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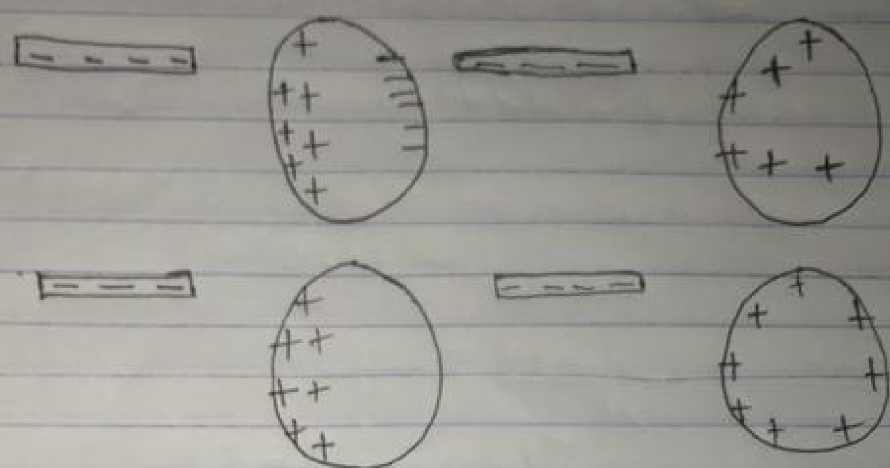
PHARMACOLOGY
18/MHS05/001.

1a)



b) $F = \frac{Kq_1 q_2}{(r_{12})^2}$

$K = 5 \times 10^9$

$F = 10N$

$q_1 = ?$

$q_2 = ?$

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

$F = \frac{Kq_1 q_2}{(r_12)^2}$

$F \times (r_{12})^2 = Kq_1 q_2$

$q_1 q_2 = \frac{F(r_{12})^2}{K}$

$\frac{1 \times (2)^2}{9 \times 10^9}$

$= 4/9 \times 10^9$

$q_1 q_2 = 4.44 \times 10^{-10}$

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

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

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

$[(5.0 \times 10^{-5}) - q_2] \times q_2 = 4.44 \times 10^{-10}$

$= 5.0 \times 10^{-5} q_2 = (q_2)^2 = 4.44 \times 10^{-10}$

$\therefore q_2 = 5.0 \times 10^{-5} + 4.44 \times 10^{-10} = 0$

using quadratic formular

$$\frac{5.0 \times 10^{-5} + \sqrt{2.5 \times 10^{-9} - 1.78 \times 10^{9}}}{2}$$

$$= \frac{5.0 \times 10^{-5} \pm \sqrt{7.2 \times 10^{-10}}}{2}$$

$$= \frac{5.0 \times 10^{-5} \pm 2.68 \times 10^{-5}}{2}$$

$$= \frac{5.0 \times 10^{-5} + 2.68 \times 10^{-5}}{2} \text{ or } \frac{5.0 \times 10^{-5} - 2.68 \times 10^{-5}}{2}$$

$$\frac{2.68 \times 10^{-5}}{2} \text{ or } \frac{2.39 \times 10^{-5}}{2}$$

3.84×10^{-5} or 1.16×10^{-5}

$q_1 = 3.84 \times 10^{-5}$ and $q_2 = 1.16 \times 10^{-3}$ or Vice versa

2a) 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.

b) $\mathcal{E}_1 = \frac{9 \times 10^9 \times 8 \times 10^{-4}}{7^2} = 1.5 \text{ N/C}$

$\mathcal{E}_2 = \frac{9 \times 10^9 \times 12 \times 10^{-4}}{3^2} = 12 \text{ N/C}$

$\mathcal{E}_{Net} = 12 + 1.5 = 13.5 \text{ N/C}$

a/ $\mathcal{E}_1 = \frac{9 \times 10^4 \times 8 \times 10^{-4}}{3^2} = 8 \text{ N/C}$

$\mathcal{E}_2 = \frac{9 \times 10^4 \times 12 \times 10^{-4}}{5^2} = 4.32 \text{ N/C}$.

$\frac{9 \times 10^9 \times 12 \times 10^{-4}}{25} = 4.32 \text{ N/C}$

$\mathcal{E}_x = 3.46 \text{ N/C}$ $\quad \mathcal{E}_y = 10.59 \text{ N/C}$

$\sqrt{(3.46)^2 + (10.59)^2} - (11.14) \text{ N/C}$

1st $\mathcal{E}_{net} = 13.5 \text{ N/C}$.

2nd $\mathcal{E}_{net} = 11.2 \text{ N/C}$

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

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

Cyclotion frequency = angular speed.

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

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

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

c) We were given parameter such as

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

ii) A radius of 1.4×10^{-5} 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 angular speed. It is called cyclotron frequencest because it is a frequency of an acalerator called cyclotion recall that angular speed is given as

$W =$ substituting we have $w = 1.6 \times 10^{\wedge} = 10.3.3.$

$\times 10^{-10} / 9 \times 10^{-31}$

$= 622222.222$

5a) State the Biot Savart law

The biot savart law ~~is based on the~~ is an equation that describes the magnetic field created by a current-carrying wire, and allows you to calculate it's strength at various points.

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5b) $B = \frac{\mu_0 I}{4\pi}\int_{-a}^{a} \frac{dl \sin\phi}{r^2}$

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

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

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

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

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

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

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

But $dl = dy$

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

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

Using special integrals

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

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

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

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

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

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

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

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

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