sphere?**



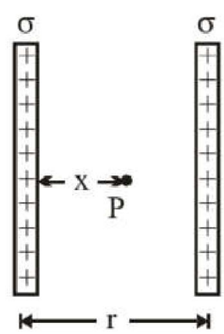
Q.17 **The electric field intensity at P and Q, due to two hollow spheres in the shown arrangement, are in the ratio**



(a) 1 : 2 (b) 2 : 1

(c) 1 : 1 (d) 4 : 3

Q.18 **For two infinitely long charged parallel sheets, the electric field at P will be**



(a) $\frac{\sigma}{2x} - \frac{\sigma}{2(r-x)}$ (b) $\frac{\sigma}{2\varepsilon_0 x} + \frac{\sigma}{2\pi(r-x)\varepsilon_0}$

(c) $\frac{\sigma}{\varepsilon_0}$ (d) Zero

Q.19 **If a dipole of dipole moment $\vec{p}$ is placed in a uniform electric field $\vec{E}$, then torque acting on it is given by**

(a) $\vec{\tau} = \vec{p}.\vec{E}$ (b) $\vec{\tau} = \vec{p} \times \vec{E}$

(c) $\vec{\tau} = \vec{p} + \vec{E}$ (d) $\vec{\tau} = \vec{p} - \vec{E}$

Q.20 **An infinite line charge is at the axis of a cylinder of length 1 m and radius 7 cm. If electric field at any point on the curved surface of cylinder is 250 NC^{-1}, then net electric flux through the cylinder is**

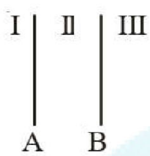
(a) 1.1×10^2 Nm^2 C^{-1}

(b) 9.74×10^{-6} Nm^2 C^{-1}

(c) 5.5×10^6 Nm^2 C^{-1}

(d) 2.5×10^2 Nm^2 C^{-1}

Q.21 **The given figure shows, two parallel plates A and B of charge densities $+\sigma$ and $-\sigma$ respectively. Electric intensity will be zero in region**



(a) I only
(b) II only
(c) III only
(d) Both (I) & (III)

Q.22 **Two long thin charged rods with charge density λ each are placed parallel to each other at a distance d apart. The force per unit length exerted on one rod by the other will be $\left(\text{where } k = \dfrac{1}{4\pi\varepsilon_0}\right)$**

(a) $\dfrac{k2\lambda}{d}$
(b) $\dfrac{k2\lambda^2}{d}$
(c) $\dfrac{k2\lambda}{d^2}$
(d) $\dfrac{k2\lambda^2}{d^2}$

Q.23 **Gauss's law can help in easy calculation of electric field due to**

(a) Moving charge only

(b) Any charge configuration

(c) Any symmetrical charge configuration

(d) Some special symmetric charge configuration

Q.24 **The Gaussian surface**

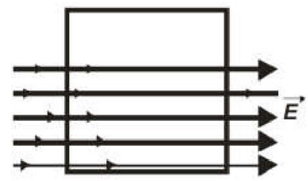
(a) can pass through a continuous charge distribution.

(b) cannot pass through a continuous charge distribution.

(c) can pass through any system of discrete charges.

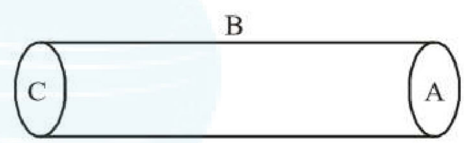
(d) can pass through a continuous charge distribution as well as any system of discrete charges.

Q.25 **A square surface of side L metres is in the plane of the paper. A uniform electric field $\vec{E}$ (volt/m), also in the plane of the paper, is limited only to the lower half of the square surface (see figure). The electric flux in SI units associated with the surface is**



(a) EL^2
(b) $\dfrac{EL^2}{2\varepsilon_0}$
(c) $\dfrac{EL^2}{2}$
(d) Zero

Q.26 **A hollow cylinder has a charge q coulomb within it. If ϕ is the electric flux in units of voltmeter associated with the curved surface B, the flux linked with the plane surface A in units of volt meter will be**



(a) $\dfrac{q}{2\varepsilon_0}$
(b) $\dfrac{\phi}{3}$
(c) $\dfrac{q}{\varepsilon_0} - \phi$
(d) $\dfrac{1}{2}\left(\dfrac{q}{\varepsilon_0} - \phi\right)$

Q.27 **Assertion :** A point charge cannot exert force on itself.

Reason : Coulomb force is a central force.

(a) Assertion and reason both are true and the reason is correct explanation of assertion.

(b) Assertion and reason both are true but reason is not correct explanation of assertion.

(c) Assertion is true but reason is wrong.

(d) Assertion and reason both are wrong.

Q.28 **Assertion :** Since matter cannot be concentrated at a point, therefore point charge is not possible.

Reason : An electron is a point charge.

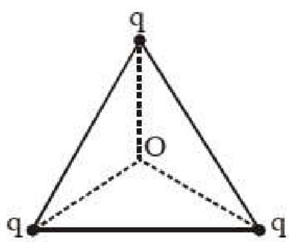
(a) Assertion and reason both are true and the reason is correct explanation of assertion.

(b) Assertion and reason both are true but reason is not correct explanation of assertion.

(c) Assertion is true but reason is wrong.

(d) Assertion and reason both are wrong.

Q.29 Three isolated equal charges are placed at the three corners of an equilateral triangle as shown in figure. The statement which is true for net electric potential V and net electric field intensity E at the centre of the triangle is



(a) E = 0, V = 0 (b) V = 0, E ≠ 0

(c) V ≠ 0, E = 0 (d) V ≠ 0, E ≠ 0

Q.30 The potential at a point 0.1 m from an isolated point charge is + 100 volt. The nature of the point charge is

(a) Positive

(b) Negative

(c) Zero

(d) Either positive or zero

Q.31 Four charges of same magnitude q are placed at four corners of a square of side a. The value of electric potential at the centre of the square will be (Where $k = \frac{1}{4\pi\varepsilon_0}$)

(a) $\frac{4kq}{a}$ (b) $4\sqrt{2}\frac{kq}{a}$

(c) $\frac{4kq}{\sqrt{2}a}$ (d) $\frac{kq}{a\sqrt{2}}$

Q.32 The electric potential V at a point P(x, y, z) in space is given by V = 4 x^2 volt. Electric field at a point (1m, 0, 2m) in V/m is

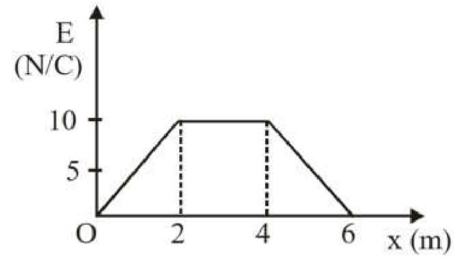
(a) 8 along –ve x-axis

(b) 8 along +ve x-axis

(c) 16 along –ve x-axis

(d) 16 along +ve x-axis

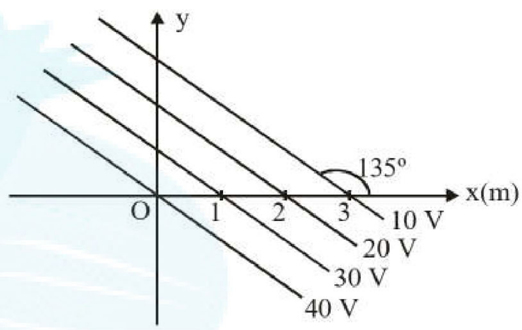
Q.33 Figure shows the variation of electric field intensity E versus distance x. What is the potential difference between the points at x = 2 m and at x = 6 m from O?



(a) 30 V (b) 60 V

(c) 40 V (d) 80 V

Q.34 Figure shows a set of equipotential surfaces. The magnitude and direction of electric field that exists in the region is



(a) $10\sqrt{2}$ V/m at 45° with x-axis

(b) $10\sqrt{2}$ V/m at –45° with x-axis

(c) $5\sqrt{2}$ V/m at 45° with x-axis

(d) $5\sqrt{2}$ V/m at –45° with x-axis

Q.35 Work done in moving a charge q coulomb on the surface of a given charged conductor of potential V is

(a) $\frac{V}{q}$ joule (b) Vq joule

(c) $\frac{q}{V}$ joule (d) Zero

Q.36 If 50 joule of work must be done to move an electric charge of 2 C from a point, where potential is –10 volt to another point, where potential is V volt, the value of V is

(a) 5 V (b) – 15 V

(c) + 15 V (d) + 10 V

Q.37 The electric potential at a distance of 3 m on the axis of a short dipole of dipole moment 4 × 10^{-12} coulomb-meter is

(a) 1.33 × 10^{-3} V (b) 4 mV

(c) 12 mV (d) 27 mV

Q.38 An electric dipole of length 2 cm is placed with its axis making an angle of 30° to a uniform electric field 10^5 N/C. If it experiences a torque of $10\sqrt{3}$ Nm, then potential energy of the dipole

(a) – 10 J (b) – 20 J

(c) – 30 J (d) – 40 J

Q.39 Two equally charged identical small balls kept some fixed distance apart exert a repulsive force F on each other. A similar uncharged ball, after touching one of them is placed at the mid-point of line joining the two balls. Force experienced by the third ball is

(a) 4F (b) 2F

(c) F (d) $\frac{F}{2}$

Q.40 What is the amount of charge possessed by 1 kg of electrons?

(a) 1.76×10^{11} C (b) 1.76×10^{-9} C

(c) 1.76×10^{-7} C (d) 1.76×10^{-5} C

Q.41 Coulomb's law is analogous to

(a) Charge conservation law

(b) Newton's second law of motion

(c) Law of conservation of energy

(d) Newton's law of gravitation

Q.42 Two charges e and 3e are placed at a distance r. The distance of the point where the electric field intensity will be zero is

(a) $\frac{r}{(1+\sqrt{3})}$ from 3e charge

(b) $\frac{r}{(1+\sqrt{3})}$ from e charge

(c) $\frac{r}{(1-\sqrt{3})}$ from 3e charge

(d) $\frac{r}{1+\sqrt{\frac{1}{3}}}$ from e charge

Q.43 Which of the following is not true about electric charge?

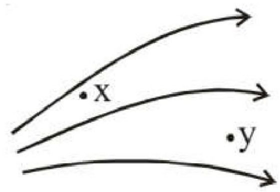
(a) Charge on a body is always integral multiple of certain charge known as charge of electron

(b) Charge is a scalar quantity

(c) Net charge on an isolated system is always conserved

(d) Charge can be converted into energy and energy can be converted into charge

Q.44 Figure shows electric lines of force. If E_x and E_y are the magnitudes of electric field at points x and y respectively, then



(a) $E_x > E_y$ (b) $E_x = E_y$

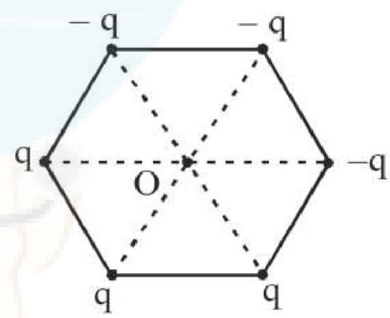
(c) $E_x < E_y$ (d) Any of these

Q.45 Consider three point objects P, Q and R. P and Q repel each other, while P and R attract. What is the nature of force between Q and R?

(a) Repulsive force (b) Attractive force

(c) No force (d) None of these

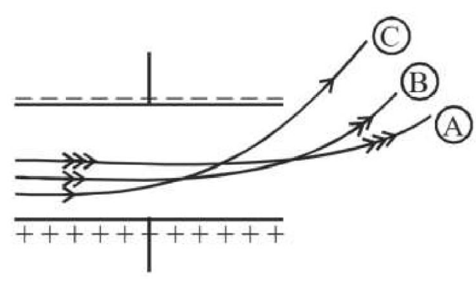
Q.46 Six point charges are placed at the vertices of a hexagon of side 1m as shown in figure. Net electric field at the centre of the hexagon is



(a) Zero (b) $\frac{6q}{4\pi\varepsilon_0}$

(c) $\frac{q}{\pi\varepsilon_0}$ (d) $\frac{q}{4\pi\varepsilon_0}$

Q.47 Three particles are projected in a uniform electric field with same velocity perpendicular to the field as shown. Which particle has highest charge to mass ratio?



(a) A

(b) B

(c) C

(d) All have same charge to mass ratio

Q.48 The magnitude of electric field strength E such that an electron placed in it would experience an electrical force equal to its weight is given by

(a) mge

(b) $\frac{mg}{e}$

(c) $\frac{e}{mg}$

(d) $\frac{e^2g}{2m}$

Q.49 **Assertion :** When an electric dipole is placed in uniform electric field, net force on it will be zero.

Reason : Force on the constituent charges of the dipole will be equal and opposite when it is in uniform electric field.

(a) Assertion and reason both are true and the reason is correct explanation of assertion.

(b) Assertion and reason both are true but reason is not correct explanation of assertion.

(c) Assertion is true but reason is wrong.

(d) Assertion and reason both are wrong.

Q.50 When air is replaced by a dielectric medium of constant K, the maximum force of attraction between two charges separated by a distance

(a) Increases K times

(b) Remains unchanged

(c) Decreases K times

(d) Increases K^{-2} times

Solution

1. (d)

Due to lack of electron body get positive charge.

2. (b)

Due to similar (like charge), repulsion force is possible but attraction force may be due to a charged and an uncharged body.

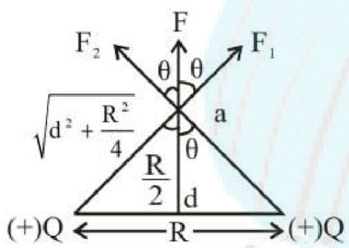
3. (a)

$$F_1 = F_2 = \frac{KQ^2}{\left[d^2 + \frac{R^2}{4}\right]}$$

$$F_N = F_1\cos\theta + F_2\cos\theta$$

$$= 2F_1\cos\theta =$$

$$F_N = 2.\frac{KQ^2}{\left(d^2 + \frac{R^2}{4}\right)} \cdot \frac{d}{\left[d^2 + \frac{R^2}{4}\right]^{\frac{1}{2}}}$$



If F = Maximum than $\frac{dF}{d(d)} = 0$

So we get $d = \frac{R}{2\sqrt{2}}$

4. (c)

Excess charge spread on outer surface only from their property.

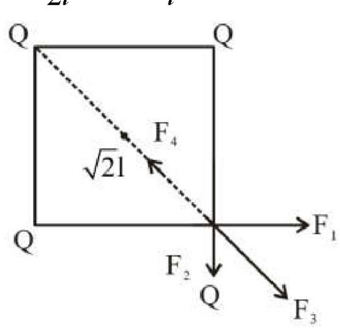
5. (b)

Net force on Q due to other corner charge is

$$F_{123} = F_3 + \sqrt{F_1^2 + F_2^2}$$

$$= F_3 + \sqrt{2}F_1$$

$$= \frac{KQ^2}{2l^2} + \frac{\sqrt{2}KQ^2}{l^2}$$



Force on Q_1 due to centre charge $-q$

$$F_4 = \frac{KQq}{l^2}.2$$

If net force on corner charge Q is zero

Then

$$F_{123} + F_4 = 0$$

So $q = -\frac{Q}{4}[1 + 2\sqrt{2}]$

6. (a)

Both charge should be unlike charge

if q_1 is positive, then q_2 is negative

$q_1(-q_2) \rightarrow$ negative

$\Rightarrow -q_1q_2 < 0$

7. (c)

Electric force between charges1 & 2 do not depend on the '3'rd charge.

8. (d)

$$E = \frac{F}{q}$$

if q = 1 C then E = F.

9. (b)

Given $E = \frac{Kq}{(2R)^2}$ ...(i)

Then $E' = \frac{Kq.\frac{R}{2}}{R^3}$ ...(ii)

Find E' = 2E

10. (c)

$$F = qE = ma_x$$

$$a_x = \frac{qE}{m}$$

Displacement in x direction will be,

$$x = u_x t + \frac{1}{2}a_x t^2$$

$$x = \frac{1}{2}a_x t^2 = \frac{1}{2}\frac{qE}{m}t^2 \quad ...(i)$$

In y-axis no force is acting so displacement in y direction will be,

$$y = ut \Rightarrow t = \frac{y}{u}$$

putting the value in equation (i)

$$x = \frac{1}{2}\frac{qE}{m}\left(\frac{y}{u}\right)^2$$

$$x \propto y^2$$

Hence the path will be parabolic.

11. (c)

Electric field inside the conductor is zero. Also it will terminate or originate at 90° to the surface.

12. (a)

$$E_{axial} = \frac{k.2Pr}{(r^2 - l^2)^2} \quad ...(i)$$

$$E_{eq.} = \frac{k.p}{(r^2 + l^2)^{\frac{3}{2}}} \quad ...(ii)$$

Find $\frac{E_{axial}}{E_{eq}} = \frac{1000}{49}$

13. (d)

The electric field lines are emerging from the charges so the charges are positive. The density of field lines around Q_1 are more as compared to Q_2. Hence $Q_1 > Q_2$

14. (b)

$$\phi = E \cdot \text{projected area}$$

$$\phi = E\pi R^2$$

15. (a)

$$\vec{E} = 10\hat{i} + 3\hat{j} + 4\hat{k}$$

$$\vec{A} = 10\hat{i}$$

So, $\phi = \vec{E}.\vec{A} = 100\,\text{unit}$

16. (c)

$$E_{outside} = \frac{kq}{r^2}$$

$$E_{inside} = 0$$

17. (c)

$$E_P = \frac{kq}{r^2} \quad ...(i)$$

$$E_Q = \frac{kq}{(2r)^2} + \frac{k.3q}{(2r)^2}$$

$$= \frac{kq}{4r^2} + \frac{k.3q}{4r^2}$$

$$= \frac{kq}{r^2} \quad ...(ii)$$

$E_P : E_Q = 1 : 1$

18. (d)

$$E_N = E_1 - E_2 = \frac{\sigma}{2\varepsilon_0} - \frac{\sigma}{2\varepsilon_0} = 0$$

19. (b)

Torque (τ) = Either force × perpendicular distance between the two forces

$$\tau = qaE\sin\theta$$

$$\tau = pE\sin\theta \text{ or } \vec{\tau} = \vec{p} \times \vec{E}$$

20. (a)

Charge enclosed is (q) = λ(a)

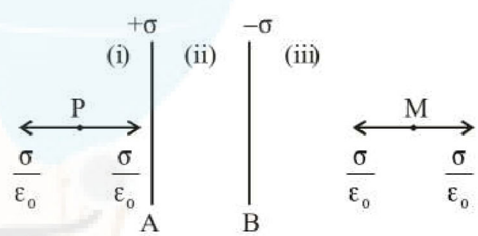
$$E = \frac{\lambda}{2\pi\varepsilon_0(0.07)} = 250$$

So, $\lambda = 500(0.07)\pi\varepsilon_0$

Electric flux through cylinder $= \frac{q}{\varepsilon_0} = 500(0.07)\pi$

$$\simeq 1.1 \times 10^2\,\text{Nm}^2\text{C}^{-1}$$

21. (d)

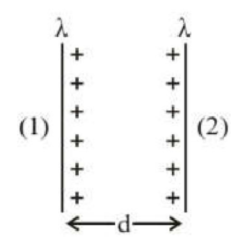


At points P and M is zero.

22. (b)

Electric field due to rod 1,

$$E = \frac{2\lambda}{4\pi\varepsilon_0 d}$$



Force per unit length = λE

$$= \lambda \times \frac{2\lambda}{4\pi\varepsilon_0 d}$$

$$= \frac{K2\lambda^2}{d}$$

23. (d)

For easy calculation of electric field using Gauss' law, gaussian surfaces having some special symmetry with respect to charge configuration is used.

24. (a)

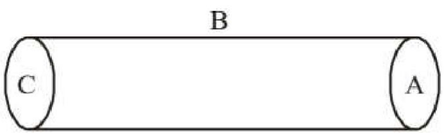
Gaussian surface cannot pass through any discrete charge because electric field due to a system of discrete charges is not well defined at the location of the charges. But the Gaussian surface can pass through a continuous charge distribution.

25. (d)

$$\phi_{net} = \vec{E}.\vec{A} = EA\cos\theta \qquad \because \theta = 90^\circ$$

$$= 0$$

26. (d)



Net flux through the all surface $= \dfrac{Q}{\varepsilon_0}$

Flux through curved surface $= \phi$

Hence, flux through plane surface $= \dfrac{1}{2}\left(\dfrac{Q}{\varepsilon_0} - \phi\right)$

27. (b)

A charge cannot exert force on itself because of its own electric field. Coloumb force is a central force as it acts along the line joining the two charges. Assertion and reason are correct but reason is not correct explanation of assertion.

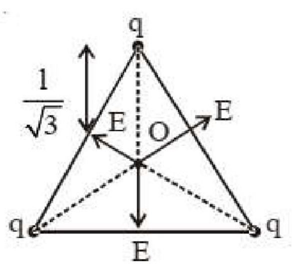
28. (c)

Idealy point charge is not possible because charge exist on matter and matter has some size.

But we can assume electron like small size charge particle as point charge it depends on relative size of particle to concern distance that may be distance of point where we observe the effect of that charge or particle or we can say radius of curvature of the path of the charge particle.

So, ideally assertion is correct but reason is incorrect.

29. (c)



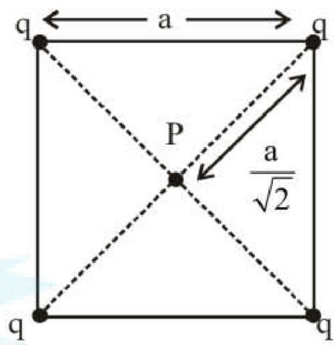
$E_{net} = 0$

$$V_{net} = 3\left(\frac{kq\sqrt{3}}{l}\right) = 3\sqrt{3}\,\frac{kq}{l}$$

30. (a)

As potential is +ve, so point charge is also +ve.

31. (b)



$$V_P = 4\left(\frac{kq\sqrt{2}}{a}\right) = 4\sqrt{2}\,\frac{kq}{a}$$

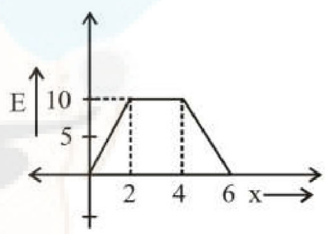
32. (a)

$V = 4x^2$

$$E_x = \frac{-dV}{dx} = -8x$$

$$E_x = -8 \text{ volt/m}$$

33. (a)

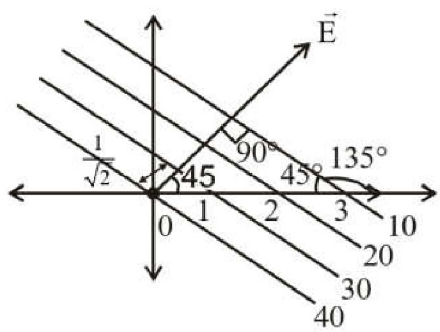


$$\Delta V = -\int E dr$$

$$\Delta V = 2\times10 + \frac{1}{2}\times2\times10$$

$$= 30V$$

34. (a)



$$E = \frac{10\sqrt{2}}{1}$$

$$\left[E = \frac{\Delta V}{r} = \frac{10}{\frac{1}{\sqrt{2}}}\right]$$

$E = 10\sqrt{2}$ at 45° with x-axis

35. (d)

As the surface of a conductor is equipotential, So W = 0.

36. (c)

$50 = 2(V - (-10))$

$25 = V + 10$

$V = 15\ V$

37. (b)

$$V = \frac{9\times10^{9}\times4\times10^{-12}}{9} = 4\times10^{-3}\,V = 4\,mV$$

38. (c)

$$10\sqrt{3} = P10^{5}\,\frac{1}{2} \quad [|\vec{\tau}| = PE\sin\theta]$$

$$2\sqrt{3}\times10^{-4} = P$$

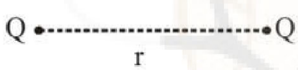
$$U = -2\sqrt{3}\times10^{-4}\times10^{5}\times\frac{\sqrt{3}}{2} \quad [|U| = -PE\cos\theta]$$

$U = -3 \times 10$

$U = -30\ J$

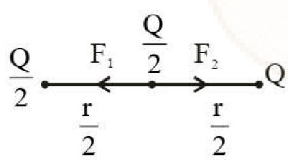
39. (c)

First case :



$$F_1 = F = \frac{KQ^2}{r^2} \qquad ...(i)$$

Second case :



$$|F_{Net}| = |F_2 - F_1|$$

$$= \frac{KQ^2 4}{4.r^2} - \frac{KQ^2 4}{2r^2}$$

$$\frac{KQ^2}{r^2} = F$$

Force remain's constant

40. (a)

$\because\ m_e = 9.1 \times 10^{-31}$ kg

$q_e = 1.6 \times 10^{-19}$ C

So charge due to 1 kg electron

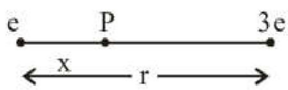
$$Q = \frac{1.6\times10^{-19}}{9.1\times10^{-31}} = 1.76\times10^{11}\,C$$

41. (d)

Coulomb's law and Newton's law of gravitation are inverse square law.

42. (b)

Net electric field at P is zero then



$0 = E_1 - E_2$

$E_1 = E_2$

$$\frac{ke}{x^2} = \frac{k\,3e}{(r-x)^2}$$

$$\text{so,}\ \frac{1}{x} = \frac{\sqrt{3}}{r-x}$$

$$r - x = \sqrt{3}x$$

$$r = x[1+\sqrt{3}]$$

$$x = \frac{r}{(1+\sqrt{3})}$$

43. (d)

A rest charge cannot be converted into energy.

44. (a)

Electric field strength is higher where the field lines are nearer as compared to the region where they are distant.

45. (b)

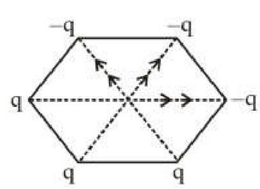
Since P and Q repel each other. Hence both have same nature of charge (+, +) or (–, –)

Again P and R attract each other. Hence they have charge of opposite nature. Hence if P has positive charge then Q will have negative charge or if P has negative charge then R will have positive charge : Since Q has some nature of charge as P. Hence Q and R have opposite charge this they will attract each other.

46. (c)

Electric field at O due to each charge is

$$E = \frac{1}{4\pi\varepsilon_0}\frac{q}{(1)^2}$$



So, net electric field (E_{net}) is,

$$\Rightarrow E_{net} = 2\left(E + \sqrt{E^2 + E^2 + 2E^2\cos 120^\circ}\right) = 2(2E)$$

$$\Rightarrow E_{net} = 4E = \frac{q}{\pi\varepsilon_0}$$

47. (c)

Charge with maximum curved path has highest charge to mass ratio.

48. (b)

mg = eE

$$E = \frac{mg}{e}$$

49. (a)

When a dipole is placed in a uniform magnetic field then the charges experies equal and opposite force hence net force on the dipole is zero.

50. (c)

$$F_{air} = \frac{1}{4\pi\varepsilon_0}\cdot\frac{Q_1.Q_2}{r^2}$$

$$F_{medium} = \frac{F_{air}}{k} \Rightarrow \text{ decreases by k times}$$