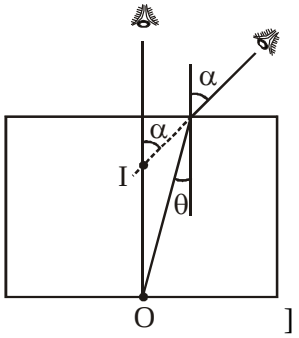
SHORT ANSWER

1. Is the formula "Real depth/Apparent depth = μ valid if viewed from a position quite away from the normal?
   Ans: No

[Sol.
In the derivation of above formulae $\sin\theta \approx \tan\theta$ this can be done only when angle is small. For eye 1 this approximation can be done but not for eye 2.



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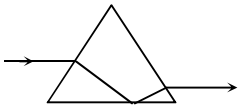
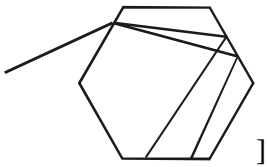
2. Can you ever have a situation in which a light ray goes un-deviated through a prism?
   Ans: Yes



3. Why does a diamond shine more than a glass piece cut to the same shape?
   Ans: TIR

[Sol.
M is concept: The ray get trapped inside the diamond and undergo multiple reflection and shine.
Concept: When while light falls on diamond as critical angle is very small it undergo multiple TIR before coming out more is TIR more separation is between the different colours when this light comes out and fall on eye. It due to different colours it shines.



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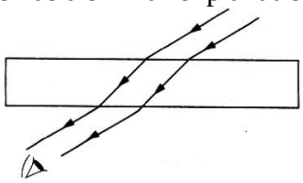
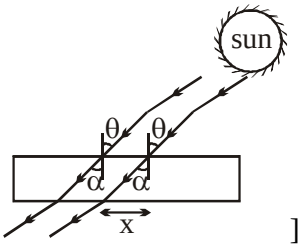
4. A narrow beam of light passes through a slab obliquely and is then received by an eye. The index of refraction of the material in the slab fluctuates slowly with time. How will it appear to the eye? The twinkling of stars has a similar explanation.



   Ans: The image position shifts because of variation in refractive index. Thus it appears to be twinkling to the eyes.

[Sol. When μ changes α changes and also x changes so ray appear to come from different position.



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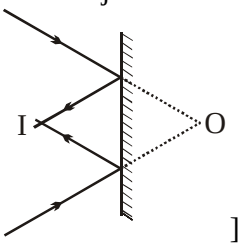
5. Can a plane mirror ever form a real image?
   Ans: Yes

[Sol. It object is virtual image is real.



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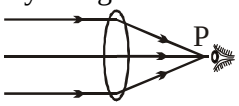
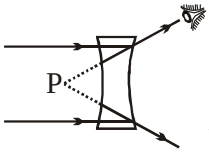
6. If a piece of paper is placed at the position of a virtual image of a strong light source, will the paper burn after sufficient time? What happens if the image is real? What happens if the image is real but the source is virtual?
   Ans: No, Yes, Yes

[Sol.
Real Image: Rays are really getting focussed at point P so intensity is high.



Virtual Image: Ray appears to come from point P and no real concentration of ray at P.



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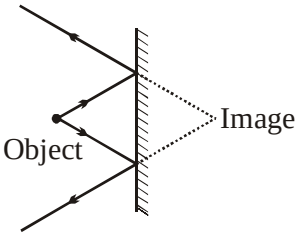
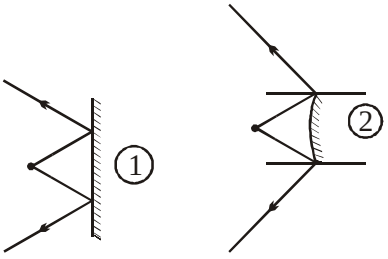
7. Can a virtual image be photographed by a camera?
   Ans: Yes



[Sol.
Yes, when you stand in front of plane mirror image is virtual and can be photographed.]

8. In motor vehicles, a convex mirror is attached near the driver's seat to give him the view of the traffic behind. What is the special function of this convex mirror which a plane mirror cannot do?
   Ans: Field of view is large.

[Sol. Field of view is more for mirror 2



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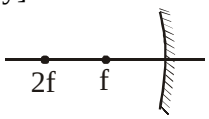
9. If an object far away from a convex mirror moves towards the mirror, the image also moves. Does it move faster, slower or at the same speed as compared to the object?
   Ans: slower. $v_{img} = m^2 v_0$ [m < 1 as far away]



[Sol.
It objects moves from infinity to 2f as distance moved by object is more in same time hence velocity of object is more.]

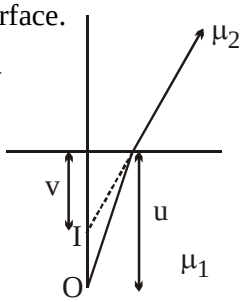
10. Suppose you are inside the water in a swimming pool near an edge. A friend is standing on the edge. Do you find your friend taller or shorter than his usual height?
    Ans: taller. When view from outside water, the height is $x_2 - x_1$; but when viewed from inside water, the height is $\mu (x_2 - x_1)$.

11. The equation of refraction at a spherical surface is $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$.
    Taking R = ∞, show that this equation leads to the equation $\frac{\text{Real depth}}{\text{Apparent depth}} = \frac{\mu_2}{\mu_1}$ for refraction at a plane surface.

[Sol. $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{\infty}$

$\frac{\mu_2}{v} = \frac{\mu_1}{u}$

$\Rightarrow \frac{\mu_2}{\mu_1} = \frac{v}{u}$.



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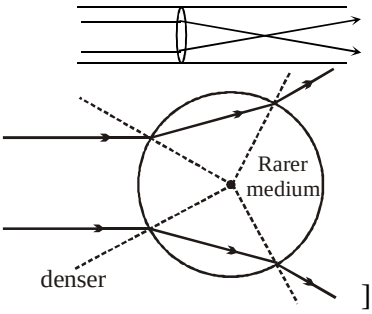
12. A *thin* converging lens is formed with one surface convex and the other plane. Does the position of image depend on whether the convex surface or the plane surface faces the object?
    Ans: No

[Sol. If it is a thin lens then focal length is not effected by from which side ray falls.]

13. A single lens is mounted in a tube. A parallel beam enters the tube and emerges out of the tube as a divergent beam. Can you say with certainty that there is a diverging lens in the tube?
Ans: No

[Sol.


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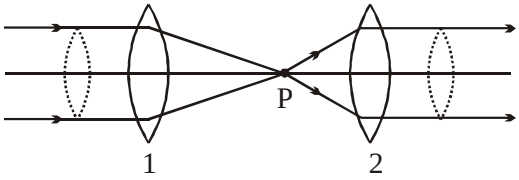
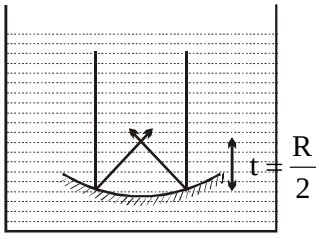
14. An air bubble is formed inside water. Does it act as a converging lens or a diverging lens?
Ans: diverging

15. Two converging lenses of unequal focal lengths can be used to reduce the aperture of a parallel beam of light without loosing the energy of the light. This increases the intensity. Describe how the converging lenses should be placed to do this.

[Sol.


Point p is focal length of lens 1 as well as lens 2.]

16. If a spherical mirror is dipped in water, does its focal length change?
Ans: No (offcourse we always take the thickness of mirror to be 3 to 4 mm only)

[Sol.


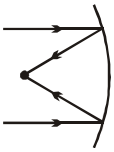
If thickness of mirror is there then refraction through glass and water is to be considered.]

17. If a thin lens is dipped in water, does its focal length change?
Ans: Yes

[Sol. $\frac{1}{f_2} = \left(\frac{\mu_2}{\mu_m} - 1\right)\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$

Is μ_{medium} is changed focal length gets changed.]

18. Can mirrors give rise to chromatic aberration?
Ans: No

[Sol.

For all colour Ray focal length is $\frac{R}{2}$ so for all rays image is formed at same point hence no chromatic aberration.]

19. A laser light is focussed by a converging lens. Will there be a significant chromatic aberration?
Ans: No, since it is monochromatic

[Sol. No, since it is monochromatic or of single wave length so μ is single so single wave length.]