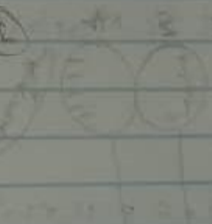
* Carryover student.

MARIA O.I MORPHY-?
18/ENG04/051
PHY 102
ASSIGNMENT

(a) 

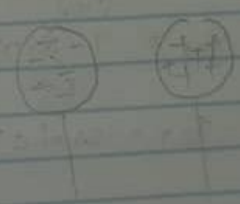
Two spheres A and B are placed together, both consists of equal amount of positive and negative charges

(b) 

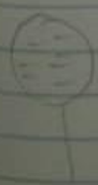
A positively charged glass rod is placed close to sphere A which attracts all the negative charges and pushes away the positive charges to sphere B.

(c) 

Now the glass rod is removed but the negative charges stay on sphere A and positive charges stay on sphere B.

(d) 

The spheres are now separated which then allows the charges to uniformly distribute themselves on the spheres.



And Now the negative sphere is produced by method of induction.

2. **Electric field:** This is a region around a charged particle or object within which a force would be exerted on other charged particles or objects.

Electric field intensity: is the measure of intensity or strength of electrical force per unit charge at any given point in the electric field. It is denoted by the letter E and its unit is Newton per coulomb (N/C).

3) Q_1 ——— $x_1 = 4m$ ——— P ——— $x_2 = 7m$ ——— Q_2

$Q_1 = +8nC = 8 \times 10^{-9} C$	$Q_2 = +12nC = 12 \times 10^{-9} C$
$x_1 = 4m$	$x_2 = 7m$
$E_1 = \frac{1}{4\pi\varepsilon_0} \, q/r^2$	$E_2 = \frac{1}{4\pi\varepsilon_0} \, q_2/r_2^2$
$E_1 = \frac{9 \times 10^9 \times 8 \times 10^{-9}}{(4)^2}$	$E_2 = \frac{9 \times 10^9 \times 12 \times 10^{-9}}{(7)^2}$
$E_1 = \frac{9 \times 8 \times 10^{9-9}}{16}$	$E_2 = \frac{9 \times 12 \times 10^{9-9}}{49}$
$E_1 = 4.5 NC^{-1}$	$E_2 = 2.2 NC^{-1}$

Net $E = E_1 + E_2$

$E = (4.5 + 2.2) NC^{-1}$

$E = 6.7 NC^{-1}$

ii) For 1-Axis

$x = x_2 - x_1 = 7 - 4 = 3m$

$Q = Q_2 - Q_1 = 12 - 8 = 4nC = 4 \times 10^{-9} C$

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

$= \frac{9 \times 10^9 \times 4 \times 10^{-9}}{(3)^2} = \frac{9 \times 4 \times 10^{9-9}}{9}$

$= 4 NC^{-1}$

Biot - Savart's law, states that:
The magnetic induction at a point due to the current I flowing through the small element dl is:
1. Directly proportional to the current (I).
2. Directly proportional to the length of the element (dl).
3. Directly proportional to the sine of angle θ between the direction of current and the line joining the element dl from point A.
4. Inversely proportional to the square of the distance (r) of point A from the element dl.

Magnetic field produced by a long straight wire carrying current.
Let a long straight wire carrying current I be given, as shown in fig 1.

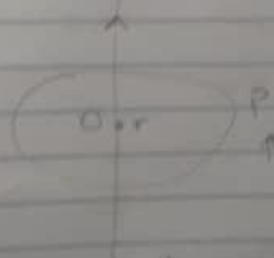


fig 1

To get an expression for the magnetic flux density $\vec{B}$ at the point P we draw a circle of radius r to get the Amperian surface.
Magnetic field is tangential to the circle and has the same magnitude at all points around the circle, hence for the integral,

$\oint \vec{B} \cdot d\vec{l} = \oint B \cdot dl = B \oint dl$

But $\oint dl$ equal circle of radius $r = 2\pi r$

$\therefore \oint B \cdot d\vec{l} = B \cdot 2\pi r$ — (i)

The Ampere's circuital law:

$\oint B \cdot d\vec{l} = \mu_0 I$ — (ii)

From equation (i) and (ii)

$B \cdot 2\pi r = \mu_0 I$ — (iii)

Divide throughout by $2\pi r$

$B = \dfrac{\mu_0 I}{2\pi r}$ //

Magnetic flux is a measurement of the total magnetic field which passes through a given area. It is useful tool for helping describe the effects of the magnetic force on something occupying a given area. SI unit is Wb (which weber).