Physics :-

States of matter

1) Solid
2) liquid
3) Gas
4) Plasma
5) Super critical fluid
6) Excitation
7) Degenerate matter
8) Photogenic matter
9) Quantum
10) Bos-Einstein condensate
11) Superconductivity
12) Fermionic condensate
13) Superfluid
14) supersolid
15) self induced spin liquid
16) Quantum spin liquid
17) string net liquid
18) Heavy fermion materials
19) Dropleton
20) Jahn-Teller Metal.
21) Rydberg Polarons
22) Time Crystals.

Reason:-

When a scale is rubbed against hair, static electricity is generated through it. This the scale gets charged and attracts the pieces of paper.

static electricity = stationary electric charge produced by friction

Reason:-

-> rubbing plastic rubber with wool cloth charges the rod negatively bits

Scanned with CamScanner

Physics

Universe consists of some great forces known as fundamental forces :-

- → Gravitational force
- → strong
- → electromagnetic
- → weak force.

Book (HRK vol. 2)

SP 25.2 :-

$q_1 = 1.35 \times 10^5 C$ $\quad$ $q_2 = 1.35 \times 10^5 C$

$r = 100 m$

$F = ?$

$$F = \frac{k q_1 q_2}{r^2} = 1.69 \times 10^{16} N$$

because both the charges are same that's why it will be ~~force~~. neutral but if both the charges are different both will repel and attract eachother.

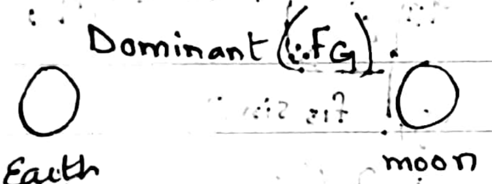
→ if neutral force will not be feel but exist.

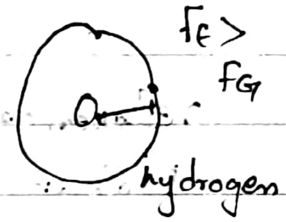
PER3/12.

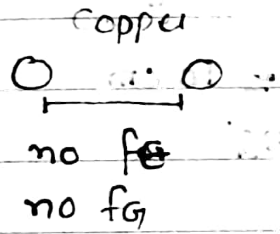
SP 25.8:- $F_E = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2} = 8.2 \times 10^{-8}\,N$

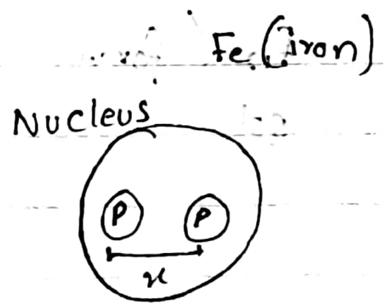
$F_G = \frac{G m_1 m_2}{r^2} = 3.67 \times 10^{-47}\,N$

here G.F is so small than Fe. ?? so the Dominant force will be Fe, F_G will not be feel but it exist.









SP 25.4:- proton = 26

$F_E = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2} \neq 14\,N$

e^-, p^+

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

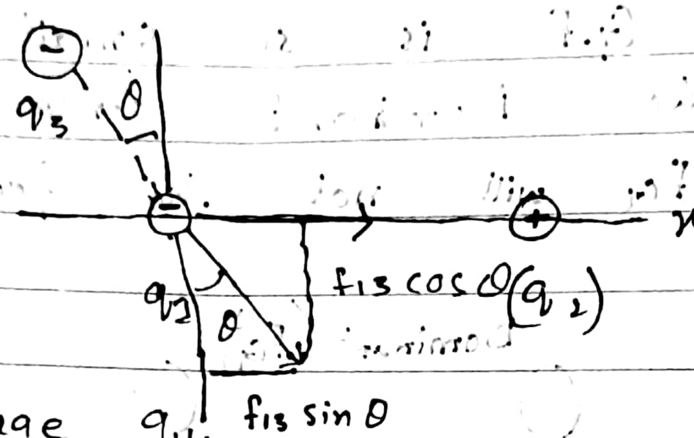
Conclusion:-

The force of repulsion b/w two proton is ~~too~~ Large but still nucleus ~~neucleus~~ is not exploding it is because of strong force. ($F_{SF} >>> F_e$)

so here the dominant force is strong force.

⇒ weak force :- exist in radioactivity.

SP.25.5



reference charge q_1.

Data:

$q_1 = -1.2\ \mu C$ $\qquad r_{12} = 15cm$

$q_2 = 3.7\ \mu C$ $\qquad r_{13} = 10\ cm$

$q_3 = -2.3\ \mu C$ $\qquad \theta = 32°$

f_{12} : (force on 1 by 2)

Sol

$$F_{13} = \frac{k q_1 q_3}{r_{13}^2} = 2.48\ N$$

$$F_{12} = \frac{k q_1 q_2}{r_{12}} = 1.77\ N$$

On x-axis :-

$F_{1x} = f_{12} + F_{13} \sin\theta$

$F_{1x} = 3.08N$

(f_{12} angle is zero)

RER3/2.

On y-axis:

$F_{1y} = 0 - f_{13}\cos\theta$ (b/c vector is downwards)

$F_{1y} = \underline{-2.10\ N}$

so,

$F_1 = 3.73\ N$ $\qquad F_1 = \sqrt{(F_{1x})^2 + (F_{1y})^2}$

Conclusion:- q_3 and q_2 are applying ~~forces~~ force of q_1 and the resultant of the forces applied on q_1 is 3.73 N

Lab:-

Resistor:- An electrical component stops or resist the flow of current.

1) brown base = Ceremic have two lege (silver)

~~Ctes~~ colors on resistor is called code and we have to decode it. To find out the how much ohms resistance does it offer.

Physics

field :- Area around which we can experience ~~something~~ force

gravity → only with objects with mass
photon in rest has no mass

Scalar
1) Temp
(d)epends $T(x,y,z)$

vector
1) velocity
$\vec{v}(x,y,z)$

field → static (in rest)
field → dynamic (movement)

system of water is static if there's no movement in it if a stone is throw into the water the system will become dynamic and after sometime it will again become static.

⇒ Electric field $(\vec{E}) = \frac{\vec{F}}{q_0}$, q_0 = test charge.

⇒ gravitational field ⇒ $\vec{g} = \frac{w}{m}$ where $w = mg$ ↓ force

or $\vec{g} = \frac{\vec{F}}{m}$

$\frac{|\varepsilon^P 3|}{}$

Test charge (q_0) = ideal charge it dosen't exist, it will be always positive. it's magnitude is always 1 test charge doesn't disturb any field.

→ Ideal charge

→ +ve

→ mag 1

→ field disturb

$$E = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q q_0}{r^2} \quad \frac{1}{q_0}$$

$$E = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q}{r^2}$$

[force mein 2 charges aingay]

by maxwells- ↓

⇒ when two charges attract ~~or~~ eachother it means that the field of both the charges are communicating

⇒ objects having mass generate the gravitational field b/c earth attracts it and earth also has the gravitational field.

PER3/12.

$\vec{E} = \frac{\vec{F}}{q_0}$ unit $\left[\frac{N}{C}\right]$ or $\left[\frac{V}{m}\right]$ $\frac{\text{volts}}{\text{meter}}$

SP 26.1

a)

$$F = 3.60 \times 10^{-8}\ N$$

$$E = \frac{F}{q} = \frac{F}{e} \quad \text{as, } q = -e$$

$\uparrow e$

$-$ charged

so, $E = -2.25 \times 10^{11}\ N/C$

b) charged object and alpha particle.

$q = \alpha = 2e \quad = -ve \ast -ve = +ve$

$q\ \alpha +$

$$E = \frac{F}{2e}$$

$-$

In part a the charged particle and electron will repel each other b/c of their same signs and in part b the charged particle and alpha particle will ~~repel~~ attract eachother b/c of their different signs ~~so the~~

b) → continue

$$F = qE$$

$$F = (2e)(\mp 2.25 \times 10^{11})$$

the same field will be used b/c the same charged particle is used in part b.

$$F = -7.20 \times 10^{-8}\ N$$

in part (a) F will be +ve b/c the direction in which charge is moving is upward.
in part (b) F will be -ve b/c the dir in which charge is moving is downward.

Practical

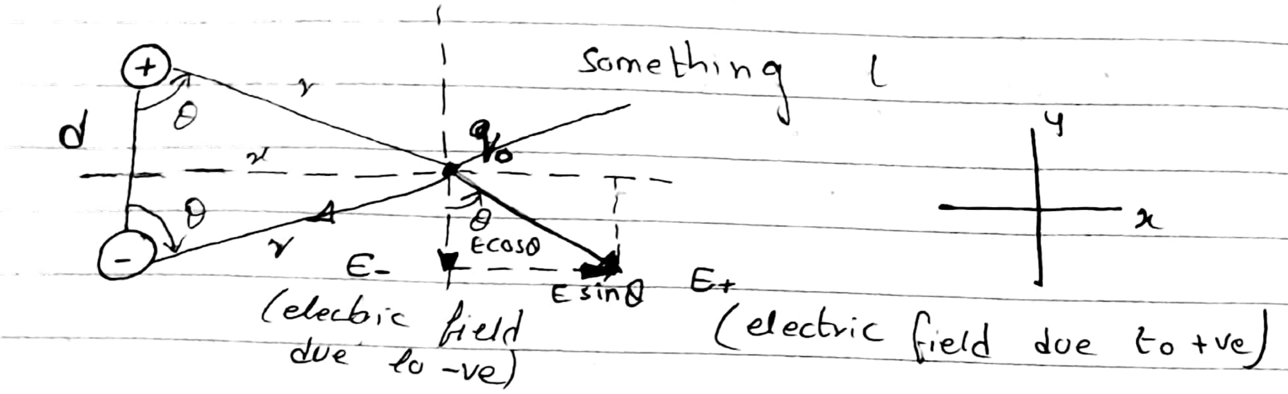
$R_1 = 18 \times 10^2$ $R_2 = 18 \times 10^2$ $R_3 = 18 \times 10^2$

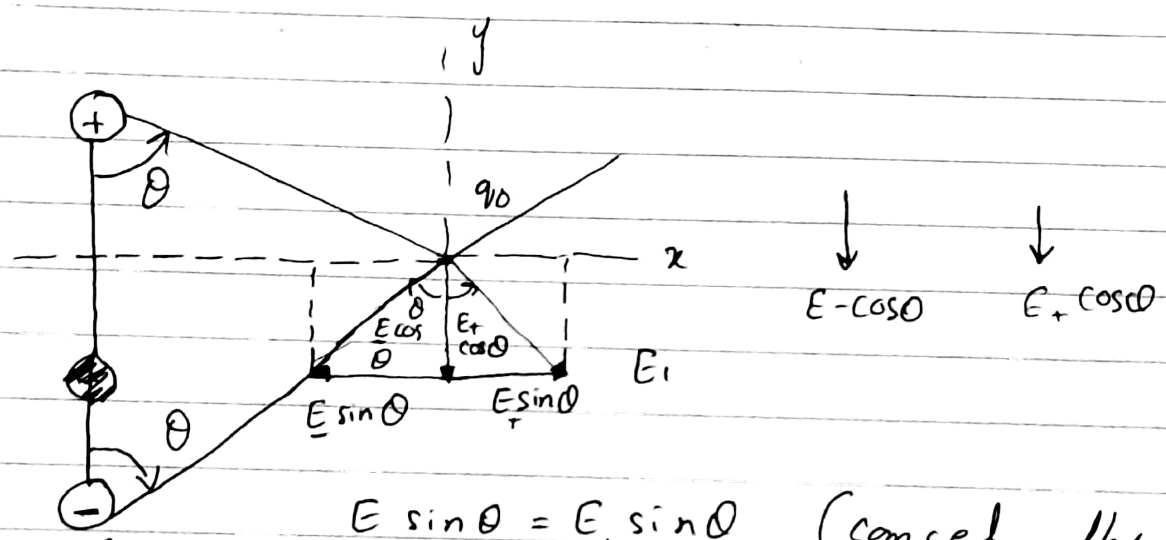
18×10^2

$R_1 R_2 R_3 / 2$.

Physics

Electric dipole:- ($P = qd$)





$E_-\sin\theta = E_+\sin\theta$ (cancel the effect of eachother.)

(equal in mag but opp in direction)

=> Something that is positive & negative & me introduce a test charge at perp bisector

PERB/2.

=> Dipole as test charge will more lies of $E\cos\theta$ (-ve E_q +ve) so the total electric field acting on it will be

$$E = E_+\cos\theta + E_-\cos\theta$$

as, $E_+ = E_- = E$

than

$$\boxed{E = 2E\cos\theta} \quad -(1)$$

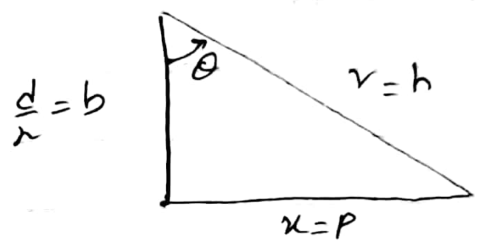
we know that

$$E = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2} = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{x^2+(d/2)^2} \quad -(2)$$

$\because h^2 = b^2 + p^2$

$r^2 = (d/2)^2 + x^2$

$r = \sqrt{\left(\frac{d}{2}\right)^2 + x^2}$



put value of eq (1) in eq (2)

$$(1) \Rightarrow E = 2\left(\frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{x^2+(d/2)^2}\right)\cos\theta \quad -(3)$$

$\because \cos\theta = \frac{b}{h} = \frac{d/2}{r}$

$$(3) \Rightarrow E = \cancel{2}\left(\frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{x^2+(d/2)^2}\right)\frac{d/\cancel{2}}{r}$$

$$E = \frac{1}{4\pi\varepsilon_0} \frac{q}{x^2+(d/2)^2} \cdot \frac{d}{\left(x^2+(d/2)^2\right)^{1/2}}$$

where, $r = \left[\left(\frac{d}{2}\right)^2 + x^2\right]^{1/2}$

as bases are same powers will add

$$E = \frac{1}{4\pi\varepsilon_0} \frac{P}{\left[x^2+\left(\frac{d}{2}\right)^2\right]^{3/2}} \quad \text{— (A)} \qquad \because P = q\,d$$

Conclusion:- This is the E-field due to a dipole, at a perpendicular bisector.

⇒ when a test charge is move far away from the dipole the distance b/w test charge will be shrink (decreases)

then, $x >>>$, and $\frac{d}{2}$ will approach to zero.

so,

$$E = \frac{1}{4\pi\varepsilon_0} \frac{p}{(x^2)^{3/\cancel{2}}}$$

RER3/12.

$$E = \frac{1}{4\pi\varepsilon_0}\frac{p}{x^3} \Rightarrow E \propto \frac{1}{x^3}$$

⇒ electric field varies inversely to the cube of the distance is called signature of E - dipole.

⇒ Electric field propeties :-

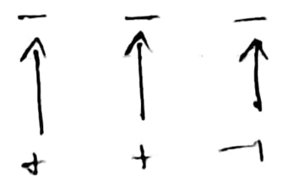
(1) •Uniform :- test chages ~~are~~ place in a region and if they moves in the same direction this means it is uniform electric field.

•non - uniform :- test charges are place in a region and if they moves in the different direction this means it is non - uniform E - field.

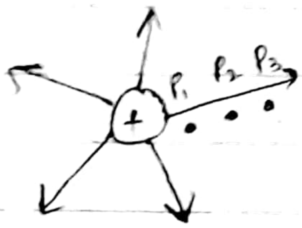
(2) Electric field lines starts from +ve and ends on -ve.

head of an arrow towards -ve

tail of an arrow towads +ve



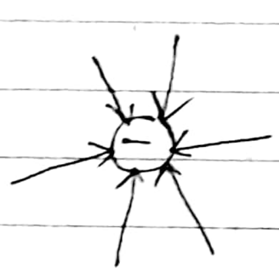
(3) Isolated positive Charge



radically outward

$P_1 > P_2 > P_3$

$E\uparrow$ $E\downarrow$ B/C ~~cors~~ crossection area of E-field



radically outward.

PER3/2.

Physics

Guass Law :-

Flux: to flow

Flux : ① something which is flowing
② Area

Flux = field . Area

$$\Phi = \vec{F} \cdot \Delta\vec{A}$$

$$\Phi = F\Delta A\cos\theta$$

Electric field:

$$\Phi_E = \vec{E} \cdot \Delta\vec{A}$$

Conditions:

① If flux is passing through a closed surface, $\phi = 0$

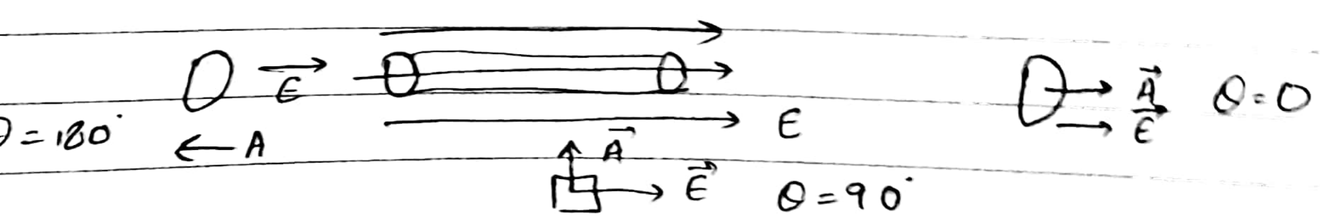
② If flux is passing through a open surface, $\phi \neq 0$

$\Rightarrow$ surface = two dimensional

Problems:-

27.2) hypothetical = imaginary

Φ_E = passing through the hyp cylinder



$\{\varepsilon^{83}\}_{1}$

$\phi_c = E\,\Delta A$

$\phi = \phi_a + \phi_b + \phi_c$ user (input)

$= E\Delta A\cos(0) + E\Delta A\cos(180$, rated by

$= E\Delta A + (-E\Delta A) + 0$

$\phi_c = 0$

through a closed surface (~~closed a uniform~~ field)

⇒ surface closed no matter field is uniform or not flux will be zero

⇒ Flux and field lines

imaginary surface.

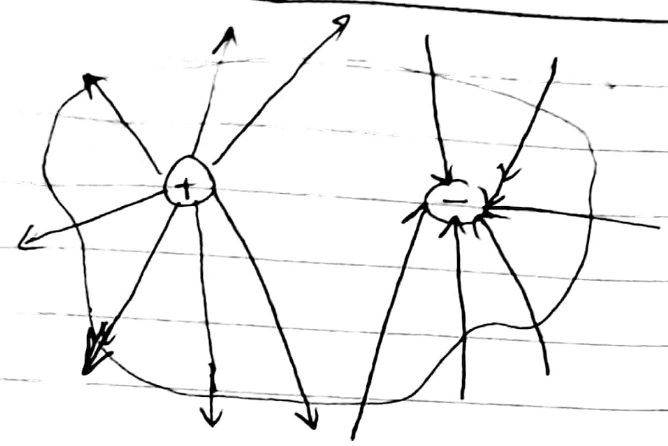
radically outward

radically inwards

→ +1 will be awarded if lines leave the surface

→ -1 " " " " " enter the surface.

(3)



0 Ans

Conclusion:

(1) +6 lines are leaving the surface.

=> we have a +ve charge inside the surface

(2) -ve Charge

(3) for third is gauss law.

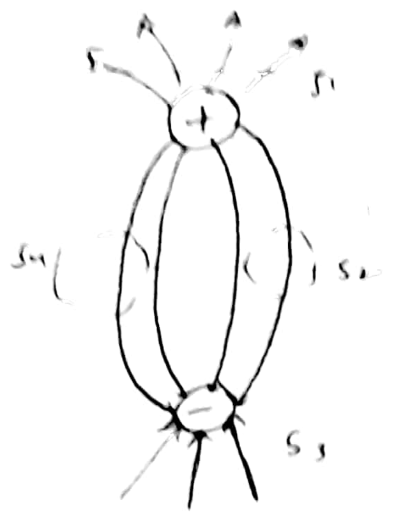
=> Guass' Law

$$\Phi_E = \frac{q_{enclosed}}{\varepsilon_0}$$

$$\oint \vec{E} \cdot \Delta\vec{A} = \frac{q_{en}}{\varepsilon_0}$$

Note: $\oint$ integration over a closed surface.

PER3/2.



user (input)

ated by

Q) which one is more fundamental Gauss law or Columbs law?)

1. Gauss law
2. why

Gauss law = Consider a sphere having charge q enclosed

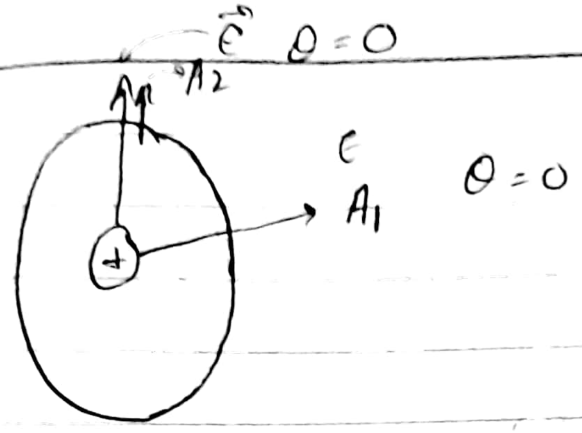
$$\oint E \cdot \Delta A = q/\varepsilon_0$$

$$E \oint \Delta A = q/\varepsilon_0$$

$$E(4\pi r^2) = q/\varepsilon_0$$

$$\boxed{E = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q}{r^2}}$$

Gauss law is more fundamental b/c we can derive Coulomb's law from Gauss law.



Subject :- ICS

- DBMS - SQL
- Infix to Postfix
- Evaluation of postfix

AI :- 1) knowledge base system
2) " engineering
3) Networks
4) Computer vision

LAB:- - Complete operation cycle of Crawler
- image analysis
- writing into binary files

⇒ FTP software or telnet

⇒ web server pr woh folder jis mein hum apni files store kartay hayn.

⇒ drive first folder is root.

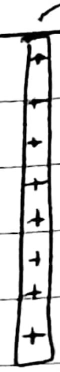
1/5/3/12

Physics

Guas's law:-

$$\oint \vec{E} \cdot \vec{dA} = \frac{q}{\varepsilon_0}$$

$\lambda = q/L$



Applications of Guas's law.

① Infinite line of charge

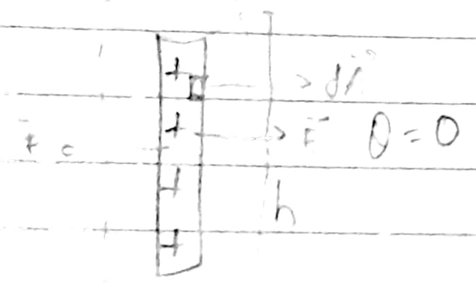
$E = ?$

charge distributed in linea

Suppose draw a guassian surface.

$\Rightarrow \lambda = \frac{q}{l}$

linear charge density



$\Rightarrow \sigma = \frac{q}{A}$

surface charge density

so, E and A are always ∥

A/C to Guass law

$\Rightarrow \rho = \frac{q}{V}$

volume charge density.

$$\oint E \cdot dA = \frac{q}{\varepsilon_0}$$

$$E \oint dA = \frac{q}{\varepsilon_0}$$

$$E (2\pi r h) = q/\varepsilon_0$$

$$E = \frac{q}{\varepsilon_0 2\pi r h}$$

PtR3/12.

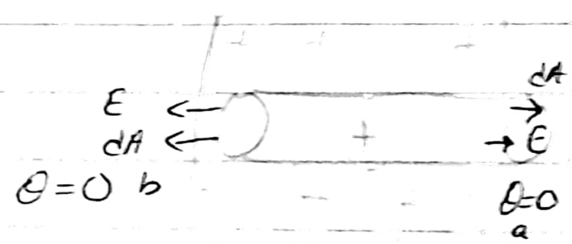
$$E = \frac{\lambda}{2\pi r \varepsilon_0}$$

Conclusion:- This is the formula for electric field due to the infinite linear charge.

(3) Infinit sheet of charge:-

A/C to Gauss

$$\oint E \cdot dA = \frac{q}{\varepsilon_0}$$



$$\oint_a E \cdot dA + \oint_b E \cdot dA = \frac{q}{\varepsilon_0}$$

$$E \oint dA + E \oint dA = \frac{q}{\varepsilon_0}$$

$$EA + EA = q/\varepsilon_0$$

$$2EA = q/\varepsilon_0$$

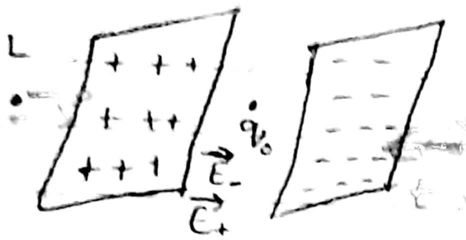
$$E = \frac{q}{2\varepsilon_0 A}$$

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

Conclusion:- this is the formula for the electricfield of 2 dimensional infinite sheet of charge.

[illegible]

Two sheets with different polarity:-



$\sigma_+ = \sigma_- = \sigma$

$E = E_+ + E_-$

$E = \frac{\sigma_+}{2\varepsilon_0} + \frac{\sigma_-}{2\varepsilon_0}$

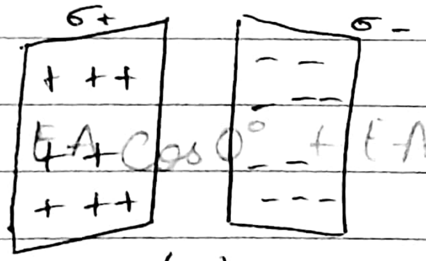
$E = \frac{\sigma}{\varepsilon_0}$

which one is greater.

1. $E = \frac{1}{2}\frac{\sigma}{\varepsilon_0}$
2. $E = \frac{\sigma}{\varepsilon_0}$ ✓

$\Rightarrow$ the larger the electric field the larger the force b/c of ~~&~~ $F = \frac{E}{q}$.

SP 27.3



$EA\cos 0° + EA\cos 180 + \frac{\sigma}{\varepsilon_0}$

$\sigma_+ = 6.8\ \mu C/m^2$

$\sigma_- = -4.3\ \mu C/m^2$

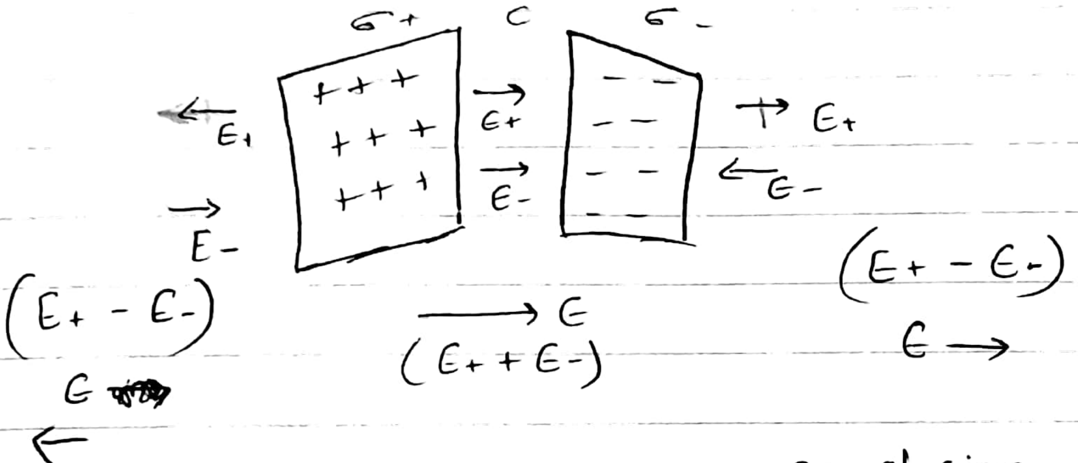
$E_c = ?$, $E_L = ?$; $E_R = ?$

PER3/12.

(E) +ve bari hoti hay

$$E_+ = \frac{\sigma_+}{2\varepsilon_0} = 3.84 \times 10^5\ N/C$$

$$E_- = \frac{\sigma_-}{2\varepsilon_0} = 2.43 \times 10^5\ N/C$$



$E_c = E_+ + E_- = 6.2 \times 10^5$

$E_R = E_+ - E_- = 1.4 \times 10^5$

$E_L = E_+ - E_- = 1.4 \times 10^5$

conclusion :- the E.f will be greater in centre

for same polarity E.f will be 0 at centre.

P.E = Energy varies from system to system.

$\Rightarrow (P.E)_g = mgh$

$\Rightarrow (P.E)_e = \frac{1}{2} k x^2$

(1) $K.E = \frac{1}{2} m v^2$

Electric Potential Energy and potential:-

Firstly,

$$F = G\frac{m_1 m_2}{r^2} \quad , \quad F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$$

similarity => inverse square law

disimilarity => mass and charge (force acted on)

product of ↑

$\Rightarrow \Delta K = W_{ab}$

$\Rightarrow \Delta U = -W_{ab}$

$$\Delta U = -\int_a^b F \cdot d\vec{r}$$

$$\Delta U = -\int_a^b \frac{G m_1 m_2}{r^2}\, d\vec{r}$$

$$= -G m_1 m_2 \int_a^b \frac{1}{r^2}\, d\vec{r}$$

$$= -G m_1 m_2 \left[-\frac{1}{r} \right]_a^b$$

$$= +G m_1 m_2 \left[+\frac{1}{r_b} - \frac{1}{r_a} \right]$$

PER3/2.

Physics

⇒ Potential Energy

$$\Delta U = -\int \vec{F} \cdot d\vec{s} \quad -① $$

⇒ For electrostatic

$$F = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2} \quad -②$$

put ② in ①

$q_1 \overset{r}{\text{———}} q_2$

$$\Rightarrow \Delta U = -\int_a^b \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2} dr$$

$$= -\frac{q_1 q_2}{4\pi\varepsilon_0} \int_a^b \frac{1}{r^2} dr$$

$$\Delta U = \frac{1}{4\pi\varepsilon_0} q_1 q_2 \left(\frac{1}{r_b} - \frac{1}{r_a} \right)$$

For change in P.E of electrostatic b/w two points A and B

there are certain cases where the change in P.E remain same, while there are few cases where there will be change in P.E.

Q) How much P.E do you have right now?
there are always two points in cal P.E reference and the Point at some height.
⇒ we have gravitational P.E

$$(P.E)_g = mgh$$
$$(60)(9.8)(20) \quad \text{PE}3\text{/}2.$$

⇒ P.E can be converted into K.E.

⇒ reference for cal Gravitational PE in sea level

⇒ P.E $\propto$ m

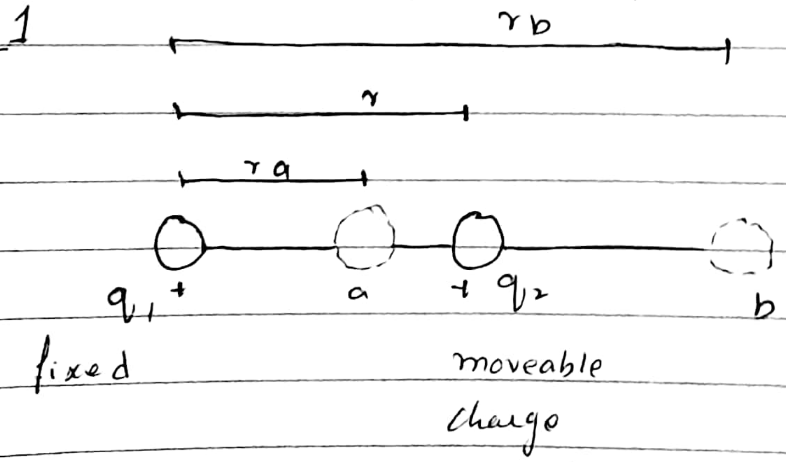
⇒ when you are storing P.E you are doing some work and that work is against the gravitational field.

⇒ when you are going towards the gravitational field you are loosing the P.E

Electric Potential Energy

similar charges along x-axis

Case 1



q2 was at position b

$b \rightarrow a$ $\Delta U > 0$ when we do +ve work done

$a \rightarrow b$ $\Delta U < 0$ when we do not apply much force to do work

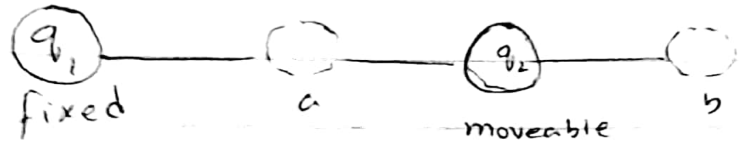
PER3/2.

workdone

for $b \to a$ reason against the electric field (storing P.C)

for $a \to b$ reason ~~is the~~ not going against the electric field

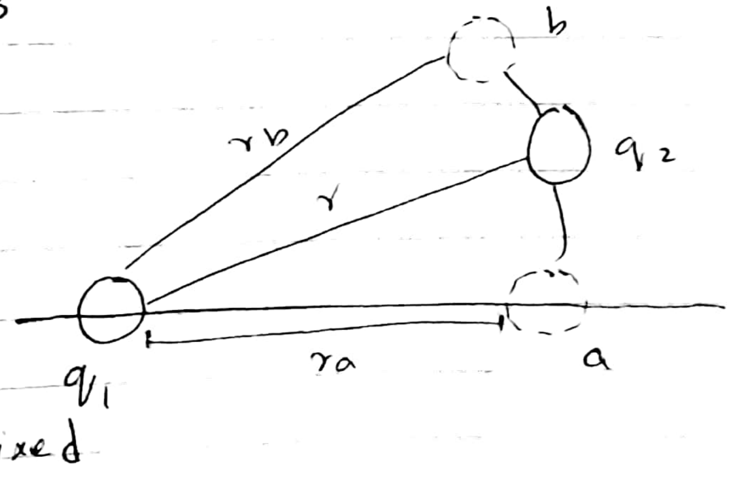
Case 2 opposite charges (along x-axis)



$b \to a$ $\Delta U < 0$ [b/c both are opposite charges and both will attract eachother.

$a \to b$ $\Delta U > 0$ [b/c when we move q_2 from a to b we need to do work done b/c of their disimilar properties

Case 3



even when you are moving charge from a to b.

there is no change in P.E b/c $r = r_a = r_b$ (the distance is same)

i.e $\Delta U = \frac{1}{4\pi\varepsilon_0} q_1 q_2 \left(\frac{1}{r_b} - \frac{1}{r_a} \right)$

$\Delta U = 0$, $U_b - U_a = 0 \Rightarrow \boxed{U_b = U_a}$

When we are moving along a radial line from a to b or b to a there will be no change

$\Rightarrow$ what happens to the K.E

if $\Delta U < 0$ then $\Delta K > 0$

b/c P.E = loss and K.E = gain

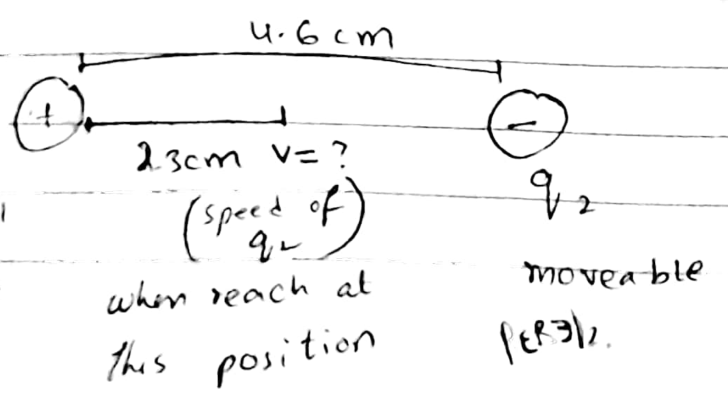
when we realse the charge all the P.E will be converted into K.E & vice versa

SP 28.2 Data

$m_1 = 0.0022\ kg$; $q_1 = 3\ \mu C$ $\times 10^{-6}$

$m_2 = 0.0039\ kg$; $q_2 = -18\ \mu C$ $\times 10^{-6}$

$x = 4.6\ cm = 4.6/100 = \underline{0.046}\ m$



$$\boxed{E = U + K}$$

Sol

Law of conservation of energy

Before (i) = After (f)

$k_i = 0$ b/c it is initially at rest

$$U_i + K_i = U_f + K_f$$
$$U_i + 0 = U_f + K_f$$
$$K_f = U_i - U_f$$
$$K_f = -\Delta U \qquad \because \Delta U = U_f - U_i$$
$$K_f = -\frac{1}{4\pi\varepsilon_0} q_1 q_2 \left(\frac{1}{r_f} - \frac{1}{r_i}\right)$$
$$K_f = -\frac{1}{4\pi\varepsilon_0} (\ )(\ )\left(\frac{1}{0.023} - \frac{1}{0.046}\right)$$
$$\boxed{K_f = 113\,J}$$
$$\frac{1}{2} m_2 v_f^2 = 113$$

b/c the charge is moving

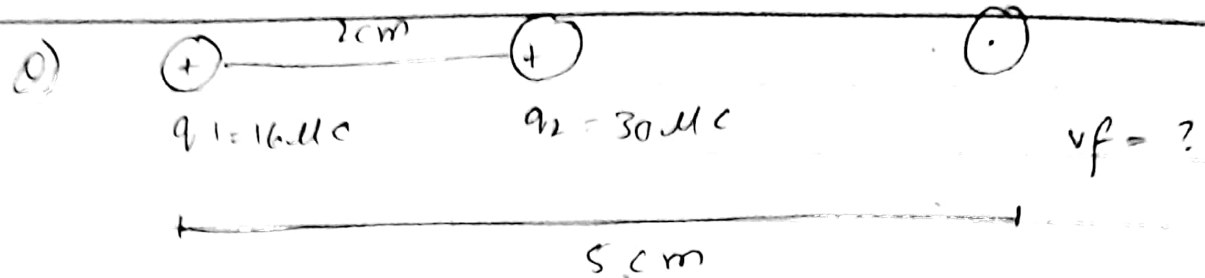
$$v_f = 240\ m/s$$

Conclusion: moving from point b → a q_2 ~~req~~ require the speed 240 m/s to move from the distance of 4.6 from q_1 to 2.3 from q_1

→ when moving the charge q_2 from b to a after releasing had a speed of 240 m/s. When charge q_2 at 4.6 cm will be realeased the charge will require 240 m/s speed to reach 2.3 cm

$(K_f = 113\,J)$

0)



$m_1 = 0.005 \text{ kg}$

$m_2 = 0.0034 \text{ kg}$

$U_i + K_i = U_f + K_f$

$U_i = U_f + K_f$

$K_f = U_i - U_f$

$K_f = -\Delta U$

$K_f = -\dfrac{1}{4\pi\varepsilon_0} q_1 q_2 \left(\dfrac{1}{0.05} - \dfrac{1}{0.02} \right)$

$K_f = 129.48 \text{ J}$

$\frac{1}{2} m_2 v_f^2 = 129.48$

$v_f = \sqrt{\dfrac{2(129.48)}{0.0034}}$

$v_f = 275.97 \text{ m/s}$

PEP 3/2