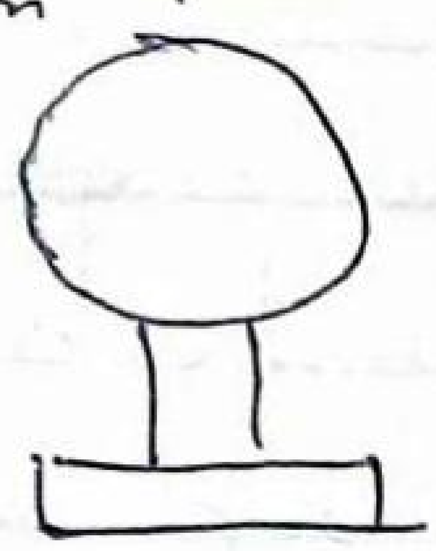
Okonkwo Elochukwu Emmanuel
18/MHS071037
Pharmacy
MHS

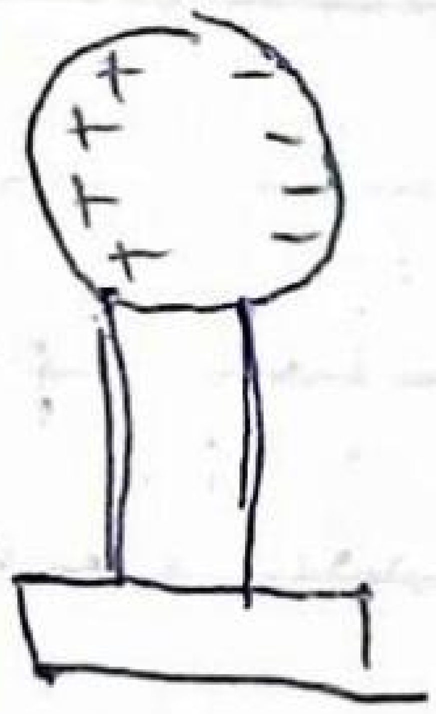
PHY102 assignment

Diagram 1



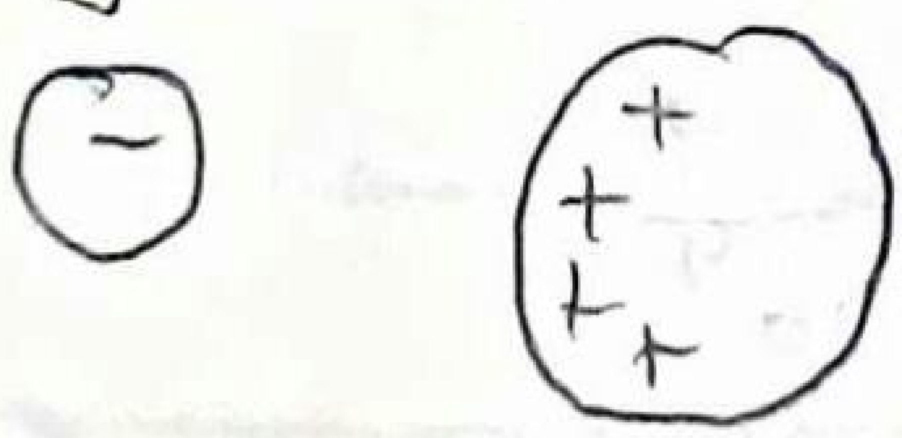
A metal sphere is ~~moutted~~ mounted on a st

Diagram 11



A - balloon index
e^- movement from
to the right side
balloon

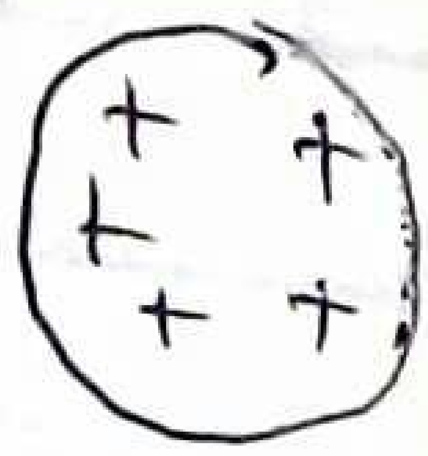
Diagram 111



When touched,
leaves the sp
the hand and
ground

The shape is now positively with the charge charge attracted to the balloon

Diagram V



The positive charge evenly distribute itself over the sphere.

b

$q_1 + q_2 = 5.0 \times 10^{-5} C$

$q_1 q_2 = \frac{Fr^2}{K} = \frac{1 \times 4}{9 \times 10^9}$

$q_1 q_2 = 4.4 \times 10^{10} C^2$

$q_1 q_2 = 5.0 \times 10^{-5} C - q_1$

$q_1 q_2 = 4.4 \times 10^{-10}$

$q_1 [(5.0 \times 10^{-5}) - q_1] = 4.4 \times 10^{-10}$

$5.0\times10^{-5} q_1 - q_1^2 = 4.4\times10^{-10}$

$q_1^2 - 5.0\times10^{-5} + 4.4\times10^{-10} = 0$

$= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-(-5.0\times10^{-5}) \pm \sqrt{(5.0\times10^{-5})^2 - (1)(4.4\times10^{-10})}}{2}$

$= \frac{(5.0\times10^{-5}) \pm 2.72\times10^{-5}}{2}$

$\Rightarrow q_1 = 3.86\times10^{-5} C$

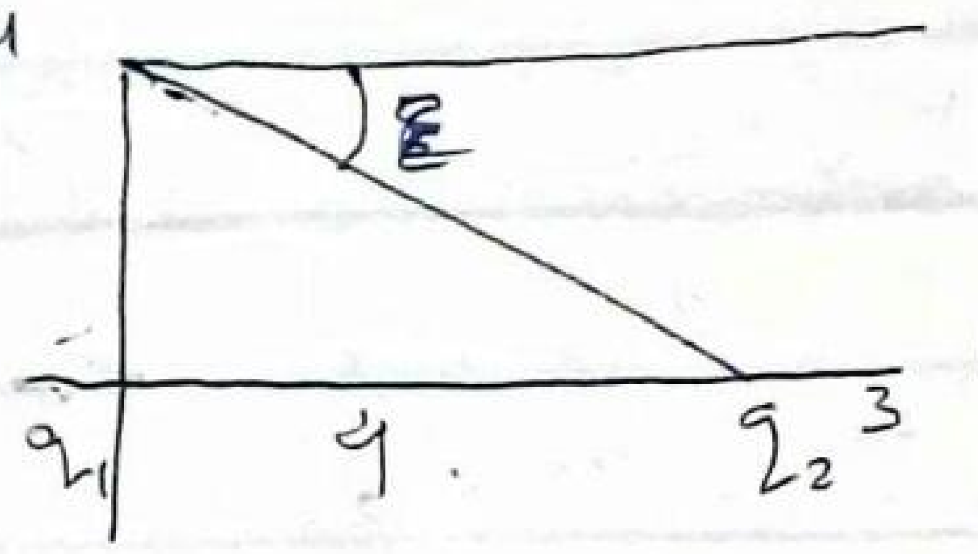
$q_2 = 1.14\times10^{-5} C$

1a ~~Diagram~~ 1

1C

2a Electric field is a region or spher where electric charge will experience an electric force

b



$$E_1 = \frac{9\times10^{7} \times (8\times10^{-14})}{7^2} = 1.5\,N/C$$

$$E_2 = \frac{9\times10^{9} \times (12\times10^{-4})}{3^2} = 12\,N/C$$

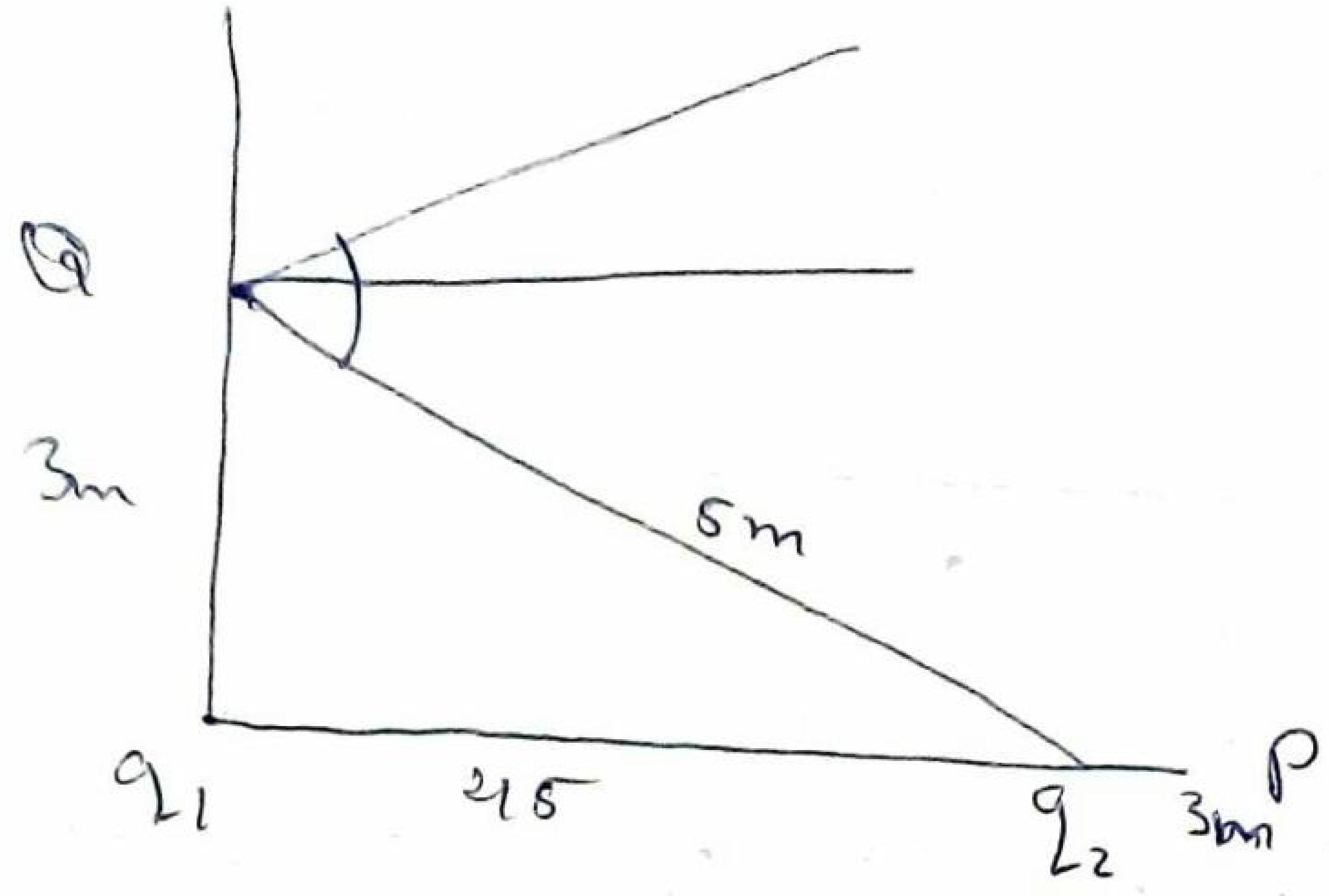
$$E = 12 + 1.5 = 13.5\,N/C$$

θ	$x \cos\theta$	$y \cos\theta$
90	0	+8
36.87	-3.046	2.59
	-3.46	10.59

$$qE = \frac{9\times10^{9} \times 8\times10^{-7}}{3^2} = 8N$$

$$E_{ne} = \sqrt{(-3.246)^2 + (10.59)^2}$$
$$= 11.14\,N/C$$

2b



4a Magnetic flux through a surface is the surface integral of the normal component of the magnetic field flux density B passing through that surface.

4b $m = 9.11 \times 10^{-31}$ kg

$r = 1.4 \times 10^{-7}$ m

$B = 3.5 \times 10^{-1}$ T

$F_B = qvB \sin\theta$

where $\theta = 90°$

$F_B = qVB$

$F_B = qVB = \frac{mv^2}{r}$

Since the proton moves in a circulation orbital therefore equation (3) become $m_p v = qBr$

$v = \frac{qBr}{m_p}$

$$V = \frac{1.60 \times 10^{-9} \times 3.5 \times 10^{-1} \times 1.4 \times 10^{-7}}{9.11 \times 10^{-31}}$$

$$V = \frac{7.84 \times 10^{-27}}{9.11 \times 10^{-3}}$$

$$V = 8.6 \times 10^{3} m/s$$

Hence the angular speed ~~or cycle~~

$$= \frac{qB}{mp} = \frac{1.6 \times 10^{-19} C (3.3 \times 10^{-1})}{9.11 \times 10^{-31}}$$

$$= \frac{5.6 \times 10^{-20}}{9.11 \times 10^{-31}}$$

$$= 6.147 \times 10^{10} rad/s$$

4c The angular speed is often referred to as the cyclotron frequency because charge particles circul at this angular particle ~~ercut~~ speed in this ty of acceleration is called cyclotoom.

5 Biot - Savart law states that the magnetic intensity dH at a point A due to current I flowing through a small element dl ~~or~~

i. Directly proportional to current (I)

ii. Directly proportional to the length of the element (dl).

iii. Directly proportional to the sine of angle θ between the direction of current and the line ~~joints~~ joining the element dl from point A.

iv. Inversely proportional to the square of the distance (x) of point A from the element dl.

$$dH = \frac{\mu_0 \mu_r}{4\pi} \times I dl \sin\theta / x^2$$

$$dH = k \times I dl \sin\theta / x^2$$

$$dH \propto I dl \sin\theta / x^2$$

where k is constant and depends on the magnetic properties of the medium

$$k = \frac{\mu_0 \mu_r}{4\pi}$$

μ_0 = absolute permeability of air or vacuum and its value is 4×10^{-7} Wb/A

μ_r = relative permeability of the medium

3b $B = \frac{\mu_0 I}{4\pi} \int_{-a}^{a} dl \frac{x}{(x^2+y^2)^{3/2}}$

Recall $dl = dy$

$$B = \frac{\mu_0 I}{4\pi} \int_{-a}^{a} \frac{x}{(x^2+y^2)^{3/2}} dy$$

$$B = \frac{\mu_0 I x}{4\pi} \int_{-a}^{a} \frac{1}{(x^2+y^2)^{3/2}} dy \quad \text{---} (iii)$$

Using special Integrals

$$\int \frac{dy}{(x^2+y^2)^{3/2}} = \frac{1}{x^2} \frac{y}{(x^2+y^2)^{1/2}}$$

Equation (iii) therefore become

$$B = \frac{\mu_0 I x}{4\pi} \left(\frac{2a}{x^2(x^2+y^2)^{1/2}} \right)$$

$$B = \frac{\mu_0 I}{4\pi x} \left(\frac{2a}{(x^2+a^2)^{1/2}} \right)$$

When the length $2a$ of the conductor is very great in comparison to its distance x from point P we consider it infinitely long. That is when a pro large than c

$(x^2+a^2)^{1/2} \approx a$, as $a \to \infty$

$$B = \frac{\mu_0 I}{2\pi x}$$

In a physical situations hence axial symmetry about the y-axis - This at all point in a circle of radius around the cond the magnitude of B is

$$B = \frac{\mu_0 I}{2\pi r}$$

The equation defines the magnitude of the magnitude field of flux density B is a long distance straight current carrying conductor.