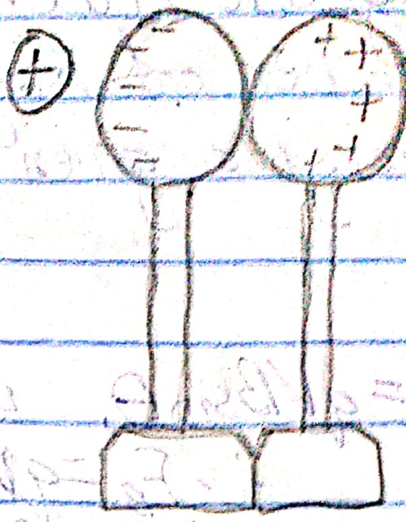
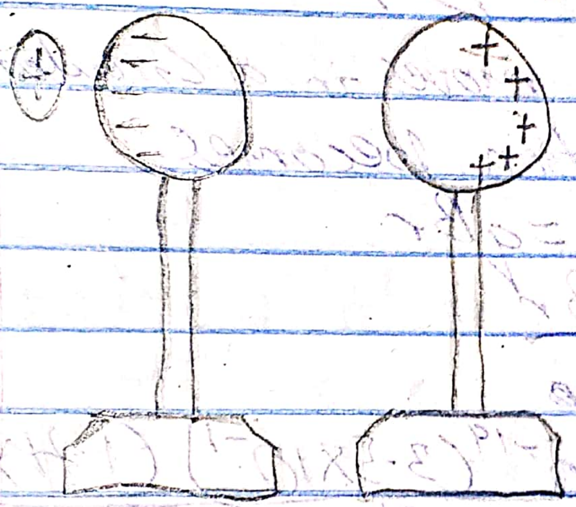
Name: Asita Asueiyandboniso
Matric Number: 19/SCI01/024
Date: 29/04/2020

1a

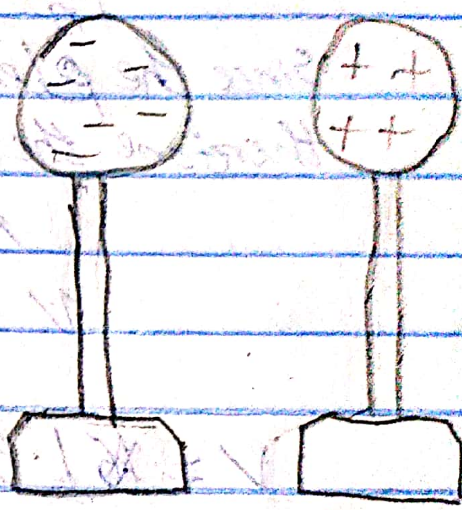
1.1



1.2



1.3



1.4

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4a Magnetic Flux: It is defined as the number of magnetic field lines passing through a given closed surface.

4b $F_B = qVB\sin\theta$, where $\theta = 90^\circ$

$\therefore F_B = qVB$

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

Since the electron moves in a circular orbit, therefore the equation becomes

$m_p v = qBr$

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

$v = \frac{1.60 \times 10^{-19} (3.5 \times 10^{-1})(1.4 \times 10^{-7})}{9.11 \times 10^{-31}}$

~~Hence, the a. V =~~

Hence, the angular speed is

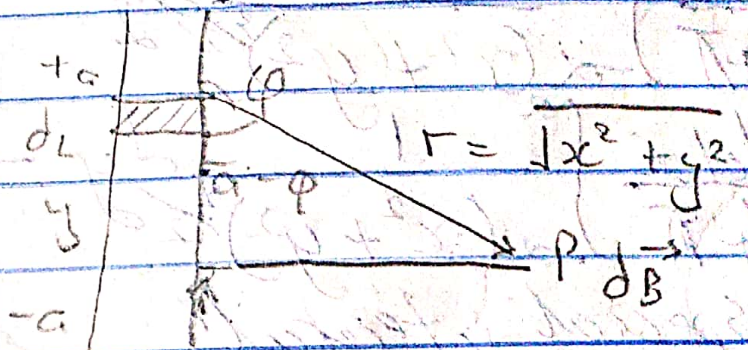
$\cancel{\omega = \frac{e}{mB}}$ $\omega = \frac{qB}{m_p}$

$\therefore \omega = \frac{1.60 \times 10^{-19} (0.35)}{9.11 \times 10^{-31}}$

$\omega = 6.15 \times 10^{10}$ rad/s

5a 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 points.

5b



$$\vec{B} = \frac{\mu_0 I}{4\pi}\int_{-\alpha}^{\alpha}\frac{dl\sin\varphi}{r^2}$$

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

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

From diagram, $r^2 = x^2+y^2$ (pythagoras)

$$B = \frac{\mu_0 I}{4\pi}\int_{-\alpha}^{\alpha}\frac{dl\sin(\pi-\varphi)}{x^2+y^2} \quad \text{—— (i)}$$

But $\sin(\pi-\varphi) = \frac{x}{\sqrt{x^2+y^2}} = \frac{x}{(x^2+y^2)^{\frac{1}{2}}}$ —— (ii)

Substituting (ii) into (i) we have