4. Light and Sound

Evaluation

1 A. Question

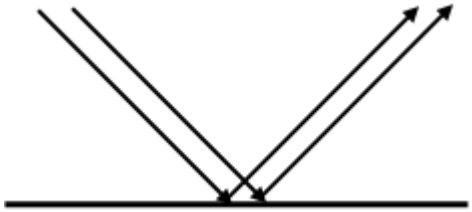
Reflection from a smooth surface is called _____reflection.

(regular, irregular, multiple, total internal)

Answer

Regular

The bouncing of light is referred to as reflection. When reflection takes place in a smooth, polished surface, then it is called regular reflection. In this case, the light rays get reflected in one direction.



1 B. Question

If the angle of incidence is 40° the angle of reflection is _____

(10°, 40°, 20°, 90°)

Answer

40°

One of the laws of reflection is that the **angle of incidence** (i.e., the angle between the incident ray and the normal) **is equal to** the **angle of reflection** (i.e., that is the angle between the reflected ray and normal).

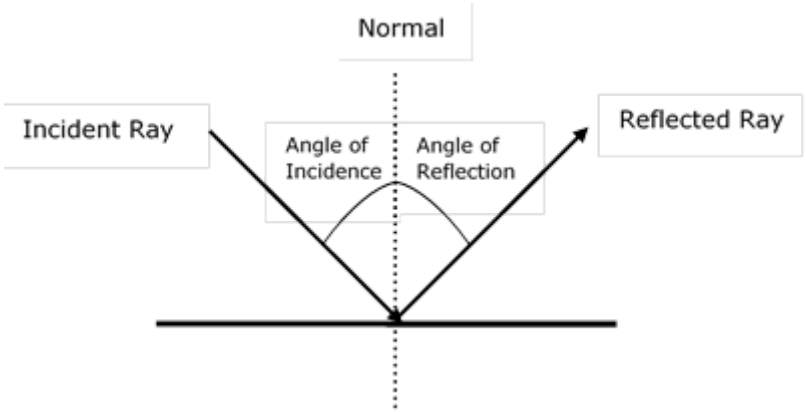
1 C. Question

The angle between the incident ray and the normal is called _____

(angle of incidence, angle of reflection, angle of refraction)

Answer

angle of incidence



2. Question

Fill in the blanks:

1. The working principle of a periscope is _____

2. A fruit appears to be bigger in a glass of water due to _____

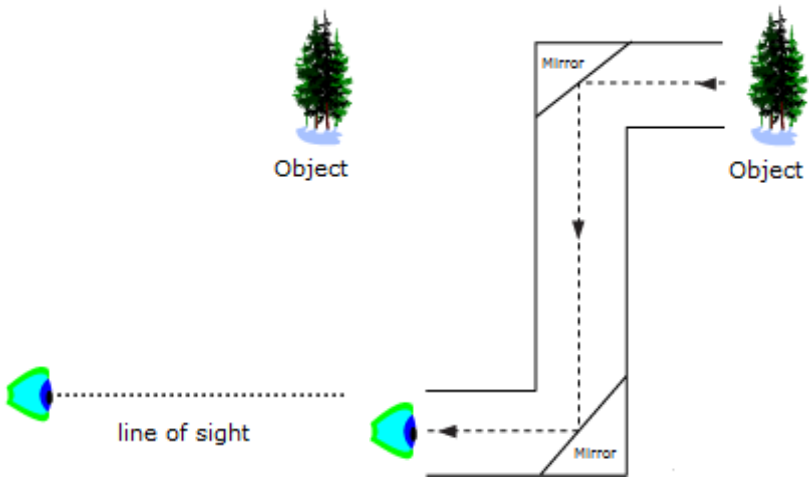
3. Sound cannot travel in _____

4. When we touch the ringing bell we can feel the _____

5. An audible sound has the frequency range of _____

Answer

1. **multiple reflections**



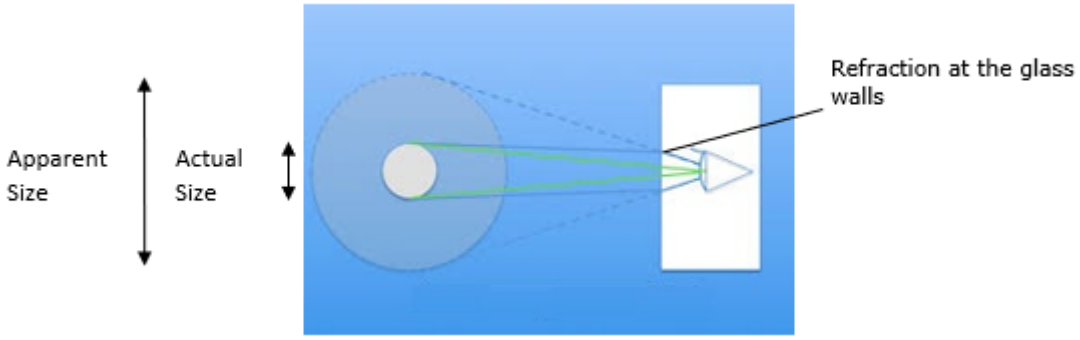
A periscope is used to observe something that is at a different height level. This is mostly used to avoid detection.

A simple periscope uses 2 mirrors tilted at an angle so that, the light from the object is **reflected multiple times** (in this case, twice) to reach the observer.

2. **Refraction**

We see an object (here, a fruit) when the light reflecting off the object reaches our eye. Here, the fruit is in a glass of water, and we are observing from outside (air).

Since there is a change in the medium, the light rays would bend. This phenomenon is called refraction. As a result, the light rays coming from the fruit bend, and reach our eyes, but we think that the light rays are coming straight into our eyes. This results in the magnification of the image. To understand clearly, see the following figure.



3. **Vacuum**

Vacuum means "empty space". It does not contain any form of matter. Sound requires a medium (like air, water, solids etc) to travel. As vacuum is devoid of everything, sound cannot travel in it. One can verify using the vacuum pump experiment mentioned in the textbook.

4. **Vibrations**

A bell when tapped using a rod, starts to vibrate, and we know that vibrating bodies produce sound. That is why, when we touch the bell, we feel a sensation of vibration.

5. 20-20000 Hz

Audible sound means the sound which can be heard by the human ear. The human ear is capable of hearing sounds of frequencies 20 Hz – 20000 Hz. Humans cannot hear the sounds beyond the given frequency range.

3 A. Question

Identify the mistakes and correct them:

The beautiful pattern that we obtain in a kaleidoscope is because of refraction.

Answer

The beautiful pattern that we obtain in a kaleidoscope is because of multiple reflections.

Kaleidoscope is an instrument which produces ever-changing patterns when rotated. To obtain these patterns, two or more reflectors (mirrors) are placed at an angle to one another. When the eye is placed at one end of the mirrors, the view on the other side is multiplied into a symmetrical pattern.

3 B. Question

Identify the mistakes and correct them:

Unwanted sound from any loudspeaker that causes discomfort of any kind is called Music.

Answer

Unwanted sound that causes discomfort is called Noise Pollution. Too much noise can damage the human ear, and cause other health problems.

Music refers to the sound which pleases a person. It does not cause any discomfort.

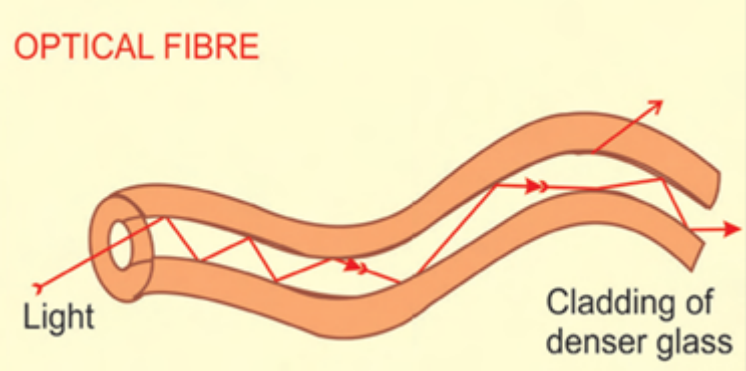
3 C. Question

Identify the mistakes and correct them:

An optical fibre is a device based on the principle of refraction.

Answer

An optical fibre works on the principle of total internal reflection.



When light enters the fibre at a very small angle, it undergoes multiple total internal reflections and reaches the other end. Optical fibre is widely used in communication purposes.

4. Question

Match the following:

a. Irregular reflection - Glass slab

b. Multiple reflection - Optic fibre

c. Refraction - Periscope

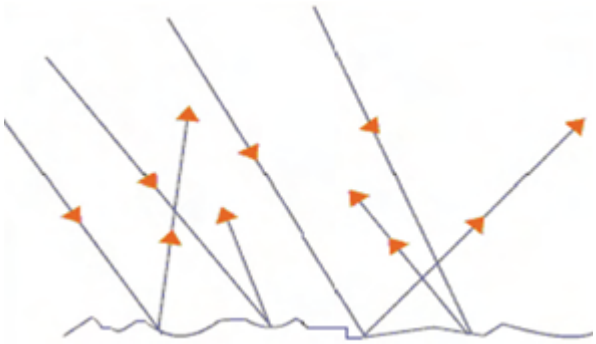
d. Total internal reflection – Wood

Answer

a. Irregular reflection – wood

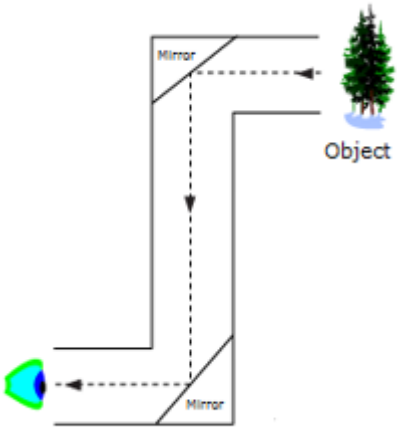
The surface of the wood is rough, and not polished. When light hits such surfaces, the reflected rays scatter in random directions (see figure below).

This is called irregular reflection.



b. Multiple reflection – Periscope

Periscopes are used, if the object to be viewed and the observer are not in line-of-sight. Periscope uses multiple mirrors, which allows the light to reflect multiple times so as to reach the observer.



A simple Periscope

c. Refraction – glass slab

Refraction is the phenomenon where the light ray bends while passing from one medium to another. When light travels from air to glass slab, there is a change in the medium, and hence refraction occurs.

d. Total internal reflection – optic fibre

An optical fibre is a thin fibre made of glass or plastic which allows light to move from one end to the other. The light is incident on the fibre at a small angle, and the light that passes inside undergoes repeated total internal reflections along the fibre and finally comes out.

5. Question

Classify the pairs of media as denser and rarer.

a. Air, water b. Air, glass c. water, glass

Answer

a. Air – rarer, Water – denser

b. Air – rarer, Glass – denser

c. Water – rarer, Glass – denser

6 A. Question

Objects present in the dark room are not visible. But when the light is switched on, everything present in the room becomes visible. Why does this happen?

Answer

We are able to see objects because the light which gets reflected from those objects reaches our eye. So if one were, to begin with no light source, then no light rays get reflected from objects and hence no light enters the eye. That is why we are not able to see anything in a dark room and see the objects present in the room once the light is switched on.

6 B. Question

Differentiate between regular and irregular reflection.

Answer

Regular Reflection	Irregular Reflection
Happens in smooth, polished surfaces	Happens in rough surfaces
Light rays are reflected in one direction when they are incident with the same angle.	Light is scattered in many directions.
Eg. of smooth surfaces: Mirror	Eg. of rough surfaces: Wood

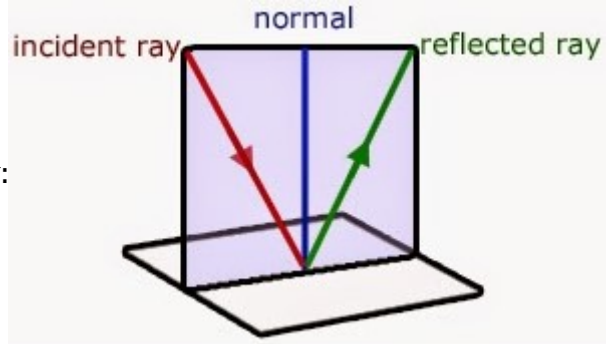
6 C. Question

State the laws of reflection.

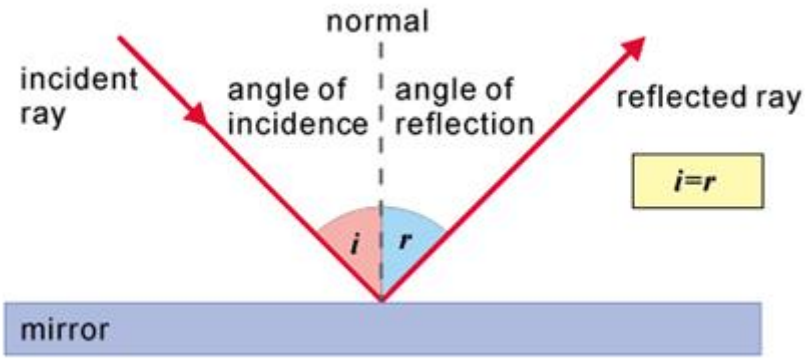
Answer

The laws of reflection state that,

A. The incident ray, the normal, the reflected ray will all fall in the same plane, as shown below:



B. The angle of incidence (angle between the incident ray and the normal) = the angle of reflection (angle between the reflected ray and the normal)The diagram is shown below:



6 D. Question

Suggest some measures to reduce noise pollution in your residential area.

Answer

Noise Pollution can be reduced by:

A. Prohibiting the usage of loudspeakers in public functions.

B. Listening to TV, computer, radio at low, comfortable volumes.

C. Only use vehicle horns whenever absolutely necessary.

D. Use headphones/earphones in controlled manner.

E. Introducing well-serviced and noiseless machineries in factories.

6 E. Question

Your parents are going to buy a new house. They have been offered one on the roadside and another two lanes away from the roadside. Which house would you suggest your parents? List out the ways and means to reduce noise.

Answer

The house two lanes away from the roadside is preferred, as it will minimise the effects of air and noise pollution produced in the road, on the parents.

To reduce noise, one should,

A. Use vehicle horns, whenever absolutely necessary. Do not simply honk, as it will be a disturbance to others.

B. Adjust the volume of headphones/TV/radio so that you or others are not harmed in any way.

C. Minimising the use of public loudspeakers in functions in and around the area.

6 F. Question

Extremely loud sound can make one deaf. Suggest some measures to check loud noise.

Answer

One can measure the loudness of noise by using a decibel meter. This instrument will tell us the given source of sound is harmful to our ears or not. decibel is the unit of intensity of sound.

Nowadays it is possible to measure the same using computers, and smartphones.

6 G. Question

Factories should not be constructed in the residential areas. Do you agree or not? If so, why?

Answer

Factories should not be constructed near residential areas because factories could be one of the sources of the noise, or air pollution. Excessive noise might cause health problems, including heart disease, ear impairment, etc.

6 H. Question

If Raman fixed two mirrors at an angle of 60 degrees to get as many number of images, could you find out the exact number of images produced? (N = 360/angle -1).

Answer

5

If 'd' is the angle made by the two mirrors, then the number of images ('N') formed by them is given by the expression:

$$N = \frac{360}{d} - 1$$

Here, d = 60°

$$N = \left(\frac{360}{60}\right) - 1 = (6) - 1 = 5$$

Raman could see five images.

6 I. Question

Veena and Rani are on the moon, Veena calls out her friend, but Rani does not hear Veena's call even though she is near. Discuss.

Answer

When comparing the atmosphere of the Earth and the Moon, the moon has a very thin atmosphere such that one can assume that the moon does not have an atmosphere. Or can say that the moon is surrounded by vacuum. We know that sound needs a medium to travel and cannot travel in a vacuum. This is the reason why Rani does not hear her friend Veena calling, even though she is near.