Vector	Degree	x Component	y Component
$E_1 = 8N/C$	90°	$8\cos 90 = 0$	$8\sin 90 = 8$
$E_2 = 4.32N/C$	36.9	$-4.32\cos 36.9 = 3.45$	$4.32\sin 36.9 = 2.59$
		$\Sigma f_x = -3.45$	$\Sigma f_y = 10.59$

End. $O = \sqrt{(-3.45)^2 + (10.59)^2}$

$= 11.14 NC^{-1}$

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COURSE TITLE: ELECTRICITY, MAGNETISM AND MODERN PHYSICS, COURSE CODE: PHY 102
ASSIGNMENT TITLE: COVID-19 HOLIDAY ASSIGNMENT

Questions

1a. charging by reduction:

Electric charges can be obtained on an object without touch light, by a process called electrostatic induction.

Consider a positively charged rubber rod brought near a neutral conducting sphere that is insulated so that there is no conducting path to ground as shown below the repulsive ~~force~~ between the protons on the end and those in the sphere causes a ~~ref tri~~ redistribution of charges on the sphere so that some protons move to the side of the sphere so that some protons move to the side of the sphere for that from the rod. The region of the sphere nearest to the positively charged rod had excess of negative charge because of the migration of proton away from the location

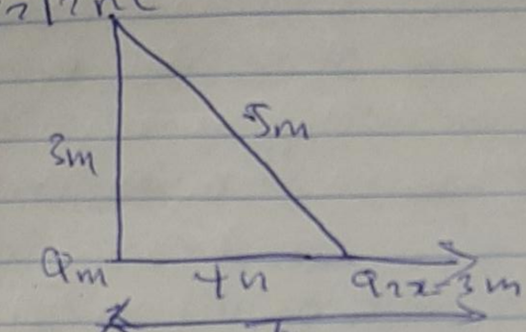
$q = -1.152 \times 10^{-5}C$

$q = -124C$

2a An electric field is a region of space in which an electric charge will experience an electric force. While electric field intensity can be defined as the force per unit charge. Electric field intensity can be expressed mathematically as $E = \frac{F(N)}{q(C)}$

b $Q_1 = 8nC$

$Q_2 = 12nC$



5a) Biot-savart law states that the magnetic field, directly proportional to the product permeability of free space (μ) the current (N), the charge in length, the radius are inversely proportional to the square of radius (r^2), mathematically. It is expressed as

$$\vec{dB} = \frac{\mu_0}{4\pi}\frac{I\vec{dl}\times\hat{r}}{r^2}$$

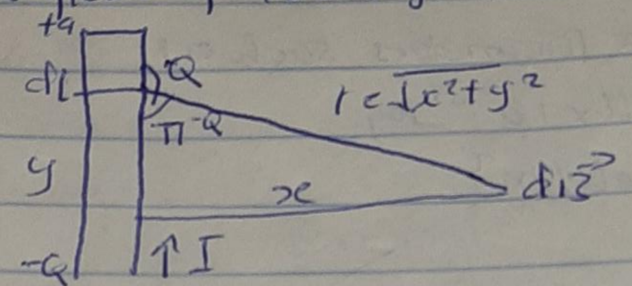
μ is a constant called permeability of free space

$\mu = 4\pi \times 10^{-2}\ T.m/A$

unit for ϕ is weber/metre square

5b

5b Magnetic field of a straight current carrying conductor



Applying the Biot savart law, we find the magnitude of the field $d\vec{B}$

$$B = \frac{\mu_0 I}{4\pi}\int_{-a}^{a}\frac{dl\sin\theta}{r^2}$$

SECTION B

4a. Magnetic flux is defined as the strength of magnetic field represented by line of force. It is usually represented by the symbol ϕ

b) $m = 9.11 \times 10^{-31}$ kg, $r = 1.4 \times 10^{-2}$ m, $B = 3.5 \times 10^{-1}$ weber/m², $\theta = 90^{\circ}$, $w = ?$

$q = -1.6 \times 10^{-19}$ C.

$w = \frac{qB}{mc}$

$w = \frac{-1.6 \times 10^{-19} \times 3.5 \times 10^{-1}}{9.11 \times 10^{-31}}$

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

c) In the question we were given some parameters such as

(i) Mean of the electron $= 9.11 \times 10^{-31}$ kg

(ii) Magnetic field of 3.5×10^{-1} web/m²

(iii) A radius of 1.4×10^{-2} m

... were asked to find the cyclotron frequency which

Recall $dl = dy$

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

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

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,

$5 \times 2 = 10$
$2 + 5 =$ 8.5

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

$q_1 = 5.0 \times 10^{-5} - q_2$ — ②

Put eqn ② in (1)

$q_2 (5.0 \times 10^{-5} - q_2) = 4.45 \times 10^{-10}$

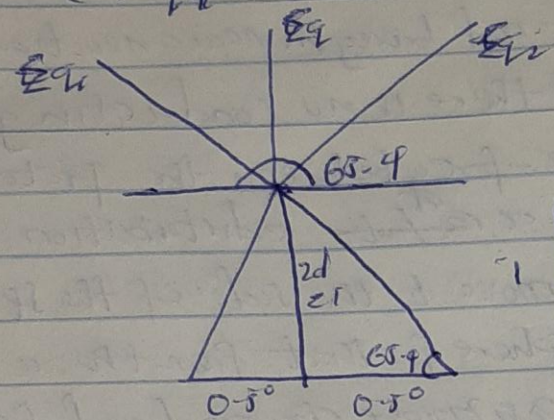
$5.0 \times 10^{-5} q_2 - q_2^2 = 4.45 \times 10^{-10}$

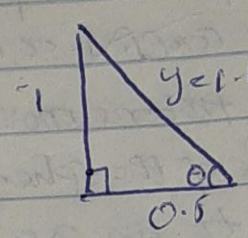
$-q_2^2 + 5.0 \times 10^{-5} q_2 - 4.45 \times 10^{-10}$

$q_2 = 3.85 \times 10^{-5}$ or $q_1 = 1.155 \times 10^{-5} C$

$\therefore q_1 = 3.85 \times 10^{-5}$, $q_2 = 1.155 \times 10^{-5} C$

C.





hyp = $\sqrt{1^2 + 0.5^2}$

hyp = $\sqrt{1.25}$

hyp = 1.1

$\tan\theta = 1/0.5$

$\tan\theta = 2$

$\theta = \tan^{-1} 2$

$E_p = E_{q1} + E_{q2} + E_q$

$E_{q1} = kq_1 = -9 \times 10^9 \times 8 \times 10^{-6} = 5.950\,44 \,\text{C}^{-1}$