CLASS 10TH MID TERM

SCORE BOOSTER

PHYSICS

HUMAN EYE & THE COLOURFUL WORLD

ONE SHOT

Human Eye

- Eye Defects
  - Myopia
  - Hypermetropia
  - Presbyopia

Dispersion of Light

- Splitting of white light into its constituent colours
- Rainbows are formed due to natural dispersion of light

Scattering of Light

- Redness of the Sun during sunrise and sunset
- Blueness of sky
- Red light scatters the less

Atmospheric Refraction

- Twinkling of stars
- Planets do not twinkle
- Advanced sunrise and delayed sunset

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13th Sept 2024

Topic	PDF	Link
Real Numbers		
Life processes		

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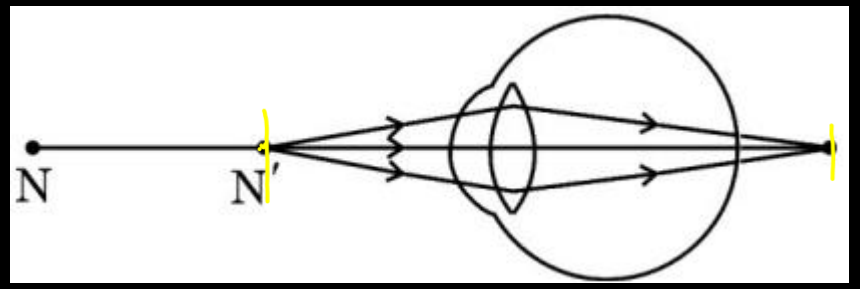
Human Eye

MCQ 1: A student sitting on the last bench can read the letters written on the blackboard but is not able to read the letters written in his text-book. Which of the following statements is correct?

(a) The near point of his eyes has receded away
(b) The near point of his eyes has come closer to him
(c) The far point of his eyes has come closer to him
(d) The far point of his eyes has receded away

Human Eye

SA 1: Study the diagram given below and answer the questions that follow :



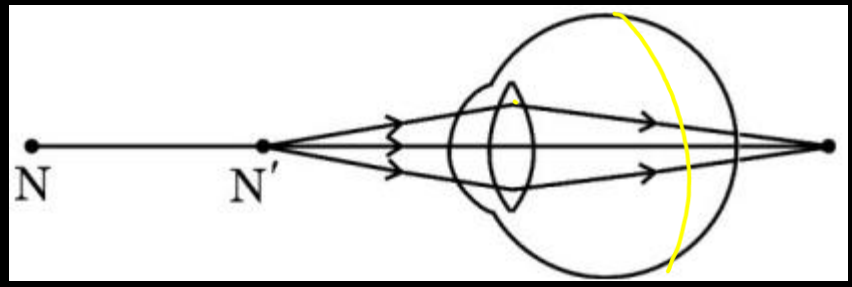
i. Name the defect of vision depicted in this diagram stating the part of the eye responsible for this condition.

Answers:

i. Hypermetropia. The eye lens is responsible for this condition.

Human Eye

SA 1: Study the diagram given below and answer the questions that follow :



ii. List two causes of this defect.

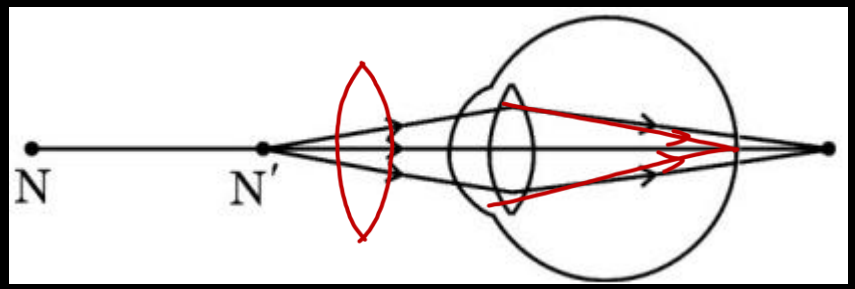
Answer:

(i) The focal length of the eye lens is too long,

(ii) The eyeball has become too small

Human Eye

SA 1: Study the diagram given below and answer the questions that follow :



iii. Name the type of lens used to correct this defect and state its role in this case.

Convex lens.
It helps to focus the rays into the retina.

Human Eye

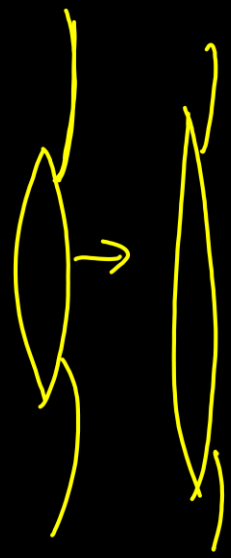
SA 2: Define the term power of accommodation of human eye. Write the name of the part of eye which plays a major role in the process of accommodation and explain what happens when human eye focuses (i) nearby objects and (ii) distant objects.

Answers:

The ability of the eye lens to adjust its focal length is called accommodation. However, the focal length of the eye lens cannot be decreased below a certain minimum limit.

The ciliary muscles plays the major role in the process of accommodation by adjusting the curvature of the eye lens.

Human Eye



SA 2: Explain what happens when human eye focuses (i) nearby objects and (ii) distant objects.

Answers:

(i) When you are looking at objects closer to the eye, the ciliary muscles contract. This increases the curvature of the eye lens. The eye lens then becomes thicker. Consequently, the focal length of the eye lens decreases. This enables us to see nearby objects clearly

(ii) When the muscles are relaxed, the lens becomes thin. Thus, its focal length increases. This enables us to see distant objects clearly

Human Eye

SA 3: Name the type of lens presented by opticians for the correction of hypermetropia. State the role of such lenses in correcting the vision of the person suffering from this defect.

Answers:

Opticians prescribe **convex lenses** (also called **converging lenses**) for the correction of hypermetropia, commonly known as farsightedness.

Convex lenses help correct the eye's focusing issue by making near objects appear sharp.

Homework Answers

MCQ 1: Absolute refractive index of glass and water is ~~2/3~~ 3/2 and ~~3/4~~ 4/3 respectively. If the speed of light in glass is 2×10^8 m/s, the speed of light in water is :

(A) $\frac{9}{4}\times10^8$ m/s

(B) $\frac{5}{2}\times10^8$ m/s

(C) $\frac{7}{3}\times10^8$ m/s

(D) $\frac{16}{9}\times10^8$ m/s

$$\frac{n_g}{n_w}=\frac{c/v_g}{c/v_w}$$

$$=\frac{c}{v_g}\times\frac{v_w}{c}$$

$$v_w=v_g\times\frac{n_g}{n_w}$$

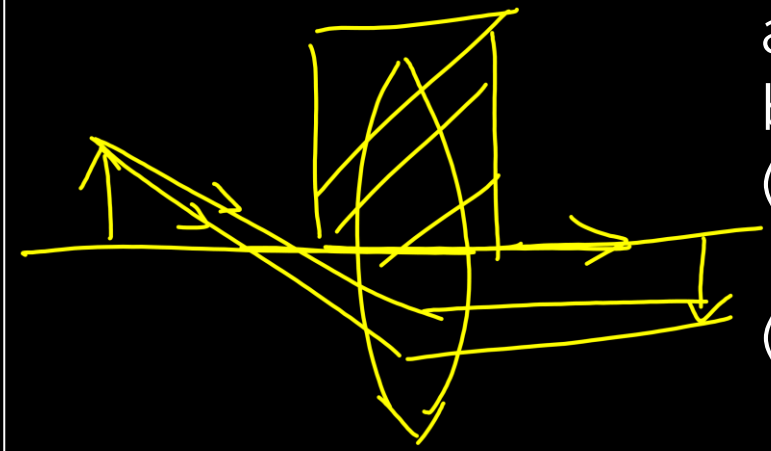
$$=2\times10^8\times\frac{9}{8_4}=\frac{9}{4}\times10^8\ m/s$$

$$n_g=\frac{3}{2}=\frac{c}{v_g}$$

$$n_w=\frac{4}{3}=\frac{c}{v_w}\rightarrow$$

$$\frac{n_g}{n_w}=\frac{3/2}{4/3}=\frac{3}{2}\times\frac{3}{4}=\frac{9}{8}$$

Homework Answers



MCQ 2: How will the image formed by a convex lens be affected, if the upper half of the lens is wrapped with a black paper ?

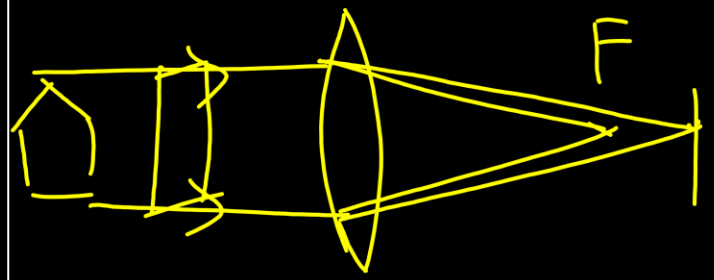
(A) The size of the image formed will be one-half of the size of the image due to complete lens.

(B) The image of upper half of the object will not be formed.

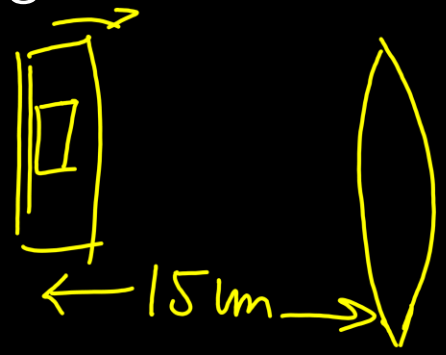
(C) The brightness of the image will reduce.

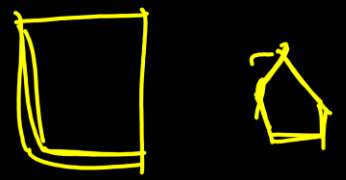
(D) The lower half of the inverted image will not be formed.

Homework Answers



SA 1: Sudha finds out that the sharp image of the window pane of her science laboratory is formed at a distance of 15 cm from the lens. She now tries to focus the building visible to her outside the window instead of the window pane without disturbing the lens. In which direction will she move the screen to obtain a sharp image of the building? What is the approximate focal length of this lens?





Homework Answers

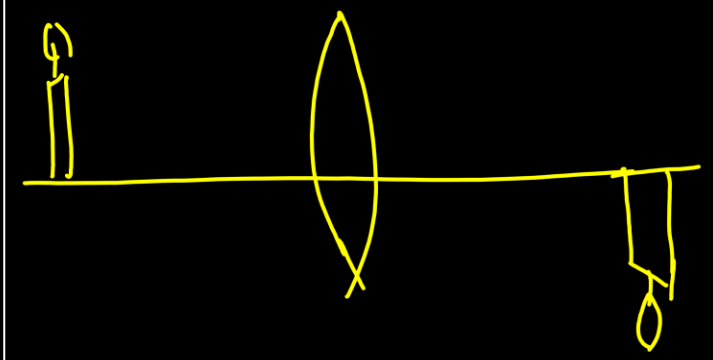
SA 2: How are power and focal length of a lens related? You are provided with two lenses of focal length 20 cm and 40 cm respectively. Which lens will you use to obtain more convergent light?

$$P = \frac{1}{f} \qquad f \Rightarrow m.$$

$$P_1 = \frac{100}{20} = +5\ D \leftarrow$$

$$P_2 = \frac{100}{40} = 2.5\ D$$

Homework



LA 1: The image of a candle flame formed by a lens is obtained on a screen placed on the other side of the lens. If the image is three times the size of the flame and the distance between lens and image is 80 cm, at what distance should the candle be placed from the lens? What is the nature of the image at a distance of 80 cm and the lens?

$$m = \frac{v}{u} = 3$$

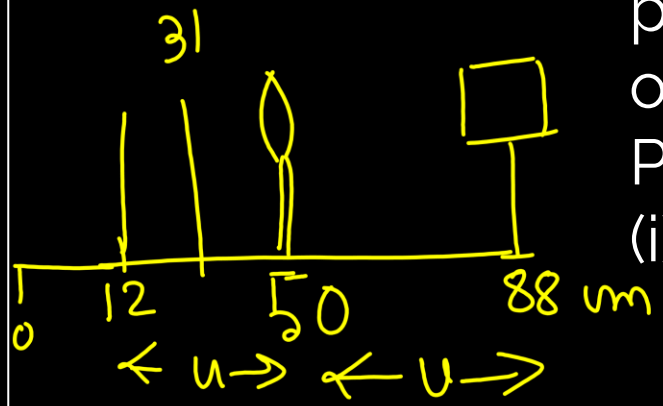
$$\Rightarrow \frac{80}{u} = 3$$

$$u = \frac{80}{3} \approx 27$$

$$u = 27 \text{ cm}$$

1) Real
2) Inverted
3) Magnified

Homework Answers



LA 2: A student focussed the image of a candle flame on a white screen using a convex lens. He noted down the position of the candle screen and the lens as under Position of candle = 12.0 cm Position of convex lens = 50.0 cm Position of the screen = 88.0 cm

(i) What is the focal length of the convex lens?

$u = (50-12) = 38$ cm

$v = (88-50) = 38$ cm

$2f = 38$

$f = 19$ cm

(ii) Where will the image be formed if he shifts the candle towards the lens at a position of 31.0 cm?

$u = (50-31) = 19$ cm , Infinity.

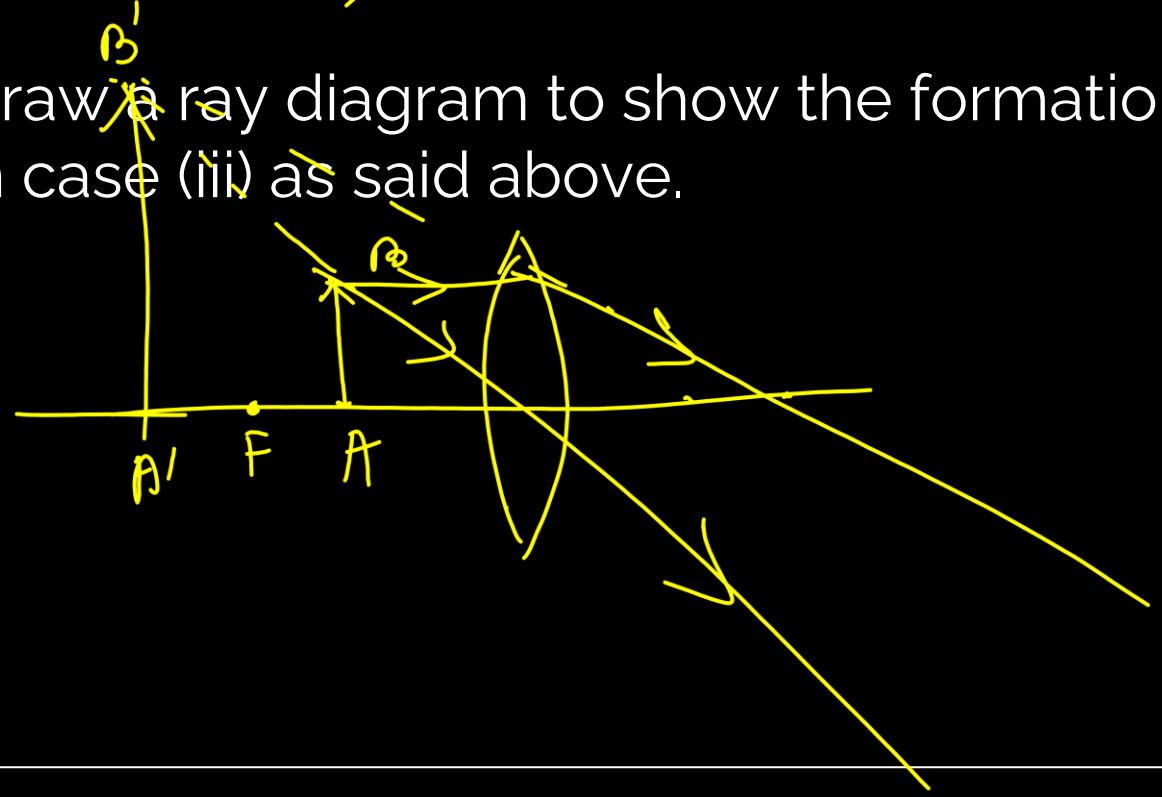
Homework Answers

LA 2:

iii. What will be the nature of the image formed if he further shifts the candle towards the lens?

u < f, Virtual, Erect & magnified.

iv. Draw a ray diagram to show the formation of the image in case (iii) as said above.



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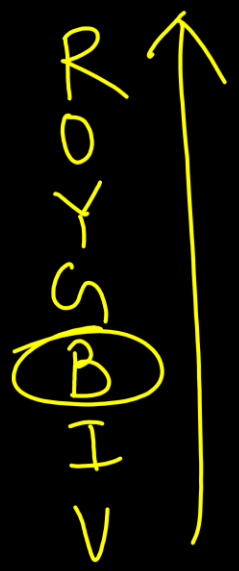
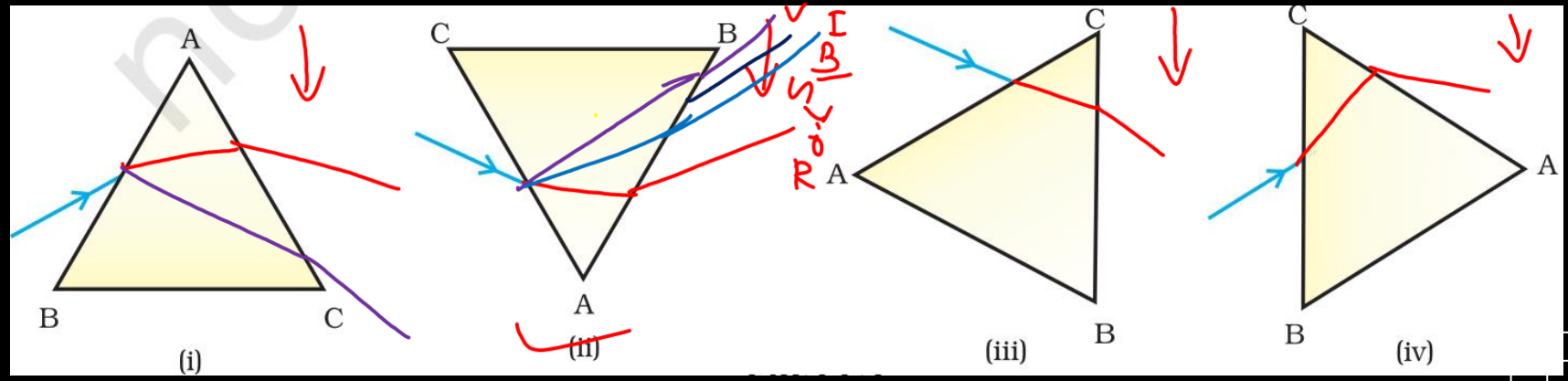


Dispersion of White Light

MCQ 2 : A prism ABC (with BC as base) is placed in different orientations. A narrow beam of white light is incident on the prism as shown in Figure below. In which of the following cases, after dispersion, the third colour from the top corresponds to the colour of the sky?

a) (i) *c)* (iii)

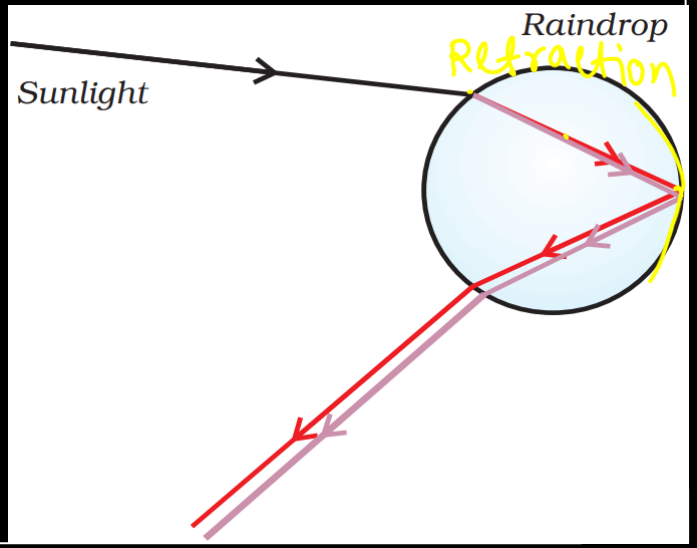
b) (ii) *d)* (iv)



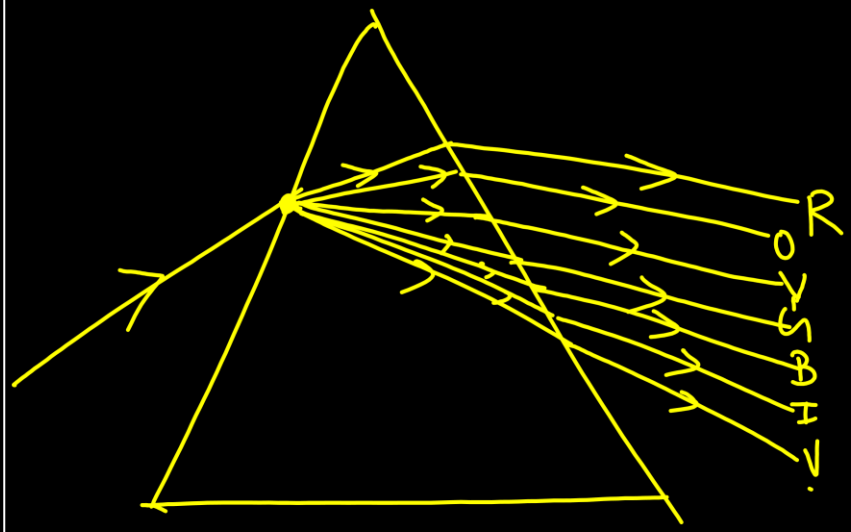
Dispersion of White Light

MCQ 3 : Which of the following phenomena of light are involved in the formation of a rainbow?

(a) Reflection, refraction and dispersion
(b) Refraction, dispersion and total internal reflection
(c) Refraction, dispersion and internal reflection
(d) Dispersion, scattering and total internal reflection



Dispersion of White Light



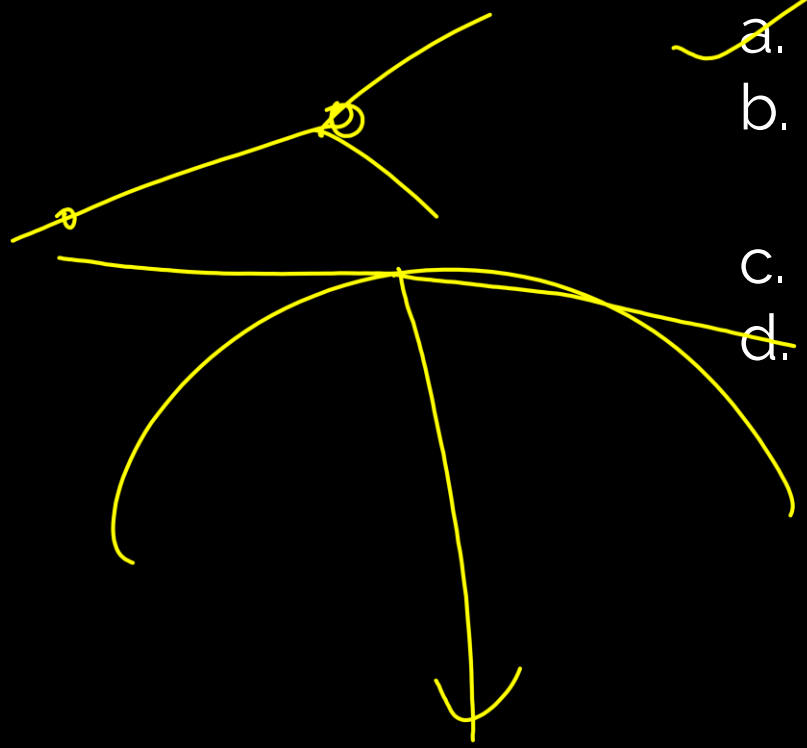
SA 3 : What is dispersion of white light ? State its cause. Draw a diagram to show dispersion of a beam of white light by a glass prism.

Answers:

The splitting of white light into its seven component colours is called dispersion.

Different colours of light bend through different angles with respect to the incident ray, as they pass through a prism. This causes dispersion of light

Scattering of Light



MCQ 4: At noon the sun appears white as

a. light is least scattered
b. all the colours of the white light are scattered away
c. blue colour is scattered the most
d. red colour is scattered the most

Scattering of Light

MCQ 5: The clear sky appears blue because

(a) blue light gets absorbed in the atmosphere

(b) ultraviolet radiations are absorbed in the atmosphere

(c) violet and blue lights get scattered more than lights of all other colours by the atmosphere

(d) light of all other colours is scattered more than the violet and blue colour lights by the atmosphere

Scattering of Light

MCQ 6: The danger signals installed at the top of tall buildings are red in colour. These can be easily seen from a distance because among all other colours, the red light

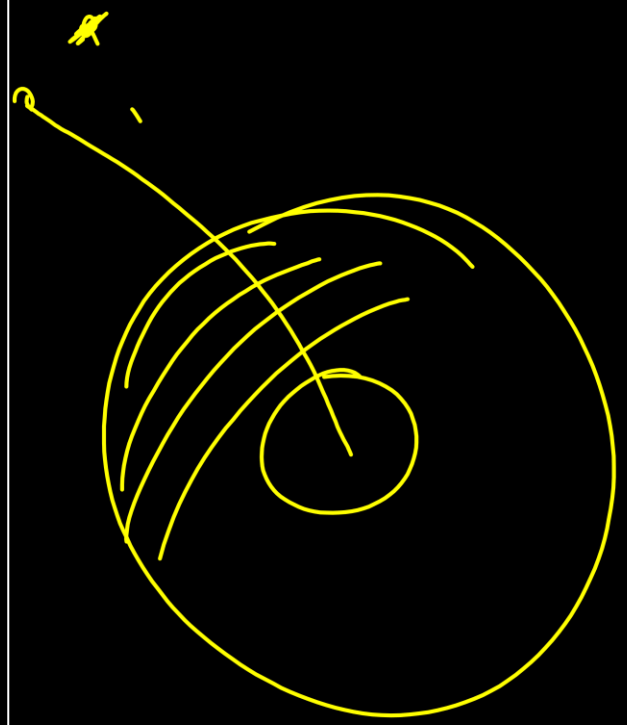
(a) is scattered the most by smoke or fog

(b) is scattered the least by smoke or fog

(c) is absorbed the most by smoke or fog

(d) moves fastest in air

Atmospheric Refraction



LA 1: Why do stars twinkle but not the planets?

Answers:

The twinkling of a star is due to atmospheric refraction of starlight. The starlight, on entering the earth's atmosphere, undergoes refraction continuously before it reaches the earth. The apparent position of the star is slightly different from its actual position. Further, this apparent position of the star is not stationary, but keeps on changing slightly.

The planets are much closer to the earth and are thus seen as extended sources. Thus, they do not twinkle.

Homework

MCQ 1: Which of the following phenomena contributes significantly to the reddish appearance of the sun at sunrise or sunset?

(a) Dispersion of light
(b) Scattering of light
(c) Total internal reflection of light
(d) Reflection of light from the earth

Homework

MCQ 2: The bluish colour of water in deep sea is due to

(a) the presence of algae and other plants found in water
(b) reflection of sky in water
(c) scattering of light
(d) absorption of light by the sea

Homework

SA 1: Draw ray diagrams each showing (i) myopic eye and (ii) hypermetropic eye.

SA 2: A person needs a lens of power −4.5 D for correction of her vision.

(a) What kind of defect in vision is she suffering from?
(b) What is the focal length of the corrective lens?
(c) What is the nature of the corrective lens?

Homework

LA 1: A student sitting at the back of the classroom cannot read clearly the letters written on the blackboard. What advice will a doctor give to her? Draw ray diagram for the correction of this defect.

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