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I.D : 24596

SECTION : A

SEMESTER : 4th BS (SE)

TIMING : FRIDAY 8:00 - 11:AM

SUBJECT : APPLIED PHYSICS

INSTRUCTOR : M. KHALID HAMID

QUESTION :- 1

A slit of width a is illuminated by white light.

a) For what value - - - $\lambda = 650\,nm$ at $\theta = 15°$?

GIVEN DATA :-

Wavelength = $\lambda = 650\,nm$

Angle = $\theta = 15°$

REQUIRED :-

Alpha = ?

SOLUTION :-

As we know that

$$d = \frac{n\lambda}{\sin\theta}$$

$$d = \frac{1 \times 650}{\sin 15°}$$

∴ For minimum =

$$d = 650 / 0.65 \qquad n = 1$$

$$\boxed{d = 1000}$$

(1)

b) What is the minimum λ - - - - - - - - red light?

GIVEN DATA :-

Angle = θ = 15°

REQUIRED:

Wavelength = λ = ?

SOLUTION:-

As

$$d = \frac{n\lambda}{\sin\theta}$$

$$d\sin\theta = n\lambda$$

$$\lambda = \frac{d\sin\theta}{n}$$

putting values :

$$\lambda = \frac{1000\,(\sin 15°)}{1}$$

$$\lambda = 1000\,(0.65)$$

$$\lambda = 650$$

$$\boxed{\lambda = 650}$$

QUESTION : 2

a) What the difference b/w reflection and refraction?

REFLECTION:-

DEFINITION:-

The property of a propagated wave being thrown back from a surface is termed as reflection. It is the bouncing back of wave while strickling a surface.

TYPES OF REFLECTION:-

Reflection is categorized into two types.

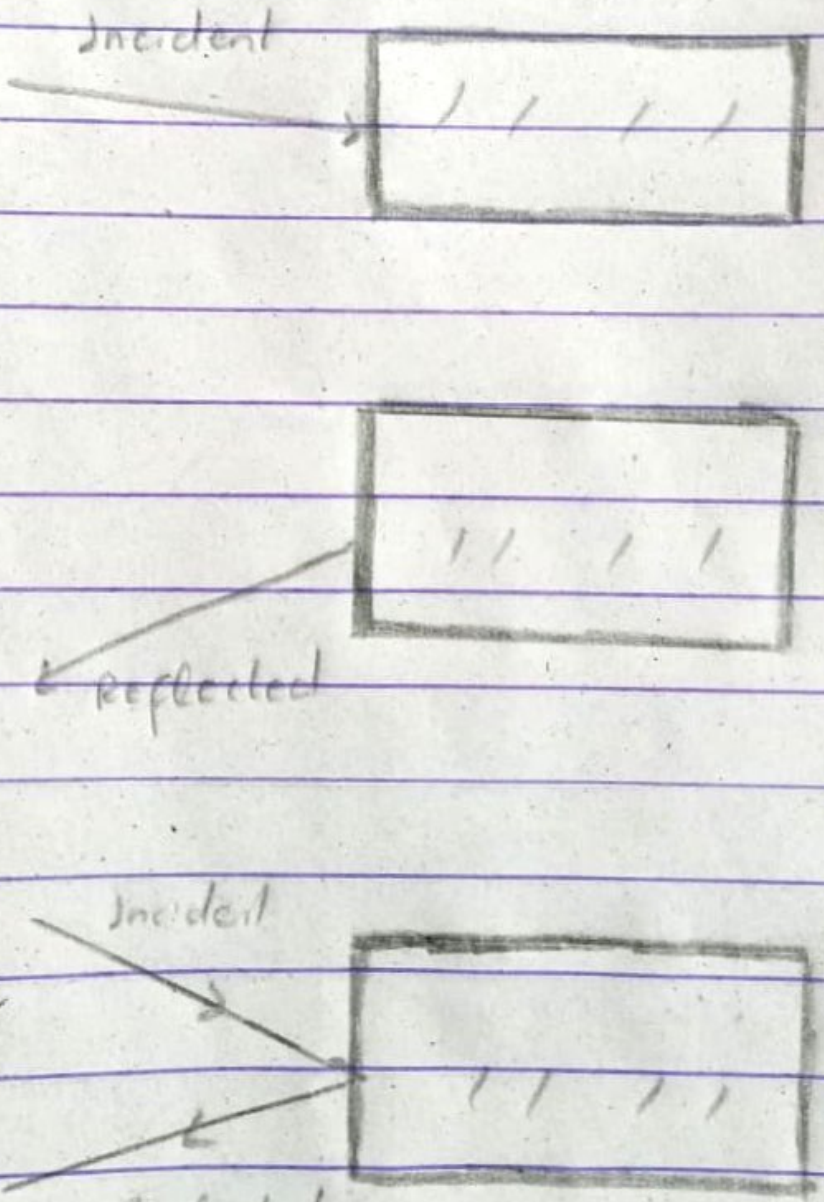
i) **SPECULAR REFLECTION:-**

It is the type of reflection from a smooth surface.

DIFFUSE REFLECTION:-

It is the type of reflection from rough surfaces.

FIGURE:-

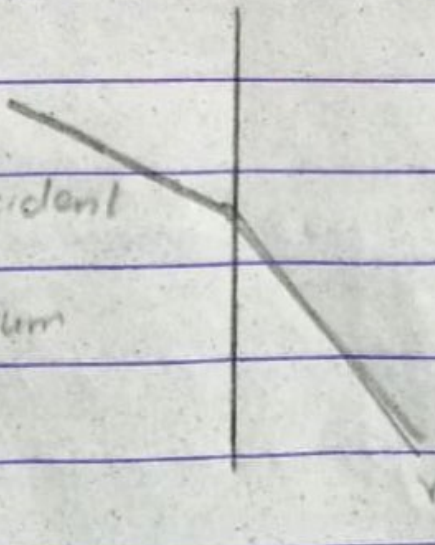


REFRACTION:-

DEFINITION:-

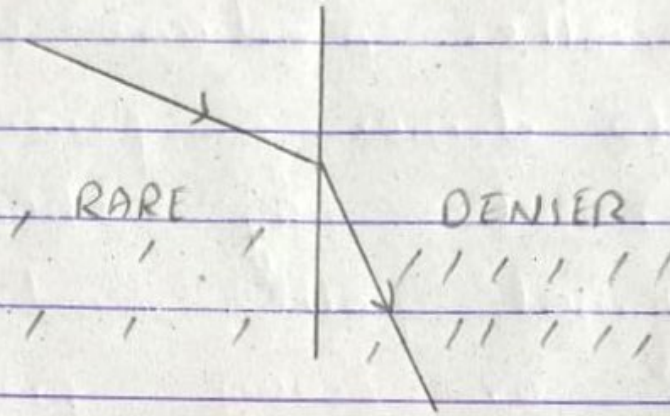
When a light wave passes from one medium to another medium (from rare to denser or from denser to rare) the ray changes its original path and move towards or away from the normal. Such property of a wave is called refraction.

FIGURE:-



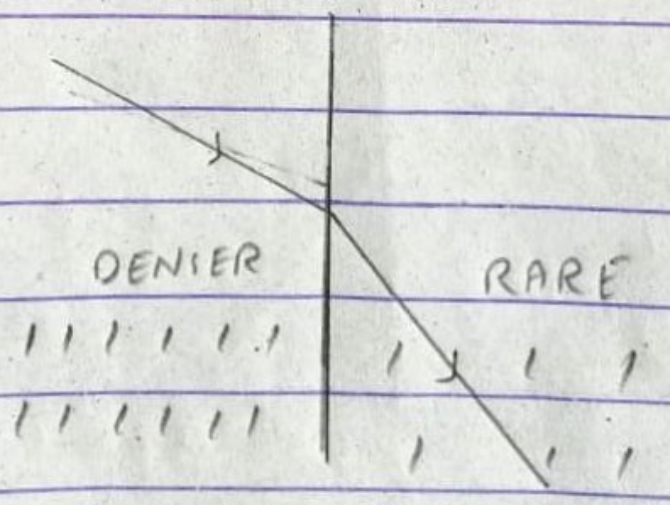
TOWARDS THE NORMAL:-

When the wave passes from rare medium to denser medium it bends toward the normal.



AWAY FROM NORMAL:-

When light passes from denser medium to rare medium it bends away from normal.



2)
b) ANGLE OF INCIDENCE:-

DEFINITION:-

The angle made by the incident ray with the normal is called angle of incidence.

ANGLE OF REFLECTION:-

The angle made by the reflected ray with the normal is called angle of reflection.

ANGLE OF REFRACTION:-

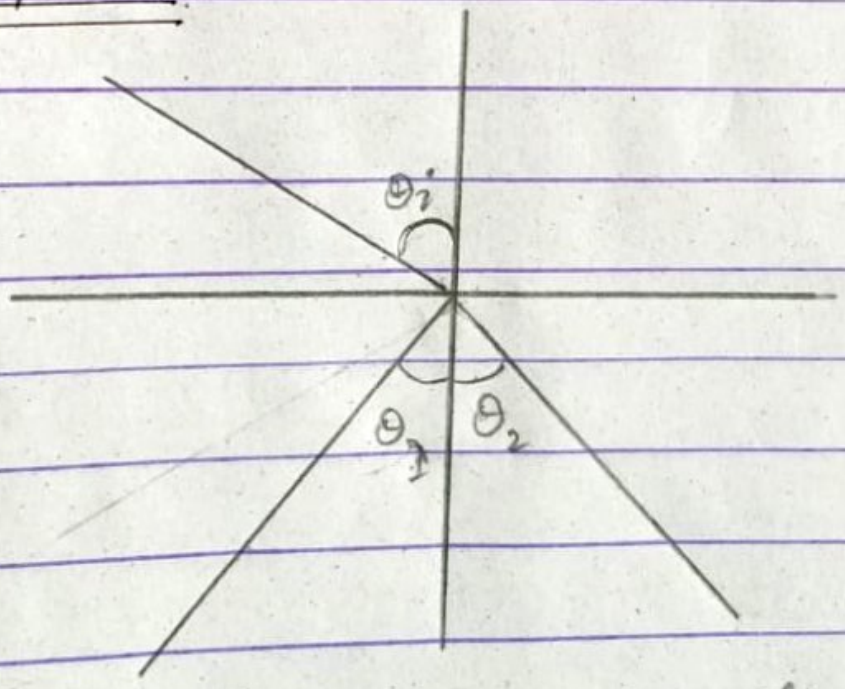
The angle made by the refracted ray with the normal is called angle of refraction.

SNELL'S LAW:-

The angles are related to each other through snell's law. The angle of incidence and angle of refraction is connected through relation:-

$$\frac{\sin i}{\sin r} = \frac{n_r}{n_i}$$

DIAGRAM:-



θ_1 = angle of reflection

θ_2 = angle of reflection.

QUESTION : 3rd

a) The long solenoid S shown ---------- while the current is changing ?

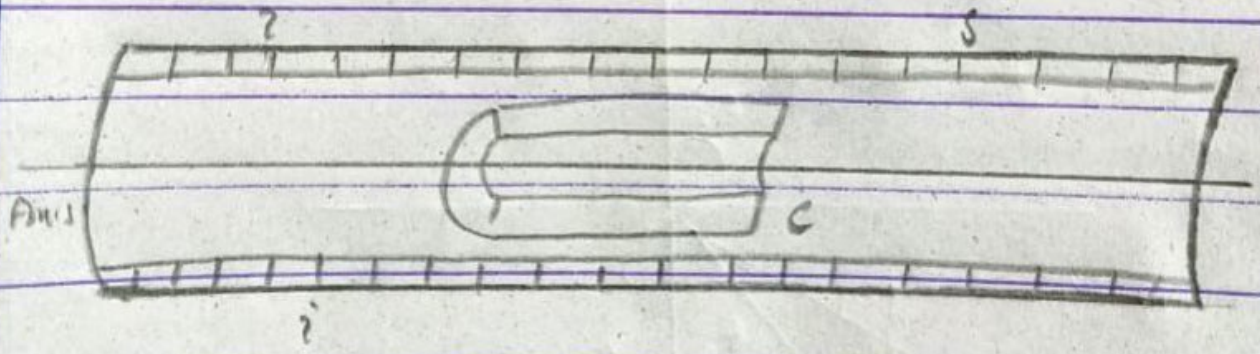
GIVEN DATA :-

No of turns = 2200 turn/cm
= 22000 turn/m

current I = 105A

B = 0.0416T

FIGURE :-



REQUIRED :-

E = Emf = ?

FORMULA :

$$E = \frac{N \Delta \Phi}{\Delta t}$$

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SOLUTION:-

Emf induced = $B\pi r^2 n / t$

$$E = \frac{130 \times 0.0145 \times 3.14 \times (0.0105)^2}{75 \times 10^{-3}}$$

$$\boxed{E = 0.0748 V}$$

QUESTION : 4th

a) How to calculate the - - - - - carrying wire?

ANSINER:-

With the discovery of electron it was soon realized that a steady current through a conducting wire creates magnetic field around the wire.

CALCULATION:-

When a current carrying wire is placed in a uniform magnetic field, the megnetic field of the wire and external field interact resulting in a force "F" on the wire. From this force we then calculate the magnetic field of the wire.

MATHEMATICALLY :-

We know

$F \propto I \longrightarrow (1)$ $\quad F \propto \sin\theta \longrightarrow (4)$

$F \propto L \longrightarrow (2)$

$F \propto B \longrightarrow (3)$

Combining all these equations we get :

$$F \propto IBL\sin\theta$$

$$F = KIBL\sin\theta$$

Where K is the constant of proportionality and its value in SI system is 1.

$$F = IBL\sin\theta$$

$$\boxed{B = \frac{F}{IL}}$$

→ Hence the magnetic field on a current carrying wire is equal to $\frac{F}{}$.

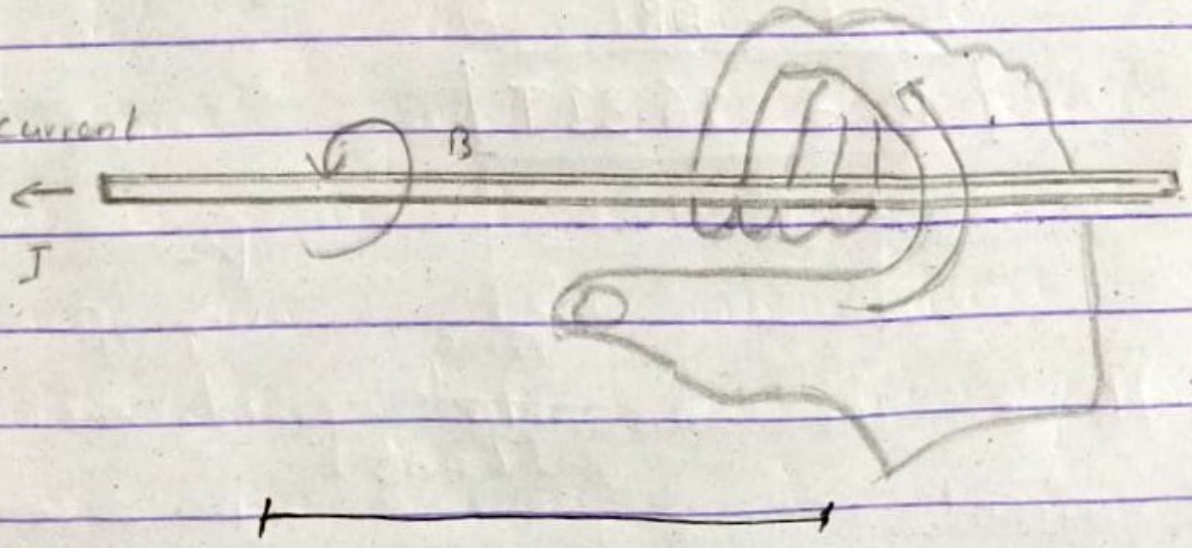
DIRECTION OF B:-

The direction of the magnetic field can be determined by right hand rule.

RIGHT HAND RULE:-

Hold the wire in your right hand so that the thumb points in the direction of current. The curling fingers gives the direction of the megnetic field.

DIAGRAMATICALLY:-



4 b) A straight horizontal - - - - - - - - - - 46.6 g/m.

GIVEN DATA:-

$I = 28\,A$

$m/L = 46.6\ g/m$

$= 46.6 \times 10^{-3}\ kg/m$

REQUIRED:- $\theta = 90^\circ$

$B = ?$

SOLUTION:-

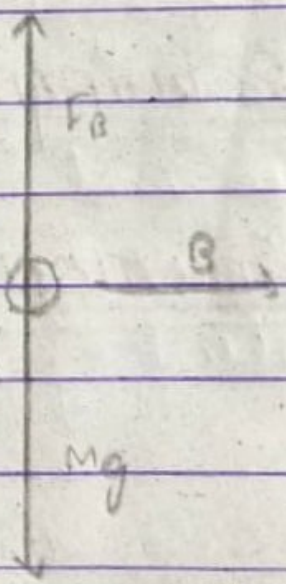
As we know that

$$B = \frac{(m/L)g}{I}$$

putting values:

$$B = \frac{(46.6 \times 10^{-3}\ kg/m)(9.8\ m/s^2)}{28\,A}$$

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



QUESTION: 5th

a) What is difference b/w resistance and resistivity?

ANSWER:-

RESISTANCE:-

DEFINITION:-

The opposition offered by a material to the flow of current is called resistance.

EXPLANATION:-

Resistance opposes the flow of current through a conductor. This opposition is due to atoms and molecules that hinder the flow of these electrons through the substance. Resistance causes production of heat.

UNIT OF RESISTANCE:-

The unit of resistance is ohm = Ω.

FACTORS:-

Resistance depends on the following factors:

- Length of conductor:-
  $R \propto L$
- Area of conductor:-
  $R \propto 1/A$
- Nature of material:

MATHEMATICALLY:-

$$V = IR$$

$$\boxed{R = \frac{V}{I}}$$

also $\boxed{R = \rho L/A}$

RESISTIVITY:-

DEFINITION:-

The resistance offered by a material of length 1m and having cross sectional area equals to $1m^2$ is called resistivity.

REPRESENTATION:-

It is represented by rho = ρ.

MATHEMATICALLY:

As $R = \rho L/A$

$$\rho = RA/L$$

UNIT:

Its unit is $ohm\,mm^2/m$

$= \Omega m^2/m = \Omega m$

5)
b) A rectangular block of iron has ---------- parallel sides are

a) the square ends (1.2cm x 1.2cm
b) Rectangular sides (1.2cm x 15cm)

SOLUTION:-

$$R = \frac{\rho l}{S}$$

$\rho = 9.6 \times 10^{-8} \Omega m$

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

$l = 15cm = 0.15m$

$$R = \frac{9.6 \times 10^{-8} \times 0.15}{1.44 \times 10^{-4}}$$

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

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

$l = 1.2cm = 0.012m$

$$R = 9.6 \times 10^{-8} \times \frac{0.012}{1.8 \times 10^{-2}}$$

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