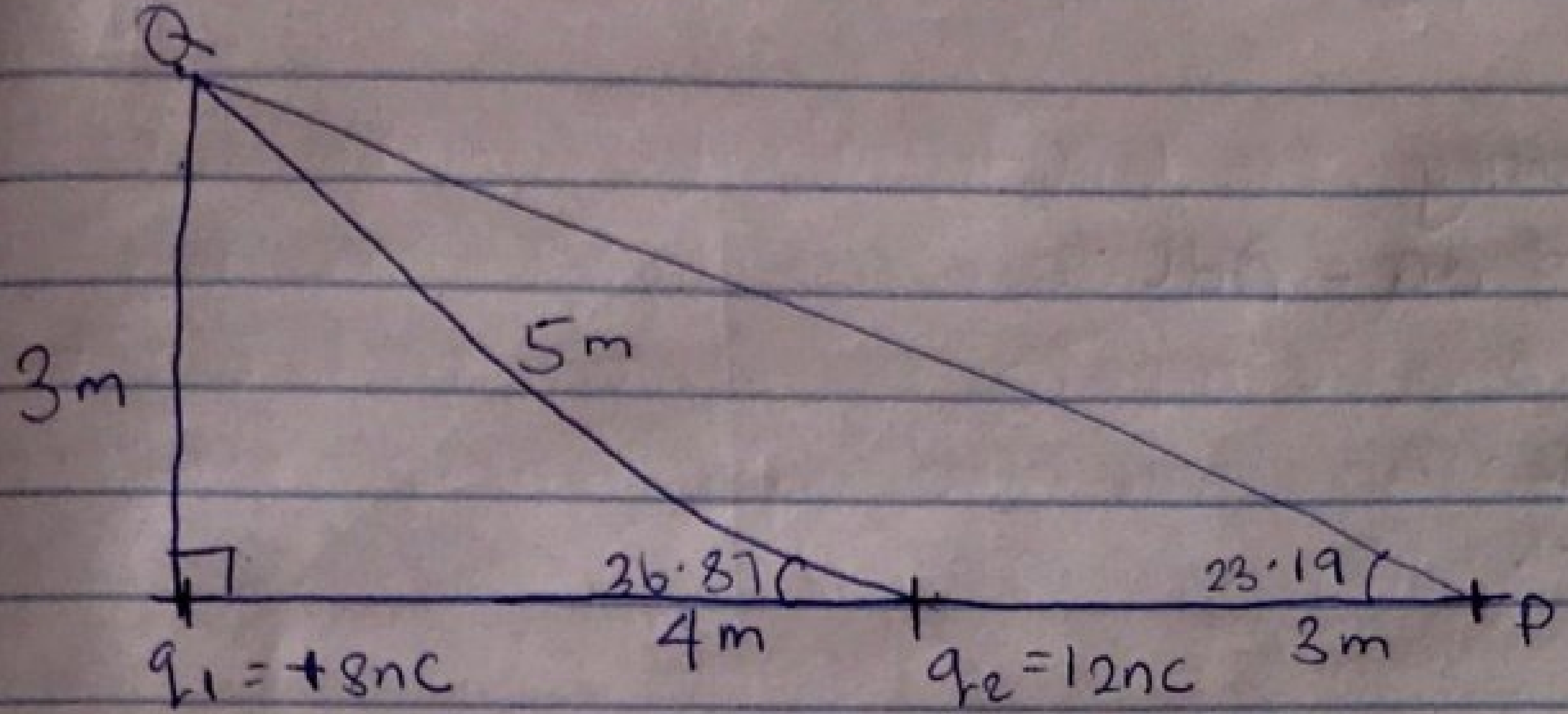
(2a) Electric field : It is a region of space in which an electric charge will experience an electric force.

Electric field intensity : It can be defined as the force per unit charge

$$E = \frac{F(N)}{q_0(C)}.$$

(b)



(i) $E_1 = \frac{KQ_1}{r^2} = \frac{9\times10^9 \times 8\times10^{-9}}{7^2} = 1.47$

$+$

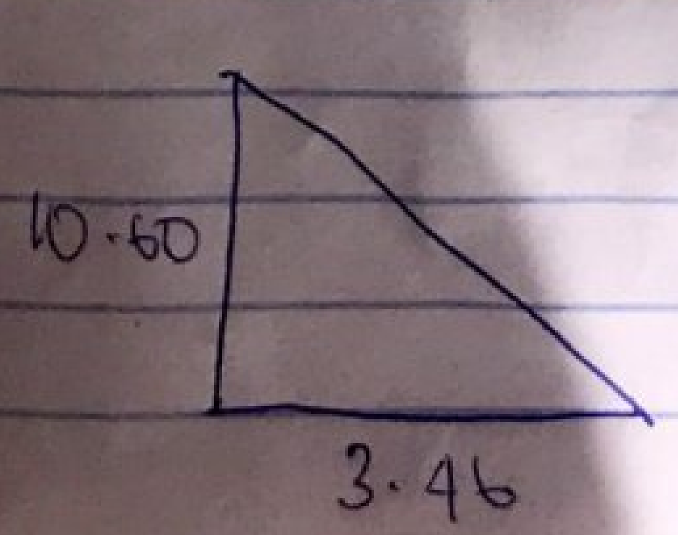
$E_2 = \frac{KQ_2}{r^2} = \frac{9\times10^9 \times 8\times10^{-9}}{3^2} = 12.$

$= 13.47 N/C.$

(ii) $E_1 = \frac{9\times10^9 \times 8\times10^{-9}}{9} = 8.$

$E_2 = \frac{9\times10^9 \times 12\times10^{-9}}{5^2} = 4.32.$

x	y
8 × cos(90)	8 × sin 90
= 0	8
4.32 × cos (36.87)	4.32 × sin (36.87).
= 3.46	2.60
3.46	10.60



$x = \sqrt{10.6^2 + 3.46^2} = 11.15 N/C.$

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③ a)

i) Volume charge density.

$$\rho = \frac{dQ}{dV} \longrightarrow dQ = \rho\, dv.$$

ii) Surface charge density

$$\sigma = \frac{dQ}{dA} \rightarrow dQ = \sigma dA.$$

iii) Linear charge density

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

(b)

$$dW = F \cdot dL.$$

$$F = -q_0 E.$$

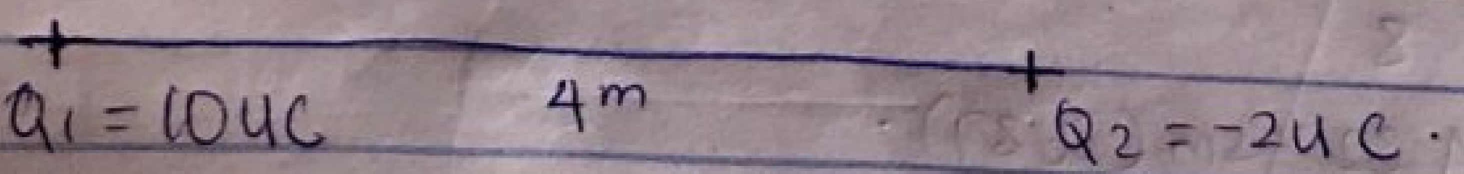
$$dW = -q_0 E dl.$$

$$W(A \rightarrow B)_{ag} = -q_0 \int_A^B E dl.$$

$$V_B - V_A = \frac{W(A \rightarrow B)_{ag}}{q_0}$$ it follows the definition.

$$V_B - V_A = -\int_A^B E dl.$$

3c).



$Q_1 = 10NC$ $Q_2 = -2\mu C$

$$V = \frac{1}{4\pi\varepsilon_0}\left[\frac{Q_1}{r_1} \times \frac{Q_2}{r_2}\right].$$

$$\frac{0}{9\times10^9} = \frac{10\times10^{-6}}{r_1} - \frac{2\times10^{-6}}{r_2}$$

$$2r = 10 r_2 \; ; \; r_1 = 5 r_2$$

Refering to the diagram above, the position along the x-axis where v = 0 is 5m from Q1 = 10UC and 1m from Q2 = -2UC.

4a) Magnetic flux is defined as the strength of the magnetic field which can be ~~reperesented~~ represented by line of forces. It is represented by the symbol Φ mathematically given as $\Phi = B \cdot dA$.

b) $m = 9.11 \times 10^{-31}$ kg. $r = 1.4 \times 10^{-7}$ m $B = 3.5 \times 10^{-1}$ weber/meter^2.

cyclotron frequency = angular speed

$$w = \frac{v}{r} = \frac{qB}{m}$$

$$w = \frac{qB}{m} = \frac{1.6 \times 10^{-19} \times 3.5 \times 10^{-1}}{9 \times 10^{-31}}$$

$$w = 62222.2222 T^{-1}$$

c) We were given paramiters such as

i) mass of the electron = 9.11×10^{-31} kg.

ii) A radius of 1.4×10^{-7} m.

iii) Magnetic field of 3.5×10^{-1} weber/meter square.

and we were asked to find the cyclotron frequency which is equal or the same thing as angularspeed. It is called cyclotron frequency because it is a frequency of an accelerator called ~~cyc~~ Cyclotron. Recall that angular speed is given as w = substituting we have w = 1.6×10^-10 × 3.5 × 10^-10 / 9×10^-31

= $622222.222 T^{-1}$

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change in length, the radius and ... squ
radius (r^2). It can be represented mathematically by where is a c...
called permeability of free space. The unit of is weber/meter square

$$B = \frac{\mu_0 I}{4\pi} \frac{dl \times r}{r^2}.$$

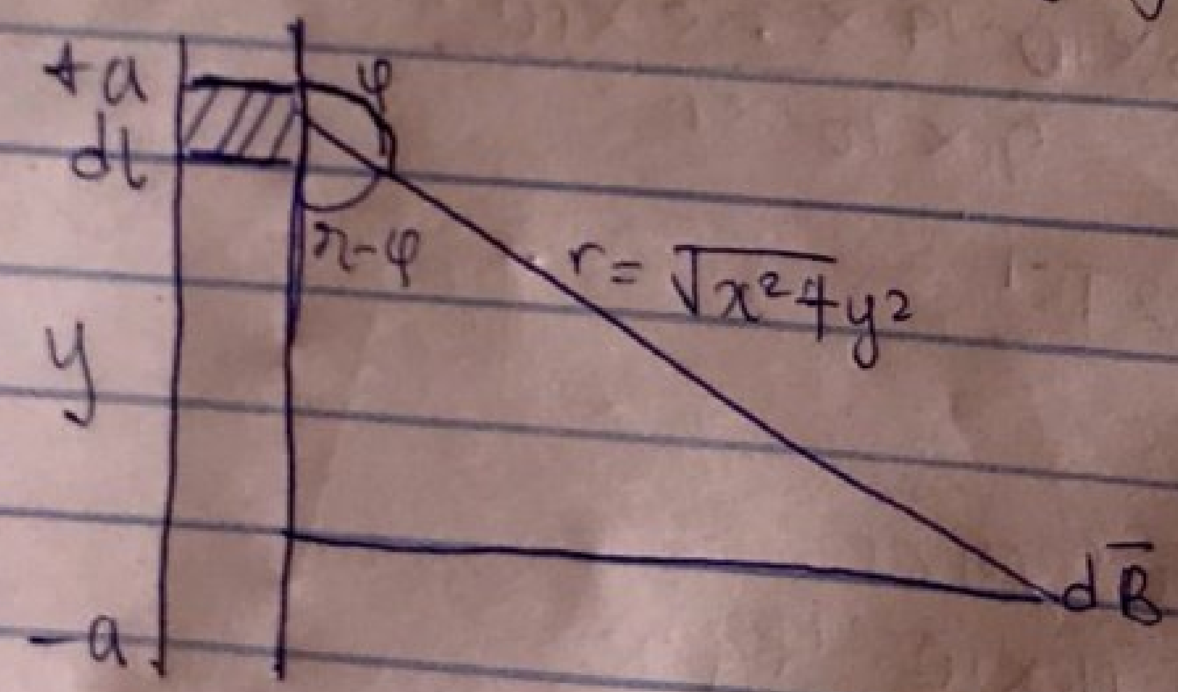
(5) Biot savart law is an equation that describes the magnetic field cre... by a current - carrying wire, and allows you to calculate its streng... at various points... And we replace the electric field E with a magnetic field element dB because a moving charge produces a mag... field not an electric field.

Permeability of free space — length of segment

$$B = \frac{\mu_0 I}{4\pi} \int \frac{d\vec{s} \times \hat{r}}{r^2}$$ — Radical direction; r^2 — Distance.

$\mu_0 = 4\pi \times 10^{-7}\ T\cdot m/A.$

(6) Section of a straight current carrying conductor.



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

When the length 2a of the conductor is very great in comparison to distance x from point P, we consider it infinitely long. That is, w... a is much larger than x,

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

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

In a physical situation, we have axial symmetry about y-axis. Thus, at all points in a circle of radius r, around the conductor, the magnitude of B is

$$B = \frac{\mu_0 I}{2\pi r} \quad \text{....} \quad (1)$$

Equation (1) defines the magnitude of the magnetic ~~field~~ field of flux density B near a long, straight current carrying conductor.