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HUMAN EYE AND THE COLOURFUL WORLD

CHAPTER NO.11

SUB: PHYSICS

HUMAN EYE AND THE COLOURFUL WORLD

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Scattering of light

- The reflection of light from an object in all directions is called scattering.
- Very fine particles scatter blue light.
- Particles of larger size scatter light of longer wavelength (red colour)
- Scattering $\alpha\ d^6$
- Scattering $\alpha\lambda^4$.

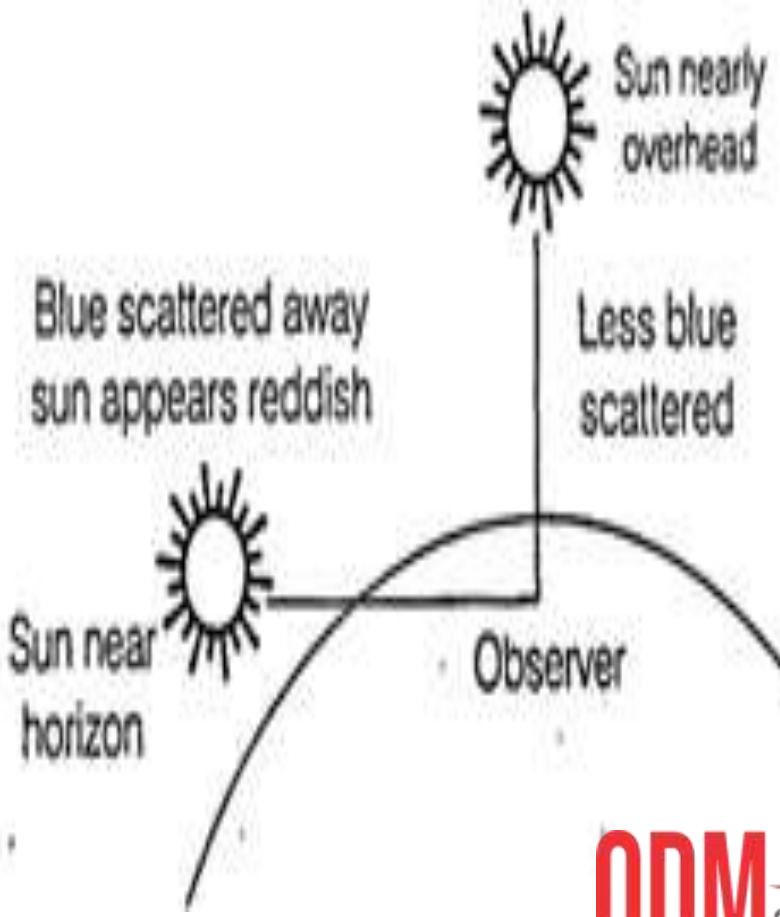
Answer the questions

- Why the colour of the sky is blue?
- Why the sky appears black to the astronauts?
- Why the sun appears reddish at the time of sun rise and sun set?
- Why the danger signals are red in colour?

Answer the questions

- Answers: 1) During the day time sky appears blue. Because,
- The size of the particles in the atmosphere is smaller than the wavelength of visible light. So, they scatter the light of shorter wavelength.
- So, the sky appears blue.

Why the sun appears reddish at the time of sun rise and sun set?



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The sky is blue

- A clear cloudless day-time sky is blue because molecules in the air scatter blue light from the sun more than they scatter red light.
- When we look towards the sun at sunset, we see red and orange colours because the blue light has been scattered out and away from the line of sight.

BLUE SKIES

When light hits our atmosphere, it separates into all its colours. Blue light scatters, making the sky appear blue, while the rest of it reaches our eyes as white light.

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Answer the questions

- A person cannot see the object beyond 3m distinctly. State the nature and focal length of the lens required to correct this defect of vision.
- **Answer**: The person cannot see the object beyond 3m distinctly.
- i.e he is suffering from myopia.
- To correct this defect, concave lens will be used which can form the image of an object which is at infinite distance at 3m from eye.
- U = -∞, v = -3m = -300 cm.
- Lens formula: 1/f = 1/v – 1/u
- 1/f = 1/-300.
- F = -300 cm = -3 m.

Answer the questions

- A person needs a lens of power -5.5 D for correcting his distant vision. For correcting his near vision he needs a lens of power + 1.5 D. What is the focal length of the lens required for correcting i. distant vision ii. Near vision.
- F = 1/p.

- = - 1/ 5.5 = - 0.18m = - 18 cm.
- F = 1/p = 1/1.5 = 0.67 m = 67 cm.

Answer the questions

- The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the problem?
- Answer:
- The image of a distant object should be formed at 80 cm in front of the eye.
- U = - ∞, v = -80 cm.
- Lens formula: $1/f = 1/v - 1/u$.
- F = - 1/80.
- P = 1/f in m = -100/80 =- 1.25D.

Answer the questions

- Make a diagram to show how hypermetropia is corrected? The near point of hypermetropic eye is 1m. What is the power of lens required to correct this defect? Assume that near point of the normal eye is 25 cm.
- Answer: v = -1 m = - 100 cm.
- U = -25 cm. By applying lens formula, f = 100/3 cm = 1/3 m
- P = 3D.

Q.Define the principal focus of a concave mirror.

- Answer-

- 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 called the principal focus of the concave mirror

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

- Answer-

- Radius of curvature (R) = 20 cm
- Radius of curvature of the spherical mirror = 2 × Focal length (f)
- R = 2f f= R/2 = 20 / 2 = 10
- Therefore, the focal length of the spherical mirror is 10 cm.

Answer The Questions

- **Q.Name the mirror that can give an erect and enlarged image of an object.**
- Answer-
-
- The mirror that can give an erect and enlarged image of an object is Concave Mirror.
- **Q.Why do we prefer a convex mirror as a rear-view mirror in vehicles?**
- Answer-
-
- Convex mirror is preferred as a rear-view mirror in cars and vehicles as it gives a wider field of view, which helps the driver to see most of the traffic behind him. Convex mirrors always form an erect, virtual, and diminished image of the objects placed in front of it.
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Answer The Questions

- **Q.Find the focal length of a convex mirror whose radius of curvature is 32 cm.**
- Answer-
-
- Radius of curvature (R) = 32 cm Radius of curvature = 2 × Focal length (f) R= 2f
- f = R/2 = 32/2 = 16
- Therefore, the focal length of the given convex mirror is 16 cm.

Answer The Questions

- **Q.A ray of light travelling in air enters obliquely into water. Does the light ray bends towards the normal or away from the normal? Why?**
- Answer-
-
- The light ray bends towards the normal. When a light ray enters from an optically rarer medium (which has low refractive index) to an optically denser medium (which has a high refractive index), its speed slows down and bends towards the normal. As water is optically denser than air, a ray of light entering from air into water will bend towards the normal

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