

Chapter 9

DISPERSION OF LIGHT

REVIEW EXERCISES

Q.1 Fill in the blanks:

- i) When light enters a right-angled prism, it makes an angle greater than the critical angle.
- ii) Splitting of white light into its component colours is called Spectrum.
- iii) Critical angle of water is 48.8° .
- iv) A binocular uses Reflecting prisms to see distant objects.
- v) If an object absorbs all seven colours of light, it appears in Black colour.

Q.2 Describe uses of different colours of light in daily life.

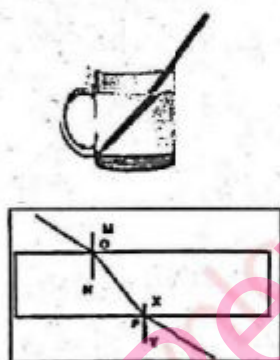
- Ans: i) For home decoration, both the pastel and bright colours are used. The choice of the colour of walls, curtains and the furniture depends on the weather of the area.
- ii) In washrooms, toilets and other washing areas, red rims are used on the taps to show the warm water connection, while blue rims are on the taps to show the cold water supply.
 - iii) Different colour markers and chalks are used to explain different topics on the white and black or green boards respectively.
 - iv) Colourful charts are used as the teaching aids to highlight different educational concepts.
 - v) Traffic light signals use red, yellow and green lights to guide the drivers and pedestrians how to behave on roads. For instance, red traffic light instructs the drivers to stop; yellow light instructs

them to be cautious, while green instruct them to keep driving.

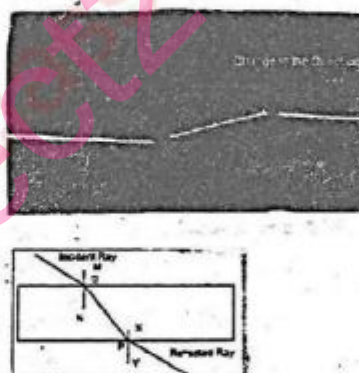
- vi) Red, yellow and orange lights and opaque objects are used to warn about the danger or cautionary actions on the public places. For instance, yellow strip indicates the edge or road for safe driving.
- vii) In building construction, white and pastel colours are used to construct hospitals because these colours give a soothing effect to the environment.
- viii) Ambulances and fire brigade use red and yellow light alarms to pass signals of emergency to other vehicle drivers.

Q.3 Draw a labelled diagrams of refraction in water and glass.

Refraction in Water



Refraction in Glass



Q.4 Compare the following:

- (i) *Real and apparent depth*
- (ii) *Primary and secondary colours*

Ans:(i) Real and Apparent Depth:

When a light ray travels from a rare medium into a denser medium it is refracted the ray bends towards the normal. However, when the same light ray travels from a denser to the rare medium its refracted ray moves away from the normal. When this refracted light

enters human eye, it makes a shallower image of the object under water. Vision of fish in water than its real depth.

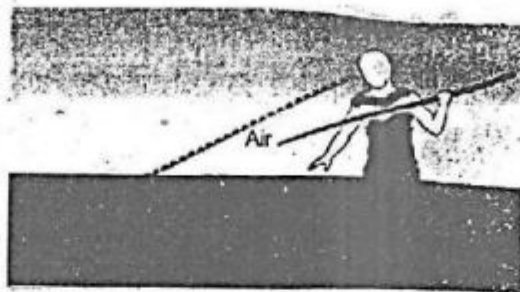


Figure Real and apparent depth

(ii) Primary and Secondary Colours

Primary Colour	Secondary Colour
Red, blue and green are called Primary Colours of light.	Primary colours combine in equal intensities to form the secondary colours of light.

Q.5(a) State the laws of refraction.

Ans: Laws of Refraction:

There are two laws of refraction.

- The incident ray, refracted ray and the normal at the point of incidence, all lie in the same plane.
 - The ratio between the speed of light in vacuum and its speed in any other medium is constant. This ratio is known as the 'Refractive Index' of that particular medium.
- (b) Discuss refractive index with the help of two examples.**

Ans: Refractive Index:

The refractive index is symbolized as 'n'. It can be calculated by the following formula:

$$\text{Refractive Index}(n) \text{ of a medium} = \frac{\text{Speed of light in vacuum}(c)}{\text{Speed of light in the medium}(v)}$$

It has no unit of measurement because it is a ratio. Table 1.1 shows the refractive indices of different media.

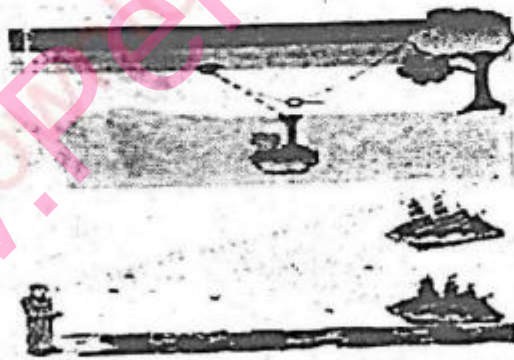
Medium	Refractive Index	Medium	Refractive Index
Vacuum	1.000	Crown Glass	1.52
Air	1.0003	Diamond	2.42
Water	1.33	Amber glass	1.55

Q.6 Explain the following phenomena with the help of their labelled diagrams:

- (i) **Mirage**
- (ii) **Fish eye view**

Ans: (i) Mirage:

Mirage is a phenomenon that occurs, in deserts and seas, due to which illusion of water appear away from their actual position. Mirage occurs from the refraction of light through two non-uniform mediums. Total internal reflection results in the mirage, On a hot day, a car driver may experience mirage as a puddle of water that appears on road several yards in front of his car.



(ii) Fish Eye View:

Fish and other aquatic animals see a reflected view of the objects, present in their surroundings as

shown in figure. When light reflects from the outer world to the boundary of two non-uniform media such as air and water, total internal reflection happens. As a result, outer world objects such as the moon, sun, plants and birds are visible to the fish under water. Simultaneously, other sea animals and plants present under water and even on the seabed are visible to each other. However, the shape and the distance of the image of such objects are different from their real frame.

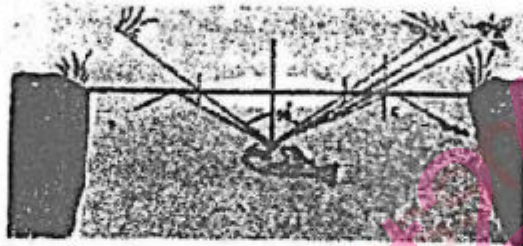
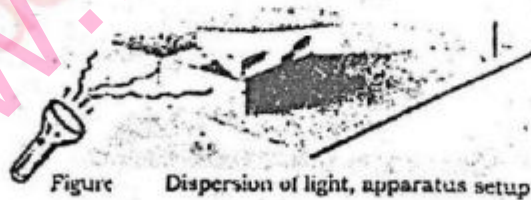


Figure Fish eye view - total internal reflection

Q.7(a) Explain Dispersion of Light.

Ans: Dispersion of Light

The splitting of light into its constituent components is called Dispersion of Light. This phenomenon can be observed by using a dispersive prism. The seven component colours of white light are red, orange, yellow, green, blue, indigo and violet.



(b) Explain Refraction of Light.

Ans: Refraction of Light

Change in the speed and direction of light rays due to change of medium is called Refraction of Light. When a light ray travels from a rare medium into denser medium it is refracted towards normal but when a ray of light enters into a rare medium from a denser medium it is refracted away from normal. The properties of a medium influence the behaviour of light. For instance, the density of a medium, changes both the speed and direction of light rays. The light travels fastest in the vacuum; while its speed is faster in the air as compared to the denser media such as water and glass. Moreover, the direction of light rays also changes on entering a denser medium.

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