SUBMIT BY :

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FINAL TERM PAPER : APPLIED PHYSICS

SUBMITTED TO : (SIR KHALID HAMID)

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(P= 1)

Final Term paper
subject: Applied physics
class (BS-SE)
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Q1:- A slit of width a is illuminated by white light.

Ans:- For what value of a will the first minimum for red light of $\lambda = 650$nm be at $\theta = 15°$?

Sol:- At the first minimum, m = 1 in equation [$a \sin\theta = m\lambda$, for m = 1, 2, 3, ...] Solving for a, we find.

$a = m\lambda / \sin\theta$
$= (1)(650\text{nm}) / (\sin 15°)$
$= 2511$ nm
$= 2.5\ \mu m$

Therefore, the value of a, the first minimum for red light of $\lambda = 650$ nm be at $\theta = 15°$ should be $2.5\mu m$. For the incident light to flare out the much ($\pm 15^\circ$) the slit has to be very fine indeed, amounting to about four times the wavelenght. Note that a fine human hair may be about 100 μm in diameter.

(b) Sol:- This miximum is about halfway between the first and seccond minima produced with wave length λ'; we can find it without too much error by putting $m = 1.5$ in equation [$a \sin\theta = m\lambda$, for $m = 1, 2, 3 \dots$] obtaining $a \sin\theta = 1.5\lambda$.

Solving fo λ' and substituting known date give $\lambda' = a \sin\theta / 1.5$

$= (2511 \text{ nm})(\sin 15^\circ)/1.5$

From the above observation we concluded that, the wave length λ' of the light whose first side diffraction maximum is at 15° would be 430nm. light of the wave length is violet. the first side maximum for light of wavelength.

430nm will always coincide with the first minimum for light of wavelength 650nm, no matter what the slit width. if the first slit is relatively narrow, the angle θ at which this overlap occours will be relatively large, and conversely.

Q2: a) What is the difference b/w Refletion and Refraction.

Reflection and Refraction are two different properties of light. the basic difference b/w reflection and refraction is that Reflection of light is the process in which light bounces back on striking the surface, while refraction of light is the process in which light changes its direction as it passes from one medium to another medium.

=> Reflection

-> When light falls from one medium on the surface of another medium apart from it bounce back in the same medium. This processe is called reflection of light.

-> In this process, light bounces back.

-> In this process, light waves bounce off the plane and change direction

-> In reflection of the light angle of incidence is equal to the angle Reflection.

-> It occurs in mirrors.

⇒ **Refraction**

→ when light falls one medium of the surface of another medium it changes its direction and speed. This process is called the refraction of light.

→ In This process light change path.

→ In refraction angle of the incident is not equel to the angle of refraction.

→ In this method, light waves change their direction and speed.

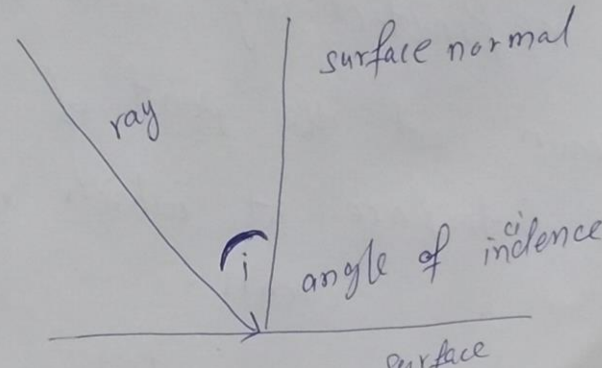
→ It occurs in lenses.

Q2b) angle of incident, angle of Refraction, and angle of Reflection

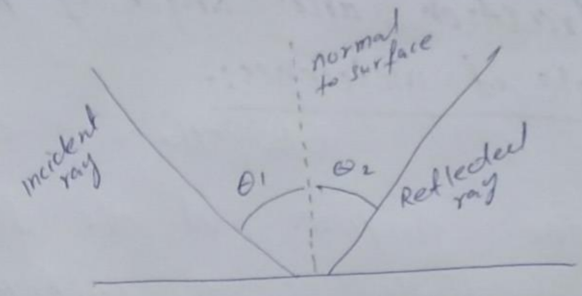
CP = 6

Anse:- **Angle of incidence:-**

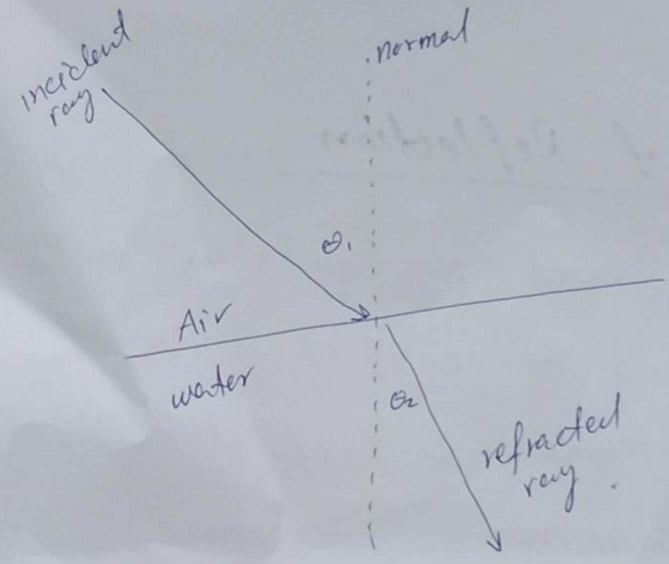
The angle b/w the ray on a plane surface and the line perpendicular to the surface at the point of incid (of the ray) is defined as The angle of incidence



=> **Angle of Reflection** => The angle b/w The incident ray and the normal is known as the angle of incidence. The angle b/w the reflected ray and the normal is known as the angle of Reflection. (P= 7)



Angle of Refraction:- The angle b/w a refracted ray and the normal drawn at the point of incidence to the interface at which refraction occurs.



(P= 8)

CQ 3:-

The initial flux through soleniod C is $\phi_{Bi} = BA_c = \mu_0 i n_s A_c = \pi \mu_0 i n_s r_c^2$

Now we can write

$$\frac{d\phi_B}{dt} = \frac{\Delta\phi_B}{\Delta t} = \frac{\phi_{Bf} - \phi_{Bi}}{\Delta}$$

$$\Rightarrow \frac{0 - \pi\mu_0 i n_s r_c^2}{\Delta t} = -\frac{\pi\mu_0 i n_s r_c^2}{\Delta t}$$

$\Rightarrow$ substituting gives

$$\frac{d\phi_B}{dt} = -\frac{\pi(4\pi \times 10^{-7}\, T.\frac{m}{A})(1.5A)}{25ms}$$

$$\times \left(22000 \frac{turn}{m}\right)(0.0105m)^2$$

$$\Rightarrow -5.76 \times 10^{-4}\, V.$$

(P = 9)

The magnitude of the induced emf is then

$$\mathcal{E} = N\left|\frac{d\Phi_B}{dt}\right| = (130)(5.76\times10^{-4}\,V)$$

$\Rightarrow$ 75 mV.

Q4. a) How to calculate the magnetic force on current carrying waire.

Answer: The force can be found with the given information by using

$F = ILB \sin\theta$

and nothing that the angle θ b/w/B is 90°, so that $\sin\theta = 1$

(P= 10)

Solution: Entering the given values into

$F = IlB \sin\theta$ yields

$F = IlB \sin\theta = (20.0A)(0.0500m)$

$(1.50T)(1)$.

The units of tesla are

$1T = \frac{N}{A.m}$ thus

$F = 1.50 N.$

Diss The large magnetic field creates a significant force on a small length of wire.

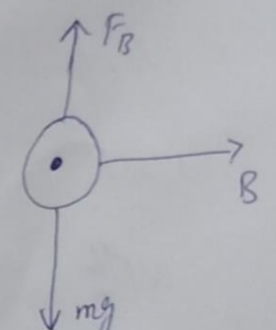
(P=11)

Q4 b)

Ans:.

What are the magnetude and direction of the minimum magnetic field B needed to suspend the wire - that is, to blance the gravitional force on it (look at)

At equilibrium



$\Rightarrow FB = Fg$

At equilibrium

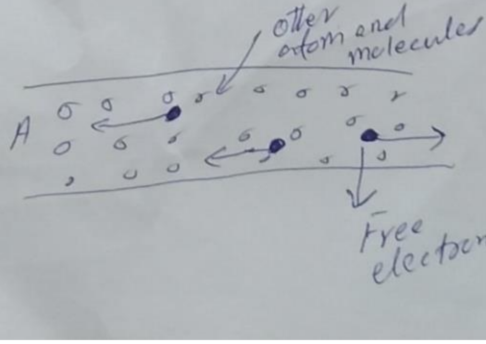
$FB = Fg \Rightarrow ILB \sin\theta = mg$

$B = 1.6 \times 10^{-2}$ Ans

Q5 a)

Ans.: Resistance

The Resistance is the property of the material which creetes on obstruction in the flwo of the current. when the voltage is applied accross the conductor, the free electrons start moving in a perticular direction. while moving these electrons collapse with atoms or mollecules and hence produce heat. these atoms or molecules oppose the movement of free electrons in a material.



This opposition is known as the resistance. It is represented by the formula $R = \rho \frac{l}{a}$

l → length of conductor

a → cross area of conductor

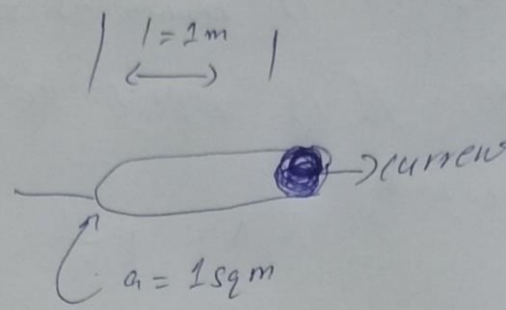
ρ → resistivity of materials

SI unit is ohms

and denoted by Ω at k Ω

→ Resistivity

The Resistivity is also known as specific resistance. the resistivity represents the resistance of the material which has specific dimensions. i.e. The material has 1-metter length and square metter area of cross section



represented the resistivity

$$\rho = \frac{R \times a}{l}$$

I → length counductor

a → cross section area of conductor

R → Resistance material

SI unit is ohm metter.

Q5 (b)

Ans.: (i) Cross-sectional area of rectangular block is squre:

$S = 1.2 \times 1.2 \; cm^3 = 1.44 \times 10^{-4} \; m^2$

l is 15 cm so $l = 0.15 \; m$

so $R = (9.6 \times 10^{-8})(0.15 / 1.44 \times 10^{-4})$

$R = 1 \times 10^{-4} \; \Omega$

(ii) cross sectional area of rectangular block is rectangular

$S = 1.2 \times 15 \; cm^2 = 1.8 \times 10^{-3} \; m^2$

$l = 6 \quad 1.2 \; cm = 0.012 \; m$

$R = (9.6 \times 10^{-8})(0.012 / 1.8 \times 10^{-3})$

$R = 6.4 \times 10^{-7} \; \Omega$

end