Two small identical spheres having charges +10 μC and –90 μC attract each other with a force of F newton. If they are kept in contact and then separated by the same distance, the new force between them is

NEET 4 JEE (m) - Similar

(a) $F/6$ (b) $16F$

(c) ✓ $16F/9$ (d) $9F$

+10 μC -90 μC

$$F = \frac{K(10)(90)}{d^2}$$

after contact

$$\frac{10+(-90\mu C)}{2} \quad \mu C$$

$$\left[\frac{10+(-90)}{2}\right]\mu C$$

-40 μC -40 μC

$$F' = \frac{K(40)(40)}{d^2}$$

$$\frac{F}{F'} = \frac{K(1\cancel{0})(9\cancel{0})}{\cancel{d^2} \times \frac{K(4\cancel{0})(4\cancel{0})}{\cancel{d^2}}}$$

$$\frac{F}{F'} = \frac{9}{16}$$

$$\boxed{F' = \frac{16F}{9}}$$

The electric charge in accelerated motion produces

(a) an electric field only

(b) a magnetic field only

(c) electromagnetic radiation only

[✓ (d) all of the above]

[JEE (m)
(NEET)
(AIIMS)]

q
• [charge]

(i) Rest → Electric field.

(ii) Motion → Electric field + magnetic field both produce

[with constant velocity]

(iii) accelerated / deaccelerated / Oscillation ⇒ Electric field / magnetic field + EMW, EM Radiation

A stationary charge produces

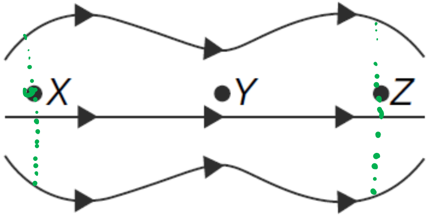
(a) a magnetic field only

[✓ (b) an electric field only]

(c) electric field and magnetic field both

(d) none of the above

In this figure, electric field lines in a certain region are shown.



The figure suggests that

(a) $E_x = E_y = E_z$

(b) $E_x < E_y < E_z$

(c) $E_x > E_y > E_z$

(d) $E_x = E_z < E_y$ ✓

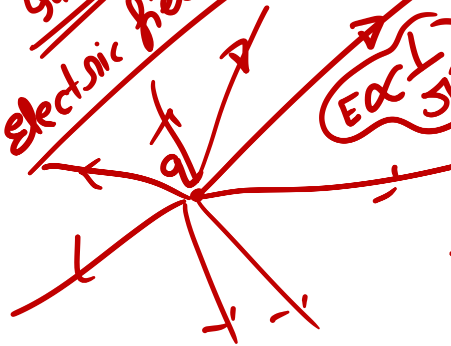
$E_y > E_x = E_y$

Question

electric field in uniform due

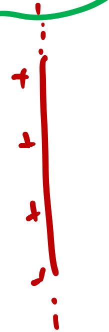
⇒ [illegible]

At High electric field density, electric field strength is high.



$E \propto \frac{1}{r^2}$

infinite rod

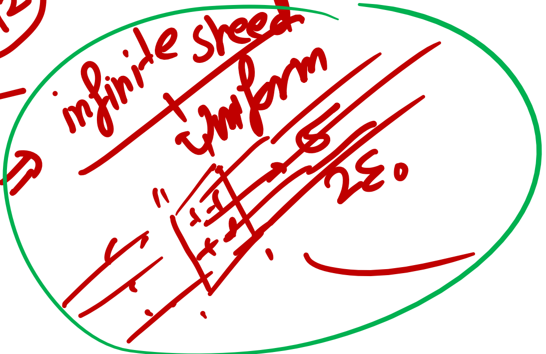


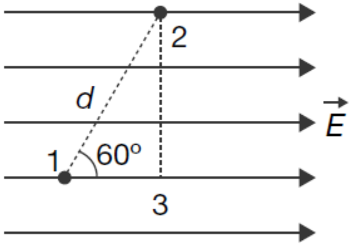
$E \propto \frac{1}{r}$

⇒ infinite sheet

uniform

$\frac{\sigma}{2\varepsilon_0}$





The electric field $\vec{E}$ between two points is constant in both magnitude and direction. Consider a path of length d at an angle $\theta = 60^\circ$ with respect to field lines shown in figure. The potential difference between points 1 and 2 is

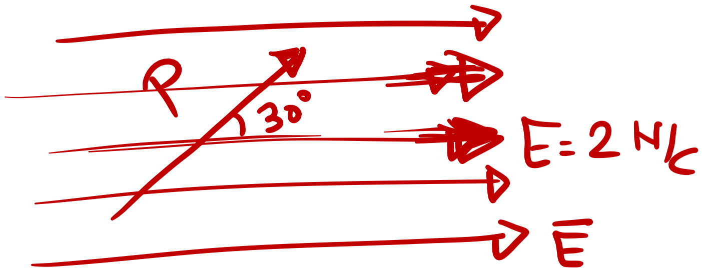
(a) $\dfrac{E}{d\cos 60^\circ}$

(b) $Ed\cos 60^\circ$

(c) $\dfrac{Ed}{\cos 60^\circ}$

(d) $\dfrac{E}{d}\cos 60^\circ$

Torque unit = Energy = Work =



$P = 2\times10^{-10}$ C-m

Find Torque

$\vec{\tau} = \vec{P}\times\vec{E}$

$\tau = PE\sin\theta$

$= (2\times10^{-10})\times\cancel{2}\times\frac{1}{\cancel{2}}$

$\boxed{\tau = 2\times10^{-10}\text{ N-m}}$

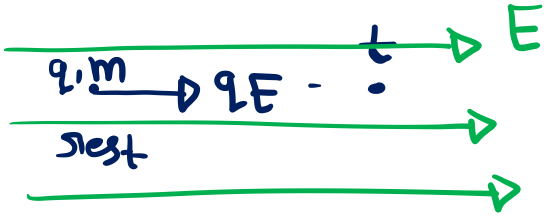
A charged particle of mass m and charge q is released from rest in an electric field of constant magnitude E. The kinetic energy of the particle after time t is

(a) $\frac{2E^2t^2}{mq}$

[✓ (b) $\frac{E^2q^2t^2}{2m}$]

(c) $\frac{Eq^2m}{2t^2}$

(d) $\frac{Eqm}{2t}$



Force on charge = qE

acceleration of charge = $\frac{qE}{m}$

$\underline{\underline{u=0}}$

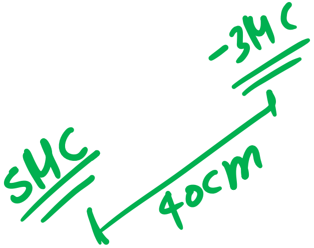
$v = u + at$

$v = 0 + \frac{qE}{m}t$

$v = \frac{qEt}{m}$

$K.E = \frac{1}{2}mv^2 = \frac{1}{2}\cancel{m}\left[\frac{q^2E^2t^2}{m\cancel{^2}}\right]$

$$\boxed{K.E = \frac{q^2E^2t^2}{2m}}$$



from (-3μc)

$$\frac{\cancel{KQ}(3\cancel{\mu C})}{x^2} = \frac{\cancel{KQ}(5\cancel{\mu C})}{(40+x)^2}$$

$$\frac{3}{x^2} = \frac{5}{(40+x)^2}$$

$$\frac{\sqrt{3}}{x} = \frac{\sqrt{5}}{40+x}$$

$$40\sqrt{3} + \sqrt{3}x = \sqrt{5}x$$

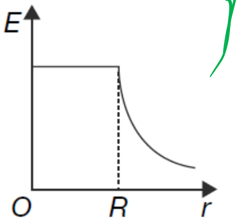
$$40\sqrt{3} = (\sqrt{5}-\sqrt{3})x$$

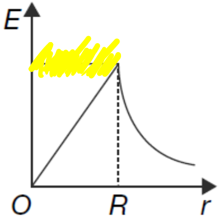
$$x = \left(\frac{40\sqrt{3}}{\sqrt{5}-\sqrt{3}}\right) cm$$

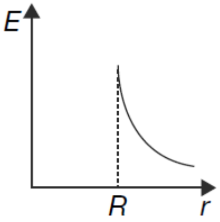
→ ⓜ

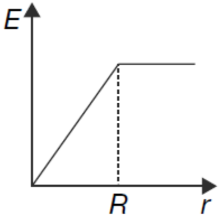
concept ↗

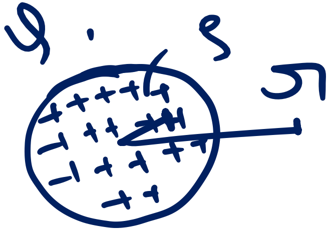
The electric field due to a uniformly charged non-conducting sphere of radius R as a function of the distance from its centre is represented graphically by

(a) 

(b) 

(c) 

(d) 



① $r < R$

$$E = \frac{\rho r}{3\varepsilon_0}$$

$$\boxed{E \propto r}$$

AIIMS

JEE(M)

JEE(A)

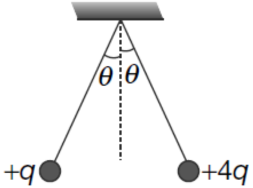
(II) $r > R$

$$E = \frac{Kq}{r^2}$$

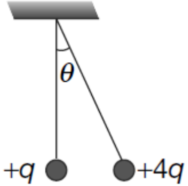
$$\boxed{F \propto \frac{1}{r^2}}$$

Two metal spheres of same mass are suspended from a common point by a light insulating string. The length of each string is same. The spheres are given electric charges $+q$ on one end and $+4q$ on the other. Which of the following diagrams best shows the resulting positions of spheres?

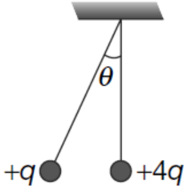
(a)



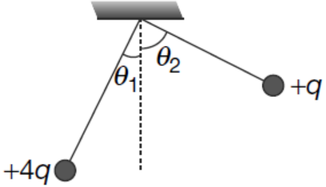
(b)

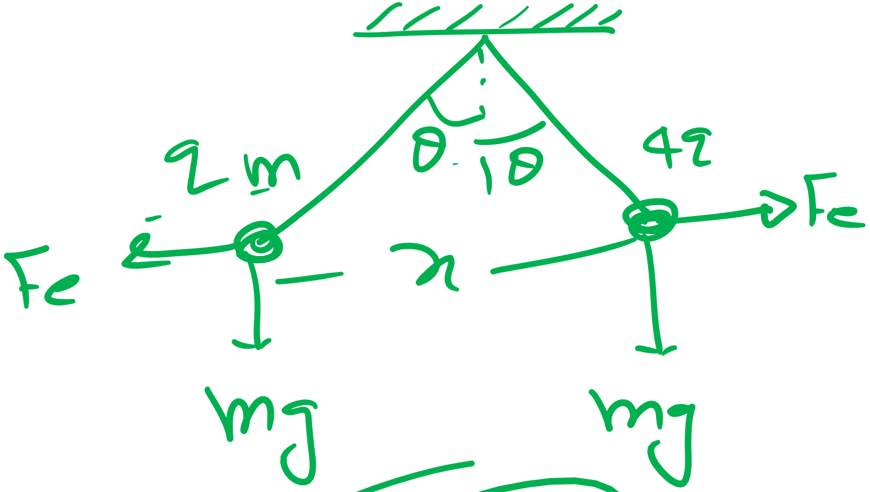


(c)



(d)





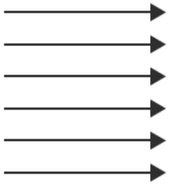
$$F_e = \frac{Kq(4q)}{x^2}$$

⇒ 4-s article

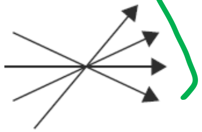
JEE (NEET ?)

Which of the following configurations of electric lines of force is not possible?

(a)

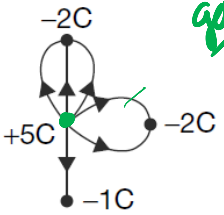


(b)



E.F.L Never cut each other

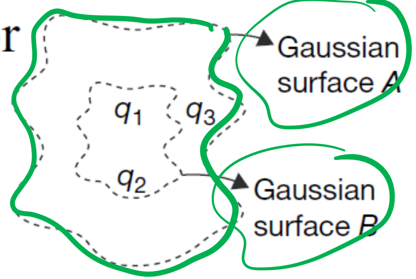
(c)



good

(d) both (b) and (c)

The electric flux for Gaussian surface A that encloses the charged particles in free space is (given $q_1 = -14$ nC, $q_2 = 78.85$ nC, $q_3 = -56$ nC)



(a) 10^3 Nm^{2}C^{-1}

(b) 10^3 CN^{-1}m^{-2}

(c) 6.32×10^3 Nm^{-2}C^{-1}

(d) 6.32×10^3 CN^{-1}m^{-2}

$q_1 = -14$ nc

$q_2 = 78.85$ nc

$q_3 = -56$ nc

$q_3 =$

$$\phi = \frac{q_{in}}{\varepsilon_0}$$

$$= \frac{q_1+q_2+q_3}{\varepsilon_0}$$

$$= \frac{(14+78.85-56)\,nc}{\varepsilon_0}$$

$$= \frac{\cancel{8.85}\times10^{-9}\,C}{\cancel{8.85}\times10^{-12}} \simeq 10^3$$

$=$

⊕ +4μC

$\vec{p} = q\vec{r}$ [dirn ⊖ to (+)]

$\vec{r} = (1i + 0j + 4k) - (2i - j + 5k)$

$\vec{r} = (-i + j - k)$

$\vec{p} = q\vec{r}$

$= 4\times10^{-6}(-i + j - k)$

4μC

(1,0,4) x y z

$\vec{r}$

−4μC

(2, −1, 5) (x₂)

electric field 20i N/C

$\vec{P} = 4\times10^{-6}(-i + j - k)$

$\vec{\tau} = \vec{P} \times \vec{E}$

Torque

$\tau = \vec{P} \times \vec{E}$

$E = 20i$

1	2	3	4	5	6	7	8	9	10
C	D	B	D	B	B	B	D	D	A