(ii) From Halogen ... AaD ... warm

Name :- Agbo Helen Cecilia
Matric no :- 19/MHS02/007
Dept :- Nursing
College :- MHS
PHY. 102
Qestions 4, 3, 5, 1
Solutions

(4) Magnetic flux is defined as the strength of a magnetic field represented by lines of force.

(4B) $r = \frac{mV}{qB}$

$14.0 = \frac{9.11 \times 10^{-31} \times V}{1.6 \times 10^{-19} \times 0.35}$

$V = \frac{14.0 \times 1.6 \times 10^{-19} \times 0.35}{9.11 \times 10^{-31}}$

$V = 8.60 \times 10^{4}$ m/s

Angular Velocity $W = \frac{qB}{m}$

$= \frac{1.6 \times 10^{-19} \times 0.35}{9.11 \times 10^{-31}}$

$W = 6.15 \times 10^{10}$ rad //

(a) (i) Volume charge density

$$\rho = \frac{dQ}{dV} \longrightarrow dQ = \rho dV$$

(ii) Surface charge density

$$\sigma = \frac{dQ}{dA} \longrightarrow dQ = \sigma dA$$

(iii) Linear charge density

$$\lambda = \frac{dQ}{dL} \longrightarrow dQ = \lambda dL$$

(b) ELECTRIC POTENTIAL DIFFERENCE

The electric Potential difference between two points in an electric field can be defined as the workdone per unit charge against electrical force when a charge is transported from one point to the other. It is measured in volt (V) or Joules per coulomb (J/C).

Equation is given as

$$V_B - V_A = \frac{W(A \rightarrow B)_{Ag}}{q_0}$$

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$V = 8.60 \times 10^{11} m/s$

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$$V_B - V_A = -\int_A^B E\,dL$$

ⓒ $V_P = K\left[\frac{Q_1}{r_1} + \frac{Q_2}{r_2}\right]$

$$0 = 9\times10^9\left[\frac{10\times10^{-6}}{4+x} + \frac{(-2\times10^{-6})}{x}\right]$$

$$0 = \frac{10\times10^{-6}}{4+x} - \frac{2\times10^{-6}}{x}$$

$$\frac{2\times10^{-6}}{x} = \frac{10\times10^{-6}}{4+x}$$

$$(4+x)(2\times10^{-6}) = 10\times10^{-6}x$$

$$8\times10^{-6} + 2\times10^{-6}x = 10\times10^{-6}x$$

$$8\times10^{-6} = 10\times10^{-6}x - 2\times10^{-6}x$$

$$\frac{8\times10^{-6}}{8\times10^{-6}} = \frac{\cancel{8\times10^{-6}}x}{\cancel{8\times10^{-6}}}$$

$$1 = x$$

$$\therefore x = 1$$

Thereforce the Position among the x-axis where $V = 0$ is 5 from $1 + 4 = 5$

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(i) The Biot–Savart law is an equation that describes the magnetic field created by a current-carrying wire, and allows you to calculate its strength at various point

(ii) $$B = \frac{\mu_0 I}{4\pi} \int_{-a}^{a} \frac{dl \sin\phi}{r^2}$$

$\sin(\pi - \phi) = \sin\theta$

$$\therefore B = \frac{\mu_0 I}{4\pi} \int_{-a}^{a} \frac{dl \sin(\pi - \phi)}{r^2}$$

Using diagram, $r^2 = x^2 + y^2$ [Pythagoras theorem]

$$B = \frac{\mu_0 I}{4\pi} \int_{-a}^{a} \frac{dl \sin(\pi - \phi)}{x^2 + y^2} \quad \ldots (*)$$

But $\sin(\pi - \phi) = \frac{x}{\sqrt{x^2 + y^2}} = \frac{x}{(x^2+y^2)^{1/2}} \quad (**)$

Substituting $(**)$ into $(*)$, we have

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

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

(iii) from Haloalkanes and dry

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Recall $dl = dy$

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

$$B = \frac{\mu_0 I x}{4\pi}\int_{-a}^{a} \frac{1}{[x^2+y^2]^{3/2}}\,dy \quad \ldots (***)$$

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 (* * *) therefore becomes

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

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

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

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 is much larger than x,

$$[x^2+a^2]^{1/2} \cong a, \text{ as } a \to \infty$$

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

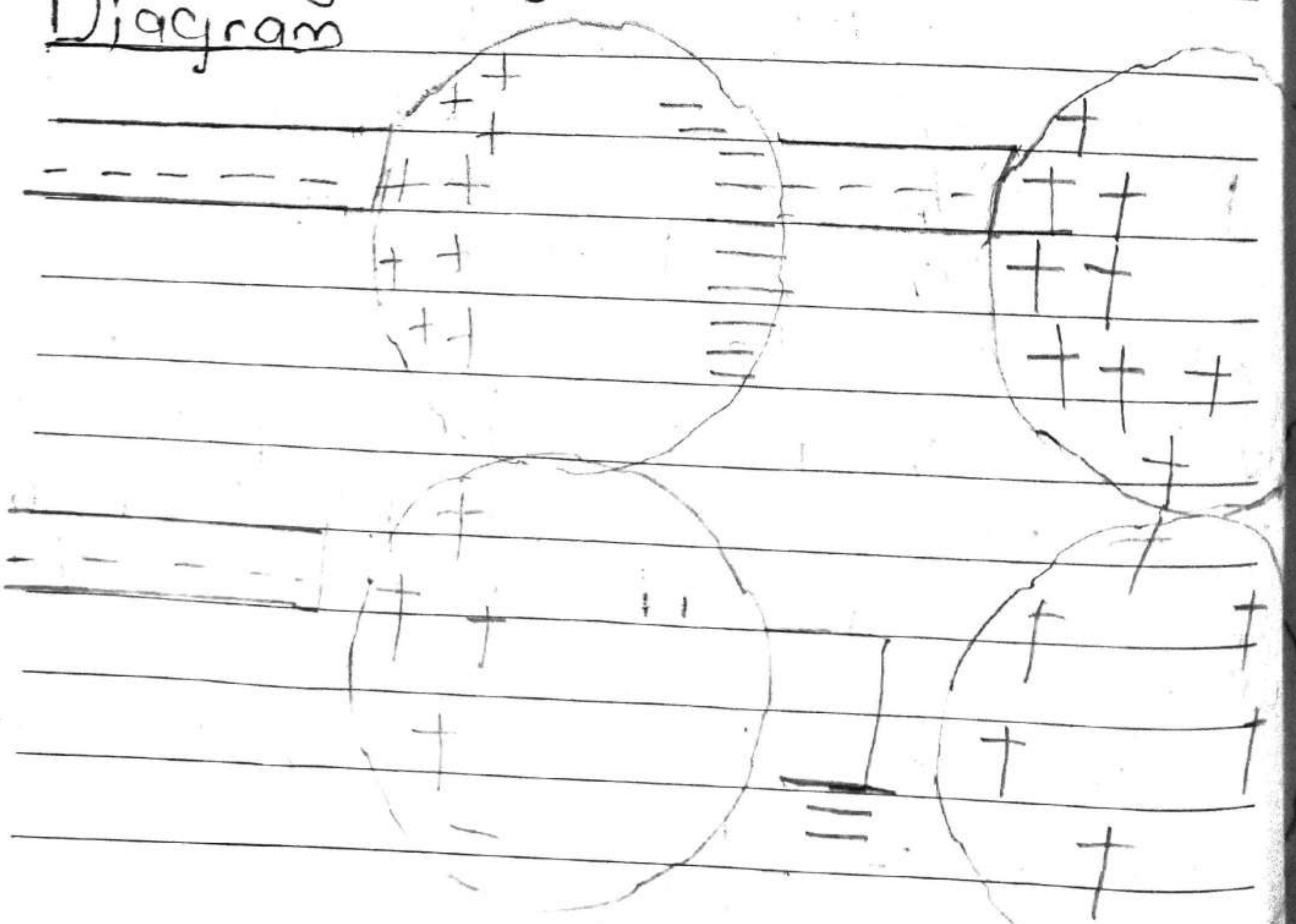
In a Physical Situation, we have
1 Symmetry about the y-axis. Thu
at all points in a Circle of radi
r, around the Conductor, the mag
nitude of B is

$$B = \frac{\mu_0 I}{2\pi r} \ldots\ldots [\#]$$

(ii

1

9) Charge by induction
Diagram



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(b) $k = 9 \times 10^9$

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

$F = 1N$

$d = 2m$

Given $q_1 + q_2 = 5 \times 10^{-5} C$ —— (i)

Using $F = \frac{kq_1 q_2}{r^2}$ we get

$q_1 q_2 = \frac{Fr^2}{K} = 1.0 \times \frac{[2.0]^2}{9 \times 10^9}$

$q_1 q_2 = \left[\frac{4}{9}\right] \times 10^{-9}$

So $[q_1 - q_2]^2 = [q_1 + q_2]^2 - 4q_1 q_2$

$= [5 \times 10^{-5}] - 4q_1 q_2$

$= 25 \times 10^{-10} - 4\left[\frac{4}{9}\right] \times 10^{-9}$

$= 25 \times 10^{-10} - \left[\frac{16}{9}\right] \times 10^{-9}$

$= 2.5 \times 10^{-9} - 1.78 \times 10^{-9}$

$[2.5 - 1.78] \times 10^{-9}$

$= 0.75 \times 10^{-9}$

$= 7.2 \times 10^{-10}$

So $[q_1 - q_2]^2 = 7.2 \times 10^{-10}$

$[q_1 - q_2] = \sqrt{7.2 \times 10^{-10}}$

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$= 2.68 \times 10^{-5}$ ——— (2)

Solve (1) and (2)

$q_1 + q_2 = 5.0 \times 10^{-5}$ — (1)

$q_1 - q_2 = 2.68 \times 10^{-5}$ — (2)

add equ. (1) and (2)

$q_1 + q_2 + q_1 - q_2 = 2q_1$

$2q_1 = 7.68 \times 10^{-5}$

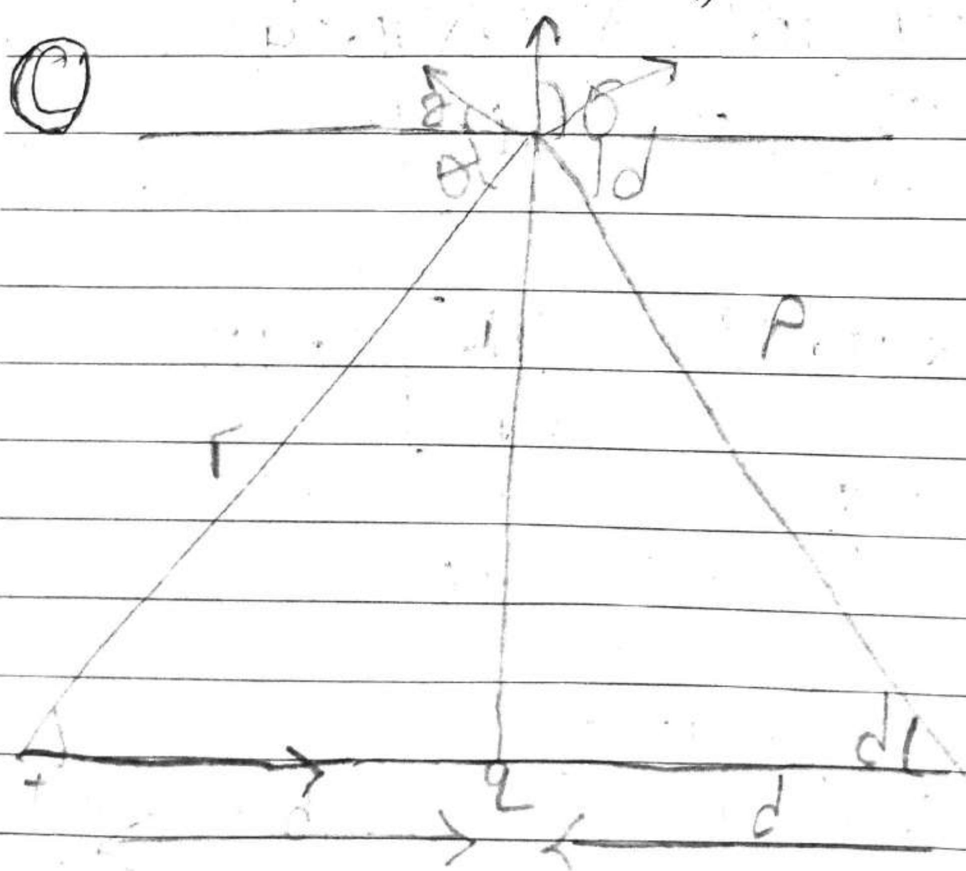
$q_1 = 3.84 \times 10^{-5}$

Put $q_1 = 3.84 \times 10^{-5}$

$q_2 = 5.0 \times 10^{-5} - 3.84 \times 10^{-5}$

$= 1.16 \times 10^{-5}$ //

(C)



Ethoxyethane

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$r^2 = 1^2 + [0.5]^2$

$r^2 = 1^2 + 0.25$

$r^2 = 1.25$

$r = 1.12m$

But

$F = \frac{Kq_1}{r} = \frac{9\times10^9 \times 8\times10^{-6}}{1.25}$

$= 57600$

$F_2 = \frac{9\times10^9 \times 8\times10^{-6}}{1.25}$

$= 57600$

$F_q = \frac{9\times10^9 \times q}{1}$

$F_q = 9\times10^{-9}q$

Vector	Angle	x-axis	y-axis
57600	63.43°	-25763.95	51516.78
57600	63.43°	+25763.95	51516.78
$9\times10^{-9}q$	90°	0°	$+9\times10^{-9}q$
		0	103033.56

$ER^2 = 0^2 + [103033.56 + 9\times10^9 q]^2$

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$$ER^2 = [103033.56 + 9\times10^9 q]^2$$

$$ER = 103033.56 + 9\times10^9 q$$

$$0 = 103033.56 + 9\times10^9 q$$

$$-9\times10^9 q = 103033.56$$

$$q = \frac{103033.56}{9\times10^9}$$

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

$$q = -11\times10^{-6} C = -11\mu C$$