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Class: 10
Subject: Physics
Topic: Light
No. of Questions: 26

Q1. For the same angle of incidence 45 degree, the angle of refraction in two transparent media 1 and 2 is 20 degree and 30 degree respectively. out of 1and 2 which is optically denser medium and why ?

Ans. As the angle of refraction is less for medium 1, So medium 1 will be optically denser medium than medium 2.

Q2. For the same angle of incidence in media p , q , r the angles of refraction are 45 , 35 and 15 degrees respectively. In which medium will the velocity of light be minimum?

Ans. Taking the refractive index of the medium as sin i / sin r, the refractive index of medium 'r' is the maximum and the refractive index of medium 'p ' is the least. In other words, out of the three media, the medium 'r' is the densest. Therefore, the velocity of light will be minimum in 'r '.

Q3. For what angle of incidence, the lateral shift produced by parallel sided glass plate is zero?

Ans. For <i = 0.

Q4. What are the factors on which the lateral shift depends?

Ans. Thickness of the refracting medium, angle of incidence and its refractive index

Q5. A coin in a glass beaker appears to rise as the beaker is slowly filled with water. Why?

Ans. It happens on account of refraction of light. A ray of light starting from the coin goes from water to air and bends away from normal. Therefore, bottom of the beaker on which the coin lies appears to be raised.

Q6. An object under water appears to be at lesser depth than in reality. Explain why?

Ans. This is due to refraction of light. We know

Real depth / Apparent depth = n Or Apparent depth = Real depth / n

Since n > 1, so apparent depth < real depth

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Q7. Why does bending of light takesplace?

Ans. The bending of light takes place because it travels with different velocity in different media

Q8. Does the refractive index of substance change with the colour of light ?

Ans: Yes, refractive index depends upon the colour of light (wavelength)

Q9. What is the advantage of "total internal reflection" over reflection ?

Ans: The loss of intensity of light is less in total internal reflection than reflection

Q10. In refraction of light through a rectangular glass slab, the emergent ray is parallel to the direction of the incident ray. Why

Ans: This is because glass slab has parallel reflecting surfaces

Q11. Under what condition in an arrangement of two plane mirrors, incident ray and reflected ray will always be parallel to each other, whatever may be angle of incidence.

Ans. Incident ray and reflected ray will always be parallel to each other if two plane mirrors are placed perpendicular to each other.

Q12. Define the principal focus of a concave mirror.

Ans. Light rays that are parallel to the principal axis of a concave mirror converge at a specific point on its principal axis after reflecting from the mirror. This point is known as the principal focus of the concave mirror

Q13. The radius of curvature of a spherical mirror is 20 cm. What is its focal length?

Ans. Focal length =R/2=20cm /2 = 10cm

Q14. Why do we prefer a convex mirror as a rear-view mirror in vehicles?

Ans. `We prefer a convex mirror as a rear-view mirror in vehicles because it gives a wider field of view, which allows the driver to see most of the traffic behind him. Convex mirrors always form a virtual, erect, and diminished image of the objects placed in front of it.

Q15. A concave mirror produces three times magnified (enlarged) real image of object placed at 10 cm in front of it. Where is the image located?

Ans. Here a concave mirror produces three times magnified (enlarged) real image

So, m=-3 and u = -10cm

-v/u = -3, -v/-10=-3, v = - 30cm

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Here, the negative sign indicates that an inverted image is formed in front of the given concave mirror at a distance of 30 cm

Q16. A ray of light travelling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?

Ans. The light ray bends towards the normal because water is optically denser than air.

Q17. Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass? The speed of light in vacuum is 3×10^8 m/s.

Ans. Speed of light in the glass = Speed of light in vacuum / refractive index of glass $=3 \times 10^8$ m/ 1.50 = $2x10^8$m/s

Q18. Find out, from Table (see NCERT Book), the medium having highest optical density. Also find the medium with lowest optical density.

Ans. As we know that Optical density of any medium is directly proportional to the refractive index of that medium. Therefore, diamond has the highest optical density and air has the lowest optical density.

Q19. You are given kerosene, turpentine and water. In which of these does the light travel fastest? Use the information given in Table (see NCERT Book)

Ans. As we know that velocity of light is inversely proportional to the refractive index of that medium. It can be observed that water has the lowest refractive index Therefore; light travels the fastest in water.

Q20. The refractive index of diamond is 2.42. What is the meaning of this statement?

Ans. The refractive index of diamond is 2.42. This suggests that the speed of light in diamond will decreases 2.42 times to the speed of light in air.

Q21. Define 1 dioptre of power of a lens.

Ans. 1 dioptre is the power of a lens having focal length 1 meter Hence, 1 D = 1 m^{-1}

Q22. A convex lens forms a real and inverted image of a needle at a distance of 50 cm From it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object? Also, find the power of the lens.

Ans. We know that the convex lens form a real image of equal the size of the object if object placed at 2F in front of Lens.

Distance of object u = - 50cm As Distance image = 50 cm

Using the lens formula you can find Focal length =25cm= 0.25m

Then, the power of the given lens = 1/f=1/0.25= +4 D

Question 23: Find the power of a concave lens of focal length 2 m.

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The power of the given lens = 1/f=1/-2= -0.5 D

Q24. The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of the object?

Ans. When an object is placed between the pole and focus of a concave mirror virtual, erect, and larger than the object image is formed.

Q25. Where an object should is placed in front of a convex lens to get a real image of the size of the object?

Ans. An object is placed at the centre of curvature in front of a convex lens to get a real image of the equal size of the object at the centre of curvature.

Q26. A spherical mirror and a thin spherical lens have each a focal length of -15 cm. The mirror and the lens are likely to be----------

Ans. Concave in nature because the focal length of a concave mirror and a concave lens are taken as negative.