

Human Eye and Colourful World

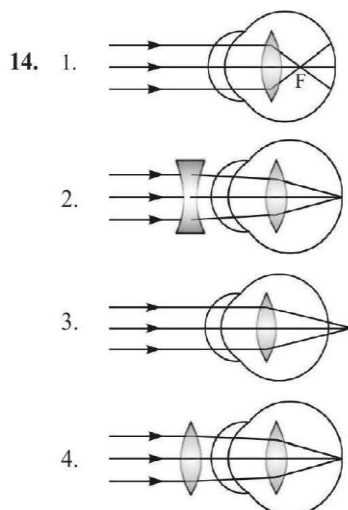
Multiple Choice Questions

- 1 The human eye possesses the power of accommodation. This is the power to :
(a) alter the diameter of the pupil as the intensity of light changes
(b) distinguish between lights of different colours
(c) focus objects at different distances
(d) decide which of the two objects is closer.
- 2 How does the eye change in order to focus on near or distant objects?
(a) The lens moves in or out
(b) The retina moves in or out
(c) The lens becomes thicker or thinner
(d) The pupil gets larger or smaller
- 3 Which of the following changes occur when you walk out of bright sunshine into a poorly lit room?
(a) The pupil becomes larger
(b) The lens becomes thicker
(c) The ciliary muscle relaxes
(d) The pupil becomes smaller
- 4 A person got his eyes tested. The optician's prescription for the spectacles reads:

Left eye : $-3.00D$ Right eye : $-3.50D$

The person is having a defect of vision called :
(a) presbyopia
(b) myopia
(c) astigmatism
(d) hypermetropia
- 5 A student sitting on the last bench in the class cannot read the writing on the blackboard clearly but he can read the book lying on his desk clearly. Which of the following statement is correct about the student?
(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 receded away.
(d) The far point of his eyes has come closer to him.
- 6 A man driving a car can read a distant road sign clearly but finds difficulty in reading the odometer on the dashboard of the car. Which of the following statement is correct about this man?
(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 receded away.
(d) The far point of his eyes has come closer to him.
- 7 Which of the following is not caused by the atmospheric refraction of light?
(a) Twinkling of stars at night
(b) Sun appearing higher in the sky than it actually is
(c) Sun becoming visible two minutes before actual sunrise
(d) Sun appearing red at sunset

- 8 The sky appears dark to passengers flying at very high altitudes mainly because :
 (a) Scatterings of light is not enough at such heights.
 (b) There is no atmosphere at great heights.
 (c) The size of molecules is smaller than the wavelength of visible light.
 (d) The light gets scattered towards the earth.
- 9 A near sighted person cannot see distinctly beyond 50 cm from his eye. The power in diopter of spectacle lenses which will enable him to see distant objects clearly is
 (a) +50
 (b) -50
 (c) +2
 (d) -2
- 10 The following one is not a primary colour
 (a) Yellow
 (b) Red
 (c) Green
 (d) Blue
- 11 When a mirror is rotated an angle the reflected ray moves through double that angle, the instrument based on the above principle is
 (a) Periscope
 (b) Odometer
 (c) Refractometer
 (d) Sextant
- 12 In the visible spectrum the colour having the shortest wavelength is
 (a) Green
 (b) Red
 (c) Violet
 (d) Blue
- 13 The splitting of white light into several colours on passing through a glass prism is due to
 (a) refraction
 (b) reflection
 (c) interference
 (d) diffraction



Identify the wrong description of the above figures

- (a) 1 represents far-sightedness
 - (b) 2 correction for short sightedness
 - (c) 3 represents far sightedness
 - (d) 4 correction for far-sightedness
- 15 At sun rise or at sun set the sun appears to be reddish while at mid-day it looks white. This is because
- (a) Scattering due to dust particles and air molecules causes this phenomenon
 - (b) The sun is cooler at sun rise or at sunset
 - (c) Refraction causes this phenomenon
 - (d) Diffraction sends red rays to the earth at these times.
- 16 A person 20 years old cannot see objects clearly which are nearer than 75cms from his eyes, the disease he is suffering from is
- (a) Astigmatism
 - (b) Myopia
 - (c) Hypermetropia
 - (d) Presbyopia
- 17 On entering a glass prism, sun rays are
- (a) Deviated but not dispersed
 - (b) Deviated and dispersed
 - (c) Dispersed but not deviated
 - (d) Neither deviated nor dispersed.
- 18 A piece of cloth looks red in sun light. It is held in the blue portion of a solar spectrum, it will appear
- (a) red
 - (b) black
 - (c) blue
 - (d) white
- 19 To get line spectrum, the substances are excited in their
- (a) solid state
 - (b) molecular state
 - (c) gaseous state
 - (d) atomic state
- 20 A student can distinctly see the object upto a distance 15 cm. He wants to see the black board at a distance of 3 m. Focal length and power of lens used respectively will be
- (a) -4.8 cm , -3.3D
 - (b) -5.8 cm , -4.3D
 - (c) -7.5 cm , -6.3D
 - (d) -15.8 cm , -6.3D
- 21 The pupil of the eye changes in size to adjust for
- (a) objects at different distances
 - (b) objects of different sizes
 - (c) different colors
 - (d) different amounts of light
- 22 What power lens is needed to correct for nearsightedness where the uncorrected far point is 250 cm ?

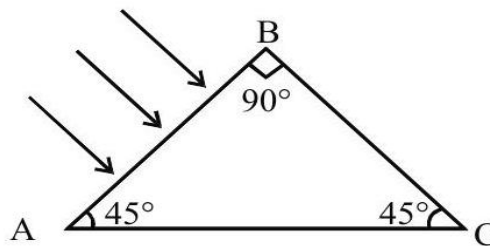
- (a) +2.5 diopters
 - (b) -2.5 diopters
 - (c) +0.4 diopters
 - (d) -0.4 diopters
- 23 What power lens is needed to correct for farsightedness where the uncorrected near point is 50 cm ?
- (a) +2 diopters
 - (b) -3 diopters
 - (c) +4 diopters
 - (d) -2 diopters
- 24 In a room, artificial rain is produced at one end and a strong source of white light is switched on at the other end. To observe the rainbow an observer must
- (a) Look anywhere in the room
 - (b) Look towards the source
 - (c) Look towards the raindrops
 - (d) Look in a direction equally inclined to the source of raindrops
- 25 Astigmatism can be corrected by
- (a) Bifocal lenses
 - (b) Cylindrical lenses
 - (c) Concave lenses
 - (d) Planoconvex lenses
- 26 The least distance of vision of a longsighted person is 60 cm. By using a spectacle lens, this distance is reduced to 12 cm. The power of the lens is
- (a) +5.0D
 - (b) $+(20/3)D$
 - (c) $-(10/3)D$
 - (d) +2.0D
- 27 A man can see upto 100 cm of the distant object. The power of the lens required to see far objects will be
- (a) +0.5D
 - (b) +1.0D
 - (c) +1D
 - (d) -5.0D
- 28 Dispersion is the term used to describe
- (a) the propagation of light in straight lines
 - (b) The splitting of a beam of light into component colours
 - (c) The bending of a beam of light when it strikes a mirror
 - (d) The change that takes place in white light after passage through red glass.
- 29 A given ray of light suffers minimum deviation in an equilateral prism P . Additional prisms Q and R of identical shape and material are now added to P as shown in the figure. The ray will suffer
- (a) greater deviation
 - (b) same deviation
 - (c) no deviation
 - (d) total internal reflection



- 30 In a glass prism
- Blue light is dispersed more than red light
 - Red light is dispersed more than blue light
 - Both red light and blue light are equally dispersed
 - None of these
- 31 An optician while testing the eyes finds the vision of a patient to be 6/12. By this he means that
- The person can read the letters of 6 inches from a distance of 12 m
 - The person can read the letters of 12 inches from 6 m
 - The person can read the letters of 6 m which the normal eye can read from 12 m
 - The focal length of eye lens had become half that of the normal eye
- 32 A person cannot see objects clearly beyond 50 cm. The power of the lens to correct the vision is
- +5D
 - 0.5D
 - 2D
 - +2D
- 33 A long sighted person has a minimum distance of distinct vision of 50 cm. He wants to reduce it to 25 cm. He should use a
- Concave lens of focal length 50 cm
 - Convex lens of focal length 25 cm
 - Convex lens of focal length 50 cm
 - Concave lens of focal length 25 cm
- 34 A long-sighted person cannot see objects clearly at a distance less than 40 cm. from his eye. The power of the lens needed to read an object at 25 cm. is
- 2.5D
 - +2.5D
 - 6.25D
 - +1.5D
- 35 Twinkling of stars is on account of
- Large distance of stars and storms in air
 - Small size of stars
 - Large size of stars
 - Large distance of stars and fluctuations in the density of air.
- 36 White light is incident at an angle to the surface of a triangular piece of glass. Which color of light deviates most from its original path after leaving the glass?
- red
 - orange
 - green
 - blue
- 37 The middle vascular coat that darkens the eye chamber and prevents refraction by absorbing the light rays is

- (a) choroid
 - (b) sclera
 - (c) retina
 - (d) cornea
- 38 When light rays enter the eye, most of the refraction occurs at the
- (a) crystalline lens
 - (b) outer surface of the cornea
 - (c) iris
 - (d) pupil
- 39 When the light is bright,
- (a) the iris makes the pupil expand
 - (b) the iris and the pupil contract
 - (c) the iris and the pupil remain as they are
 - (d) none of the above
- 40 The eyelens light rays to form real, inverted and highly diminished image on the
- (a) converges, retina
 - (c) converges, pupil
 - (b) diverges, retina
 - (d) diverges, pupil
- 41 The surface of retina has about 125 million light sensitive
- (a) rods only
 - (c) rods and cones
 - (b) cones only
 - (d) neither rods nor cones
- 42 The 'far point' of a normal human eye is
- (a) 25 cm
 - (b) 25 m
 - (c) 100 m
 - (d) at infinity
- 43 The property related to the sense of continuity of vision is called
- (a) persistence of vision
 - (b) colour blindness
 - (c) optical illusion
 - (d) none of these
- 44 When the ciliary muscles are relaxed, the eye lens is _____. and distant objects can be seen clearly.
- (a) thin
 - (b) thick
 - (c) inclined
 - (d) none of these
- 45 While looking at nearby objects, the ciliary muscles the eye lens so as to its focal length.
- (a) contract, increase
 - (b) contract, decrease
 - (c) expand, increase
 - (d) expand, decrease

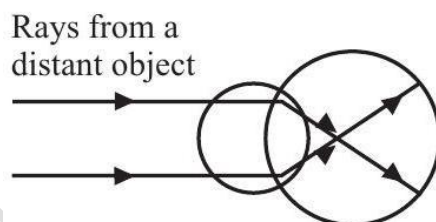
- 46 The change in focal length of an eye lens to focus the image of object at varying distances is done by the action of the
 (a) pupil
 (b) ciliary muscles
 (c) retina
 (d) blind spot
- 47 Which of the following statement is correct?
 (a) A person with myopia can see distant objects clearly
 (b) A person with hypermetropia can see nearby objects clearly
 (c) A person with myopia can see nearby objects clearly
 (d) A person with hypermetropia cannot see distant objects clearly
- 48 A person cannot see distinctly objects kept beyond 2 m. This defect can be corrected by using a lens of power
 (a) $+0.5D$
 (b) $-0.5D$
 (c) $+0.2D$
 (d) $-0.2D$
- 49 A beam of light consisting of red, green and blue colours is incident on a right-angled prism as shown. The refractive index of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively. The prism will



- (a) separate part of the red colour from the green and blue colours.
 (b) separate part of the blue colour from the red and green colours.
 (c) separate all the three colours from one another.
 (d) not separate even partially any colour from the other two colours.
- 50 The rod cells correspond to
 (a) the colour of light
 (b) the source of light
 (c) the intensity of light
 (d) none of these
- 51 Which of the following statements is correct regarding the propagation of light of different colours of white light in air?
 (a) Red light moves fastest
 (b) Blue light moves faster than green light
 (c) All the colours of the white light move with the same speed
 (d) Yellow light moves with the mean speed as that of the red and the violet light
- 52 When a ray passes through a prism,
 (a) it goes undeviated
 (b) it remains parallel to the base

- (c) it bends towards the base
(d) none of the above
- 53 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 violet and blue colour lights by the atmosphere
- 54 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
- 55 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
- 56 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
- 57 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
- 58 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
- 59 A person is suffering from both near sightedness and far sightedness. His spectacles would be made of
(a) two convex lenses with the upper lens having a larger focal length than the lower lens.
(b) two concave lenses with the upper lens having a smaller focal length than the lower lens.
(c) a concave lens as the upper lens and a convex lens as the lower lens
(d) a convex lens as the upper lens and a concave lens as the lower lens

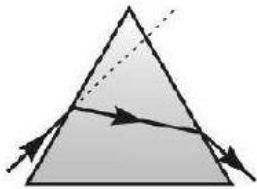
- 60 The stars twinkle in the night, because:
- Their emit light intermittently
 - Their star's atmosphere absorbs light intermittently
 - The earth's atmosphere absorbs light intermittently
 - The refractive index of air in atmosphere fluctuates
- 61 A Red object when seen through a thick blue glass appears:
- Green
 - Violet
 - Black
 - Red
- 62 If a person can see on object clearly when it is placed at 25 cm away from him, he is suffering from :
- myopia
 - hyper metropia
 - asitgmatism
 - none of these
- 63 A person is suffering from some sight problem. From the given diagram say which defect he suffers from?
- Myopia
 - Hypermetropia
 - Cataract
 - Astigmatism



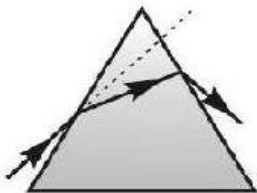
- 64 To read a poster on a wall, a person with defective vision needs to stand at a distance of 0.4 m from the poster. A person with normal vision can read the poster from a distance of 2.0 m. Which one of the following lens may be used to correct the defective vision?
- A concave lens of 0.5D
 - A concave lens of 1.0D
 - A concave lens of 2.0D
 - A convex lens of 2.0D
- 65 Select the correct statement about rainbow.
- We can see a rainbow in the western sky in the late afternoon
 - The double rainbow has red on the inside and violet in the outside
 - A rainbow has an arc shape, since the earth is round
 - A rainbow on the moon is violet on the inside and red on the outside
- 66 Various optical processes are involved in the formation of a rainbow. Which of the following provides the correct order in time in which these processes occur?
- Refraction, total internal reflection, refraction
 - Total internal reflection, refraction total internal reflection
 - Total internal reflection, refraction, refraction
 - Refraction, total internal reflection, total internal reflection.

- 67 Pick the wrong answer in the context with rainbow.
- (a) When the light rays undergo two internal reflections in a water drop, a secondary rainbow is formed.
 - (b) The order of colours is reversed in the secondary rainbow.
 - (c) An observer can see a rainbow when his front is towards the sun.
 - (d) Rainbow is a combined effect of dispersion, refraction and reflection of sunlight.
- 68 The reason for using red light in traffic signals to stop vehicles.
- (a) Red light has shorter wavelength
 - (b) Red light has longer wavelength
 - (c) Red light is very bright and attractive
 - (d) Red light has highest angle of refraction
- 69 The figures represent three cases of a ray passing through a prism of angle A. The case corresponding to minimum deviation is

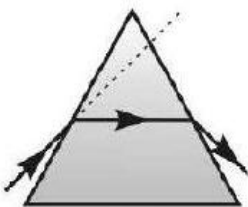
(1)



(2)



(3)



- (a) 1
- (b) 2
- (c) 3
- (d) None of these

- 70 If for a given prism the angle of incidence is changed from 0° to 90° , the angle of deviation
- (a) Increases
 - (b) Decreases

- (c) First decreases and then increases
- (d) First increases and then decreases

Case/Passage Based Questions

DIRECTIONS: Study the given case/passage and answer the following questions.

Case/Passage - 1

Human eye is spherical in shape and has diameter of about 2.5 cm. Sclerotic is a tough, opaque and white substance forming the outermost coating of the eyeball. The front portion is sharply curved and covered by a transparent protective membrane called the 'cornea'. Inner to the sclerotic there is a layer of black tissue called as choroids consisting of a mass of blood vessels, which nourishes the eye. The black colour does not reflect the light and hence rules out the blurring of image by reflection within the eyeball.

Behind the cornea, the space is filled with a liquid called the aqueous humour and behind that a crystalline lens. 'Iris' is a muscular diaphragm lying between the aqueous humour and the crystalline lens. Iris has an adjustable opening in the middle called the pupil of the eye. The pupil appears black because all the light entering is absorbed by the 'retina', which covers the inside of the rear part of the ball. Iris controls the amount of light entering because the retina absorbs nearly all the light, which falls upon it. This is done by varying the aperture of the pupil with the help of the iris. In dim light the iris dilates the pupil so that more light can enter in. When the light is bright the pupil contracts.

The crystalline lens divides the eyeball into two chambers. The chamber between the cornea and the lens is called the anterior chamber filled with a fluid called aqueous humour while the chamber between the lens and the retina is called the posterior chamber which is filled with a transparent gelatinous substance called vitreous humour.

The refractive indices of the cornea, pupil lens and fluid portion of the eye are quite similar. So, when a ray of light enters the eye, it is refracted at the cornea. This refraction produces a real inverted and diminished image of distant objects on the retina.

When the object is kept at different distances then, we may expect the image to be formed at different distances from the lens. It means, it may not form on the retina always. But in reality it is not so. Image is always formed on the retina. This is possible because the curvature of the crystalline lens is altered by ciliary muscles. When the eye is focused on infinity the muscles are relaxed and the eye lens remains thin. If the object is brought near by, the curvature increases so that the image can be formed on the retina. This property of the eye lens is called accommodation.

- 71 The change in focal length of an eye lens to focus the image of objects at varying distances is done by the action of
 - (a) pupil
 - (b) ciliary muscles
 - (c) retina
 - (d) blind spot
- 72 The fluid between the retina and the lens is called
 - (a) aqueous humour
 - (b) vitreous humour
 - (c) aqua
 - (d) humus

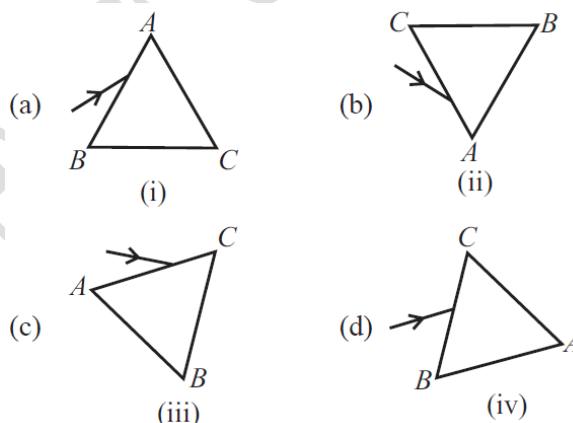
- 73 The part of the eye where optic nerves enter the eye
 (a) pupil
 (b) ciliary muscles
 (c) retina
 (d) blind spot
- 74 The inner back surface of the eyeball is called
 (a) pupil
 (b) ciliary muscles
 (c) retina
 (d) blind spot

Case/Passage - 2

The phenomenon of decomposition of the white light into its seven component colours when passing through a prism or through a transparent object delimited by non parallel surfaces is called dispersion of light. A beam of light containing all the visible spectrum of the light is white, because the sum of all the colors generates the white color. The light is decomposed in all the component colours, Violet, Indigo, Blue, Green, Yellow, Orange and Red, called as VIBGYOR. The band of the coloured components of a light beam is called its spectrum. The phenomenon can be explained by thinking that light of different colours (different wavelengths) has different velocities while travelling in a medium $v_m = f\lambda_m$.

Hence, the change in velocity of light observed when the light passes from the air to the glass, depends on the wavelength.

- 75 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. In which of the following cases, after dispersion, the third colour from the top corresponds to the colour of the sky?



- 76 Which of the following statements is correct regarding the propagation of light of different colours of white light in air?
 (a) Red light moves fastest
 (b) Blue light moves faster than green light
 (c) All the colours of the white light move with the same speed
 (d) Yellow light moves with the mean speed as that of the red and the violet light
- 76 When white light is allowed to pass through a glass prism, which colour deviates the least?
 (a) Violet
 (b) Red

- (c) Green
- (d) Orange

- 77 When white light is allowed to pass through a glass prism, which colour deviates the most?
- (a) Indigo
 - (b) Green
 - (c) Red
 - (d) Violet
- 78 For a prism material, refractive index is highest for
- (a) Red
 - (b) Yellow
 - (c) Orange
 - (d) Violet
- Passage Based Questions

Case/Passage - 3

The ciliary muscles of eye control the curvature of the lens in the eye and hence can alter the effective focal length of the system. When the muscles are fully relaxed, the focal length is maximum. When the muscles are strained the curvature of lens increases (that means radius of curvature decreases) and focal length decreases. For a clear vision the image must be on retina. The image distance is therefore fixed for clear vision and it equals the distance of retina from eye-lens. It is about 2.5 cm for a grown-up person.

A person can theoretically have clear vision of objects situated at any large distance from the eye. The smallest distance at which a person can clearly see is related to minimum possible focal length. The ciliary muscles are most strained in this position. For an average grown-up person minimum distance of object should be around 25 cm.

A person suffering for eye defects uses spectacles (Eye glass). The function of lens of spectacles is to form the image of the objects within the range in which person can see clearly. The image of the spectacle-lens becomes object for eye-lens and whose image is formed on retina.

The number of spectacle-lens used for the remedy of eye defect is decided by the power of the lens required and the number of spectacle-lens is equal to the numerical value of the power of lens with sign. For example, power of lens required is +3D (converging lens of focal length $100/3$ cm) then number of lens will be +3

For all the calculations required you can use the lens formula and lens maker's formula. Assume that the eye lens is equiconvex lens. Neglect the distance between eye lens and the spectacle lens.

- 80 Minimum focal length of eye lens of a normal person is
- (a) 25 cm
 - (b) 2.5 cm
 - (c) $25/9$ cm
 - (d) $25/11$ cm
- 81 Maximum focal length of eye lens of normal person is
- (a) 25 cm
 - (b) 2.5 cm
 - (c) $25/9$ cm
 - (d) $25/11$ cm

- 82 A nearsighted man can clearly see object only upto a distance of 100 cm and not beyond this. The number of the spectacles lens necessary for the remedy of this defect will be
- (a) +1D
 - (b) -1D
 - (c) +3D
 - (d) -3D

Assertion & Reason

DIRECTIONS: Each of these questions contains an assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

- (a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
- (b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
- (c) If Assertion is correct but Reason is incorrect.
- (d) If Assertion is incorrect but Reason is correct.

- 83 Assertion : When ray of light falls on the particles of a colloidal solution, the path of the beam is visible. The Human Eye and the Colourful World
Reason : Path of light is visible due to the scattering of light by the colloidal particles.
- 84 Assertion : Sun looks white at noon.
Reason : At noon, the light has to travel longer distance through the atmosphere before reaching the eye of an observer.
- 85 Assertion : When a ray of light passes through a prism, it bends towards the thicker part of the prism.
Reason : An incident ray strikes a prism, undergoes refraction and comes out as an emergent ray.
- 86 Assertion: Myopia is due to the increased converging power of the eye lens.
Reason: Myopia can be corrected by using spectacles made from concave lenses.
- 87 Assertion: The twinkling of stars is due to the fact that refractive index of the earth's atmosphere fluctuates.
Reason: In cold countries, the phenomenon of looming (i.e., ship appears in the sky) takes place, because refractive index of air decreases with height.
- 88 Assertion: When we see an object, the image formed on the retina is real and inverted.
Reason: If the magnification of a system is less than one, then the image formed is inverted.
- 89 Assertion: Rainbow is an example of the dispersion of sunlight by the water droplets.

Reason: Light of shorter wavelength is scattered much more than light of larger wavelength.

MSH PHYSICS CLASSES X SMN