

## MULTIPLE CHOICE QUESTIONS

Choose the correct answer from the following choices:

i) Which of the following quantities is not changed during refraction of light?

- a) its direction
- b) its speed
- c) its frequency
- d) its wavelength

ii) A converging mirror with a radius of 20 cm creates a real image 30 cm from the mirror. What is the object distance?

- a) 50 cm
- b) 7.5 cm
- c) 15 cm
- d) 20 cm

iii) An object is placed at the center of curvature of a concave mirror. This image produced by the mirror is located:

- a) beyond the center of curvature
- b) at the center of curvature
- c) between the center of curvature and the focal point
- d) at the focal point

**iv) An object is 14 cm in front of a convex mirror. The image is 5.8 cm behind the mirror. What is the focal length of the mirror?**

- a) 4.1 cm
- b) 8.2 cm
- c) 9.9 cm
- d) 20 cm

**v) The index of refraction depends upon:**

- a) the focal length
- b) the speed of light
- c) the image distance
- d) the object distance

**vi) Which type of image is formed by a concave lens on a screen?**

- a) inverted and real
- b) inverted and virtual
- c) upright and real
- d) upright and virtual

**vii) Which type of image is produced by the converging lens of human eye if it views a distant object?**

- A) real, erect, same size

- c) Virtual. Erect, diminished
- b) real, inverted, diminished
- d) Virtual. inverted, magnified

**viii) Image formed on a camera is:**

- a) real, inverted, and diminished
- c) virtual. Upright and magnified
- b) virtual, upright and diminished
- d) real, inverted and magnified

**ix) If a ray of light in glass is incident on an air surface at an angle greater than the critical angle, the ray will:**

- a) refract only
- b) reflect only
- c) partially refract and partially reflect
- d) diffract only

**x) If a ray of light in glass is incident on an air surface at an angle greater than the critical angle, the ray will:**

- a) be absorbed
- b) totally reflected
- c) partially reflected and partially transmitted
- d) totally transmitted

### ANSWERS

- i) C) its frequency
- ii) C) 15 cm
- iii) B) centre of curvature
- iv) C) 9.9 cm
- v) B) the speed of light
- vi) D) upright and virtual
- vii) B) real, inverted, diminished
- viii) A) real, inverted, diminished
- ix) B) reflect only
- x) B) totally reflected

### REVIEW QUESTIONS

**12.2 Describe the following terms used in reflection?**

**a) Normal    b) angle of incidence    c) angle of reflection**

**Answer:**

**i) Normal**

An imaginary line perpendicular to the reflecting surface (on which the ray of light is incident) is called normal.

**ii) Angle of incidence**

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

**iii) Angle of reflection**

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

### 12.9 State the conditions for total internal reflection?

**Answer**

- 1) The ray of light should be incident from denser medium to rare medium.
- 2) The angle of incidence should be greater than the critical angle.

### 12.10 What is critical angle? Derive a relationship between the critical angle and the refractive index of a substance?

**Answer**

#### Critical angle

When a ray of light in the denser medium moves toward a rare medium then the angle of incidence at which light instead of refracting into rare medium comes across the media making an angle of refraction of  $90^\circ$  with the normal is called critical angle.

Relation between ' $\theta$ ' and ' $n$ '

According to snell's law,  $n_1 \sin \theta_1 = n_2 \sin \theta_2$

$$\text{If, } \theta_1 = \theta_c, \quad \theta_2 = 90^\circ$$

$$n_1 \sin \theta_1 = n_2$$

$$\therefore (\sin 90^\circ = 1)$$

$$\sin \theta_c = n_2/n_1$$

### 12.16 A coin is placed at a focal point of a converging lens. Is an image formed? What its nature?

**Answer**

Yes, an image will be formed away from the focal point which will be real inverted and magnified.

### 12.17 What are the differences between real and virtual images?

**Answer**

#### **Real image**

The image formed on the screen at the other side of the lens is called real image. It is obtained by joining the real rays of light.

#### **Virtual image**

The image formed on the same side where the object is placed is called virtual image. It is obtained by extending the real rays behind called imaginary rays. So virtual image is formed by joining such imaginary lines.

### 12.20 i) Describe the passage of light through a glass prism?

#### ii) Measure the angle of deviation?

**Answer**

i) Please see the topic.

ii) for the measurement of angle of deviation, we apply the following formula.

$$n = \frac{\sin(A + \frac{D_m}{2})}{\sin(\frac{A}{2})}$$

Where  $n$  is the refractive index of glass medium, ' $A$ ' is the angle of prism and ' $D_m$ ' is the angle of deviation.

Secondly, angle of deviation can also be measured graphically through diagram.

## CONCEPTUAL QUESTIONS

**12.1 A man raises his left hand in a plane mirror, the image facing him is raising his right hand. Explain why.**

**Answer**

In case of plane mirror, virtual & opposite image is formed due to which left hand of the man is seemed to be right hand in the mirror.

**12.2 In your own words, explain why light waves are refracted at a boundary between two materials.**

**Answer**

When a ray of light enters from rare medium to denser medium its speed and wave length are decreased while frequency remains the same. Due to this fact light bends while entering from one medium (rare) to another medium (denser).

**12.3 Explain why a fish under water appears to be at a different depth below the surface than it actually is. Does it appear deeper or shallower?**

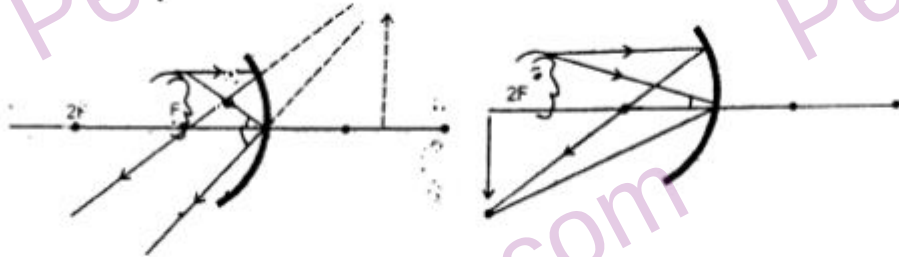
**Answer**

This is due to the refraction of the light by which apparent depth of the fish is seen at some angle outside the water. The fish appears shallower as compared to its actual position or location.

**12.4 Why or why not concave mirrors are suitable for make up?**

### Answer

If the face of the person is in the range of focal length of concave mirror, its image formed is virtual, erect and magnified but as we move away from the focal point. The image becomes real but inverted and magnified as shown below.



### 12.5 Why is the driver's side mirror in many cars convex rather than plane or concave?

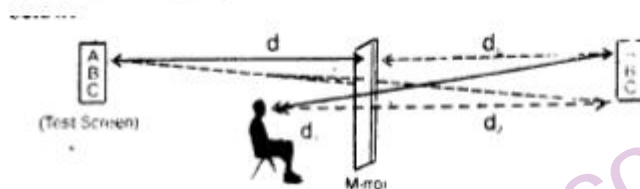
#### Answer

It is better to use concave mirrors to view properly the far sight cars coming behind. In this case the rays coming from those cars or objects diverge and make an erect and virtual image.

### 12.6 When an optician's testing road is small, he uses mirror to help him test the eye sight of his patients. Explain why.

#### Answer

In this case the patients observe the test screen double that of its actual distances shown below



So total distance of test screen as observed by the patient will be ....

**12.7 How does the thickness of lens effects its focal length?**

**Answer**

Thick lens has short focal length while thin lens has large focal length.

**12.8 Under what conditions will a converging lens form a virtual image?**

**Answer**

If the object lies within the range of focal length of converging lens then the ....  
Formed will be virtual. Erect and magnified.

**12.9 Under what conditions will a converging lens form a real image that is the same size as the object?**

**Answer**

When the object is placed at  $2F$  from a converging lens then its real, inverted but same sized image is formed.

**12.10 Why do we use refracting telescope with large objective lens of large focal length?**

**Answer**

In case of telescope, large objective lens is used to collect maximum rays of light coming from far sight objects and the focal length of such objective lens is also kept large to focus all the rays received at a common focal point of objective lens and eye-piece. That is why a refracting telescope having large objective lens of large focal length is commonly used to view distant objects.

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