PHYSICS

REFRACTION AT CURVED SURFACES

QUESTIONS

1   Write the formula for formation of image by curved surfaces?

2.   A man wants to get a picture of a zebra. He photographed a white donkey after fitting a glass with black stripes on the lens of his camera. What photo will he get? Explain.

3.   If a white sheet of paper is stained with oil, the paper turns transparent. Why?

4.   Define the word lens.

5.   How do we represent a) Convex lens (b) Concave lens.

6.   Can a virtual image be photographed by a camera?

7.   What is centre of curvature ?

10.   What is pole or optical centre ?

9.   What is principal axis ?

10.   What is focus?

11.   What is focal length ?

12.   What is focal plane ?

13.   What is radius of curvature?

14.   What are paraxial rays ?

15.   Draw the refracted ray given below diagram?

16.   When does a convex lens behave as a concave lens ?

17.   What is the focal length and power of a rectangular glass slab ?

18.   Why is the power of a lens measured as the reciprocal of its focal length ?

19.   Sun glasses (goggles) have curved surfaces but they do not have any power why

20.   Two thin lenses of powers +2D and +5D are placed in contact. Will the focal length of the combination increase, or decrease ?

Key

1. Image formula :- $\dfrac{n_2}{v} - \dfrac{n_1}{u} = \dfrac{n_2 - n_1}{R}$

   Where, n_1 = Refractive index of the first medium.
   n2= Refractive index of the second medium.
   u= Object distance.
   v = Image distance.
   R = Radius of curvature.

2. 1. Photographer will get a picture of white donkey.
   2. This is because the reflected light from the donkey enters the lens of the camera through the Opening of the stripes and form the full image. Since some of rays are blocked the image will be slightly dull.

3. The oil connects the fibres in the paper with a liquid which can transmit by refraction (rather than scattering) light that falls upon it . As a result , the paper stained with oil is turned transparent.

4. Lens: - A lens is formed when a transparent material bounded by two surfaces of which one or both surfaces are spherical.

5. a) Convex lens is represented with a symbol ↕

   b) Concave lens is represented with a symbol ⅄

6. Yes, a virtual image can be photographed by a camera.
7. The centre of sphere which contains the part of curved surface is called centre of curvature
8. The midpoint of a thin lens is called pole or optical centre.
9. The line which joins the centre of the curvature and the pole is called principal axis.
10. The point where refracted rays converge or the point from which refracted rays appears to diverge is called focal point or focus.
11. The distance between pole and focus is called focal length.
12. A plane which is perpendicular to principal axis at the focus is called focal plane.
13. The distance between the centre of curvature and curved surface is called radius of curvature.
14. The rays which moves very close to the principal axis which can be treated as paralled are called paracial rays.
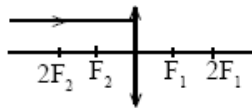
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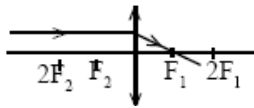
16. When a lens is placed inside a transperent medium of refractive index greater than that of its own material , it behaves as a concave lens.
17. Focal length of a glass slab is infinity. Power of a glass slab is zero.
18. The power of a lens represents its ability to converge or diverge a beam of light. Smaller its focal length, larger is its bending power. That is why power is expressed as reciprocal of focal length (P = 1/f).
19. Both the surfaces of sun glasses are equally curved i.e, $R_1 = R_2$ and hence

   Power, $P = (n-1)\left[\dfrac{1}{R_1} - \dfrac{1}{R_2}\right] = 0$

20. Power of combination P = P_1+P_2=2+5=7D
   As power increases , so focal length of the combination decreses.