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Sec: 05

PhY112 ~~Ph~~ final.

Question: 1(a)

$$C_{23} = \frac{A\varepsilon_0}{2d}\left(\frac{K_2 K_3}{K_2 + K_3}\right)$$

$$= \frac{\left(\frac{34}{100}\right) \times \varepsilon_0}{37 \times 10^{-3}} \times \left(\frac{4.1 \times 4.3}{4.1 + 4.3}\right)$$

$$= 1.707 \times 10^{-12}$$

$$C_1 = \frac{K_1 \times (A/2) \times \varepsilon_0}{2d}$$

$$= \frac{6.6 \times \left(\frac{34}{100} \times \frac{1}{2}\right) \varepsilon_0}{37 \times 10^{-3}}$$

$$= 2.684 \times 10^{-12}$$

$$C = C_1 + C_{23}$$

$$= 2.684 \times 10^{-12} + 1.707 \times 10^{-12}$$

$$= 4.39191 \times 10^{-12}$$

(D)

Dielectric constant,

$$C = \frac{K_1 \cdot (A) \cdot \varepsilon_0}{2d}$$

$$4.3919 \times 10^{-10} = \frac{K \cdot \left(\frac{34}{100}\right) \times 8.854 \times 10^{-12}}{37 \times 10^{-3}}$$

$$4.391 \times 10^{-10} = \frac{3.010 \times 10^{-12} \times K}{37 \times 10^{-3}}$$

$$\Rightarrow 1.624 \times 10^{-13} = 3.010 \times 10^{-12} \times K$$

$$\therefore K = \frac{1.624 \times 10^{-13}}{3.010 \times 10^{-12}}$$

~~$\therefore K = 5.39$~~ ~~$K = 0.05$~~

$$\therefore K = 5.395$$

(c) Given,

$E = 11\ V.$

Stored energy $= \frac{1}{2} \times C \times E^2$

$= 1/2 \times 4.3919 \times 10^{-12} \times (11)^2$

$= 2.657 \times 10^{-8} J$

(d) Now,

removing all dielectric material ~~removed~~, we get.

$$C = \frac{\varepsilon_0 A}{2d} = \frac{8.854 \times 10^{-12} \times \left(\frac{34}{100}\right)}{37 \times 10^{-3}}$$

$= 8.136 \times 10^{-13}$

Ans:-

From (a) we got,

$C = 4.3919 \times 10^{-12} C$.

after we remove all the dielectric materials, we get,

$C = 8.136 \times 10^{-13}$

It's seen the capacitence has decreased. because of removing all

Answer - 4

(a) $\mu = I \pi r^2$ | $I = 9mA$, $r = (24 \times 10^{-3})$

$= (9 \times 10^{-3}) \times \pi \times (24 \times 10^{-3}) r$

$= 1.628 \times 10^{-5}$

(b) $B = \frac{\mu_0 I}{2R} = \frac{4\pi \times 10^{-7} \times 9 \times 10^{-3}}{2 \times 24 \times 10^{-3}}$

$= 2.356 \times 10^{-7}$

(c) Here,

$B_1 = \mu_0 n I_1$

$= 12.566 \times 10^{-7} \times 120 \times 19 \times 10^{-3}$

$= 2.865 \times 10^{-6}$

$B_2 = \mu_0 \times 120 \times 16 \times 10^{-3}$

$= 2.412 \times 10^{-6}$

total magnetic field = $B_1 + B_2$

$= (2.865 \times 10^{-6} + 2.412 \times 10^{-6})$

$= 5.277 \times 10^{-6}$.

(d)

$= 5.277 \times 10^{-6}$

(d) Torque, $T = \mu \times$ total magnetic field $\times \cos(45)^\circ$

$= 1.628 \times 10^{-5} \times 5.277 \times 10^{6} \times \cos 45$

$= 6.074 \times 10^{-11}$

Ans-3

(a) Here,

$B = 2\,T$

$m = 60 \times 10^{-9}\,kg$

$$r = \frac{mv}{q_1 B} = \frac{60 \times 10^{-9} \times 44 \times 10^{5}}{61 \times 10^{-6} \times 2.0}$$

$$= 2163.9344$$

(b) $$T = \frac{2\pi \times m_1}{q_1 B} = \frac{2\pi \times 60 \times 10^{-9}}{61 \times 10^{-6} \times 2}$$

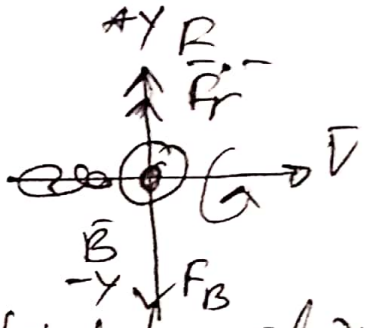
$$= 3.090 \times 10^{-3}\,sec$$

(c) if $m_2 = 3.7 \times 10^{-9}$ before $= 2.22 \times 10^{-7}$

$$B = \frac{2\pi m_2}{qT} \qquad T = \frac{2\pi \times m_1}{q_1 B}$$

$$= \frac{2\times\pi\times 2.22\times10^{-7}}{61\times10^{-6}\times 3.090\times10^{-2}}$$

$$B = 7.400\ T$$



(d) Here,

if we apply electric field along +y axis the electric force will act along +x axis from left hand rule.

Therefore, Magnetic force will act along $-X$ axis. $[\bar{F}_E = -\bar{F}_B]$,

magnetic force and electric force are equal and opposite to each other.

So, they get cancelled.