SYMBIOSIS SCHOOL, NASHIK.

STD: X TERM I (2020-21)

PHYSICS: L.10 LIGHT

CONCEPT 2 ANSWERS:

Ans.1: All the distances para measured to the right of the origin (along +x axis) are taken as positive while those measured to the left of the origin (along -x axis) are taken as negative.

Ans.2: i) Distances measured perpendicular to and above the principal axis are taken as positive
ii) Distances measured perpendicular to and below the principal axis are taken as negative.

Ans.3 The angle of incidence is 0°

Ans.4 The positive (+) sign of magnification m indicates that the image is virtual and erect. The magnification m = 1 indicates that the image is of the same size as the object. Thus the magnification of +1 produced by a plane mirror means that the image formed by a plane mirror is virtual, erect and of the same size as the object.

Ans.5: A concave mirror gives an erect and enlarged image of an object.

Ans 6. A convex mirror gives an erect, virtual and diminished image.

CONCEPT 3: Refraction of light Refractive indices

* Refraction of light: When a ray of light travelling obliquely from one medium to another, the direction of propagation of light in the second medium changes. This phenomenon is known as refraction of light.

* Refraction through a rectangular glass slab.

Fig 10.10

* When the light goes from a gases medium to denser medium (air to glass) it bends towards the normal at the interface seperating the medium. On the other hand when the light goes from a denser to gases medium (glass to air) it bends away from the normal at the interface seperating the medium.

* Refraction is due to the change in the speed of light as it enters from one transparent medium to another.

Q. Why does the emergent ray appears parallel to the direction of incident ray. ?

Ans The extent of bending of the ray of light at the opposite parallel face AB (air - glass interface) and CD. (glass - air interface) of the rectangular glass slab is equal and opposite. Hence the emergent ray appears parallel to the direction of incident ray

Q State the laws of refraction of light

Ans: 1. The incident ray, the refracted ray and the normal to the incident interface of two transparent media at the point of incidence, all lie in the same plane.

2. State Snell's law of refraction

The ratio of sine of angle of incidence to the sine of angle of refraction is a constant, for the light of a given colour and for the given pair of media.

If i is the angle of incidence and r is the angle of refraction then.

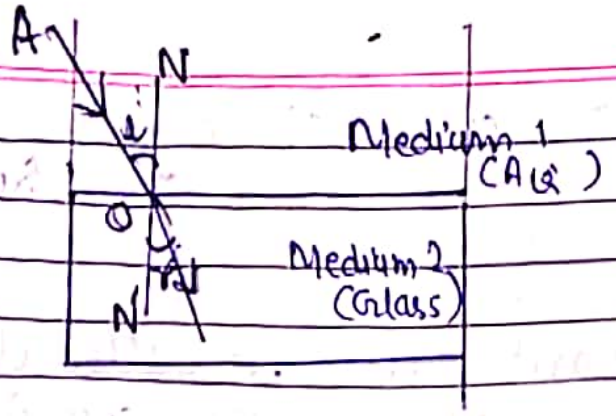
$$\frac{\sin i}{\sin r} = \text{constant}$$

This constant value is called the refractive index of the second medium with respect to the first.

* Refractive index.

* A ray of light that travels obliquely from one transparent medium into another will change its direction in the second medium. The extent of the change in direction that takes place in a given pair of media is expressed in terms of refractive index, the constant.

* The refractive index can be linked to an important physical quantity the relative speed of propagation of light in different media. The light travels fastest in vacuum with speed of 3×10^8 m/s.
In air the speed of light is only marginally less, compared to that in vacuum.



Consider a ray of light travelling from medium 1 into medium 2, as shown in figure.
Let v_1 be the speed of light in medium 1 and v_2 be the speed of light in medium 2
The refractive index of medium 2 with respect to medium 1 is given by the ratio of the speed of light in medium 1 and the speed of light in medium 2. It is represented by symbol n_{21}.

$$n_{21} = \frac{\text{Speed of light in medium 1}}{\text{Speed of light in medium 2}} = \frac{v_1}{v_2}$$

Similarly
the refractive index of medium 2 with respect to medium 2 is represented as n_{12}. It is given as

$$n_{12} = \frac{\text{Speed of light in medium 2}}{\text{Speed of light in medium 1}} = \frac{v_2}{v_1}$$

Absolute refractive index / Refractive index.

If medium 1 is vacuum or air, then the refractive index of medium 2 is considered with respect to vacuum. It is called absolute refractive index of the medium. It is simply represented as n_2

If c is the speed of light in air and v is the speed of light in the medium, then the refractive index of the medium n_m is given by.

$$n_m = \frac{\text{Speed of light in air}}{\text{Speed of light in medium}} = \frac{c}{v}$$

The absolute refractive index of a medium is simply called it's refractive index.

Solve the following questions. 1×10=10

1. What happens to the speed of light when light undergoes refraction at the surface of two media ?
2. Find the value of angle of emergence when an incident ray makes an angle of 40° with a normal to the air glass interface of the rectangular

glass slab.

3. How is the refractive index of the medium related to the speed of light through it?
4. What happens to a ray of light when it travels from one medium to another having equal refractive index.
5. Does the value of speed of light change with medium.

Intext questions: Pg. No 176
Q. 1, 2, 3, 4, 5.

INSTRUCTIONS

1. Check the answers of concept 2. worksheet with the answers given. If found wrong redo it.
2. Solve the questions of concept 3 in your notebook.
3. Write the notes in C.W notebook.
4. Do the assignment: Image formation of spherical mirrors (& ray diagrams) on project papers as discussed in class.
5. Watch the videos.