

6. The Human Eye and The Colourful World

Very Short Answer Type Questions-Pg-269

1. Question

What kind of lens is present in the human eye?

Answer

Convex lens is present in the human eye.

2. Question

Name two parts of the eye which refract light rays (or bend light rays).

Answer

Two parts of the eye which refract light rays (or bend light rays) are Cornea and Eye-lens.

3. Question

Name the part of the eye:

- (a) Which controls the amount of light entering the eye.
- (b) on which the image is formed.
- (c) which changes the focal length of eye.

Answer

- (a) The part of the eye which controls the amount of light entering the eye is iris.
- (b) the part of the eye on which the image is formed is retina.
- (c) the part of the eye which changes focal length of eye-lens is ciliary muscles.

4. Question

What is the name of:

- (a) the curved, transparent front surface of the eye ?
- (b) the light-sensitive layer in the eye?

Answer

(a) The name of the curved, transparent surface is cornea.

(b) The name of the light-sensitive layer in the eye is retina.

5. Question

Where is the image formed in a human eye?

Answer

the image formed in a human eye at retina.

6. Question

What is the function of the lens in the human eye?

Answer

The major function of the lens in the human eye is to change its shape and thickness to focus light on the retina.

7. Question

What job does the pupil of the eye do?

Answer

According to the intensity of light around the eye, Pupil expands or contracts.

8. Question

How does the eye adjust to take account of an increase in brightness?

Answer

The pupil of our eye contracts to adjust the eye to take account of an increase in brightness.

9. Question

Name that part of the eye which is equivalent to the photographic film in a camera.

Answer

The part of the eye which is equivalent to the photographic film in a camera is retina.

10. Question

Name the part of the retina which is insensitive to light.

Answer

the part of the retina which is insensitive to light is blind spot.

11. Question

Which part of the eye contains cells which are sensitive to light?

Answer

Retina contains cells which are sensitive to light.

12. Question

Name two types of cells in the retina of an eye which respond to light.

Answer

The two types of cells in the retina of an eye which respond to light are Rods and Cones.

13. Question

Out of rods and cones in the retina of your eye:

- (a) which detect color?
- (b) which work in dim light?

Answer

- (a) Cones detect color.
- (b) Rods work in dim light.

14. Question

State whether the following statement is true or false: The image formed on our retina is upside-down

Answer

True, The image formed on our retina is upside-down.

15. Question

What is the principal function of the eye-lens?

Answer

To focus light on to the retina is the main function of the eye lens.

16. Question

Where does the greatest degree of refraction of light occur in the eye?

Answer

The greatest degree of refraction of light occur in the eye at cornea.

17. Question

What changes the shape of lens in the eye?

Answer

Ciliary muscles changes the shape of lens in the eye.

18. Question

What do the ciliary muscles do when you are focusing on a nearby object?

Answer

the ciliary muscles make the eye-lens thicker (more converging) when you are focusing on a nearby object.

19. Question

What is the least distance of distinct vision for a normal human eye ?

Answer

25cm is the least distance of vision for a normal human eye.

20. Question

What is the:

- (a) far point of a normal human eye?
- (b) near point of a normal human eye?

Answer

- (a) The far point of a normal human eye is at infinity.
- (b) The near point of a normal human eye is at 25cm from the eye.

21. Question

What is the range of vision of a normal human eye?

Answer

The range of vision of normal human eye is from 25cm to infinity.

22. Question

Name the part of our eyes which helps us to focus near and distant objects in quick succession.

Answer

The part of our eyes which helps us to focus near and distant objects in quick succession is ciliary muscles.

23. Question

Define the term "power of accommodation" of human eye.

Answer

The term "power of accommodation" of human eye refers to the ability of an eye to focus the distance objects as well as the nearby objects on the retina by changing the focal length of its lens.

24. Question

Give the scientific names of the following parts of the eye:

- (a) carries signals from an eye to the brain.
- (b) muscles which change the shape of the eye-lens.
- (c) a hole in the middle of the iris.
- (d) a clear window at the front of the eye.
- (e) changes shape to focus a picture on the retina.

Answer

- (a) The scientific name for the part of the eye which carries the signals from the eye to the brain is called optic nerve.
- (b) The muscle which changes the shape of the eye-lens is known as ciliary muscles.
- (c) A hole in the middle of the iris is known as pupil.
- (d) A clear window at the front of the eye is known as cornea.
- (e) Eye-lens changes shape to focus a picture on the retina.

25. Question

Fill in the following blanks with suitable words:

- (a) Most of the refraction of light rays entering the eye occurs at the outer surface of the _____

- (b) The part of eye sensitive to light is_____
- (c) The part of eye which alters the size of the pupil is_____
- (d) When light is dim, the pupil becomes_____
- (e) The iris controls the amount of_____entering the eye.
- (f) The ciliary muscles control the shape of the _____
- (g) To bring light from a distant object to a focus on the retina of the eye, the convex eye-lens needs to be made_____
- (h) To bring light from a near object to a focus on the retina of the eye, the convex eye-lens needs to be made_____

Answer

- (a) Most of the refraction of light rays entering the eye occurs at the outer surface of the cornea.
- (b) The part of eye sensitive to light is retina.
- (c) The part of eye which alters the size of the pupil is iris.
- (d) When light is dim, the pupil becomes larger.
- (e) The iris controls the amount of light entering the eye.
- (f) The ciliary muscles control the shape of the eye-lens.
- (g) To bring light from a distant object to a focus on the retina of the eye, the convex eye-lens needs to be made thinner.
- (h) To bring light from a near object to a focus on the retina of the eye, the convex eye-lens needs to be made thicker.

Short Answer Type Questions-Pg-270

26. Question

Why is a normal eye not able to see clearly the objects placed closer than 25 cm?

Answer

All the power of accommodation of the eye is exhausted at a distance of 25 cm. The maximum accommodation of the eye is reached when the object is placed at 25 cm from the eye. After this the ciliary muscles cannot make the eye-lens more thick. This is why a normal eye not able to see clearly the objects placed closer than 25 cm.

27. Question

What changes take place in the shape of eye-lens : (a) when the eye is focused on a near object?

(b) when the eye is focused on a distant object ?

Answer

(a) when the eye is focused on a near object eye-lens become thicker.

(b) When the eye is focused on a distant object the eye-lens becomes thinner.

28. Question

The eyes of a person are focused (i) on a nearby object, and (ii) on a distant object, turn by turn. In which case:

(a) the focal length of eye-lens will be the maximum ?

(b) the converging power of eye-lens will be the maximum?

Answer

(a) The focal length of eye-lens will be the maximum when the eyes of a person are focused on a distant object.

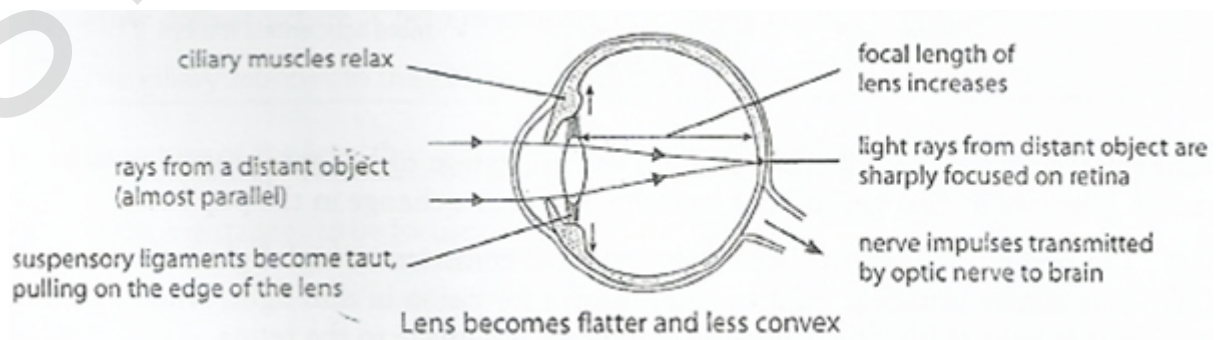
(b) The converging power of eye-lens will be the maximum when the eye of a person is focused on a nearby object.

29. Question

What change is made in the eye to enable it to focus on objects situated at different distances ? Illustrate your answer with the help of diagrams.

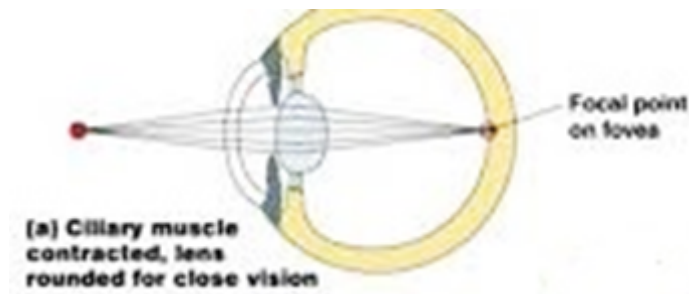
Answer

When the eye need to focus on any distance object, then in that case the ciliary muscles of the eye get fully relaxed and this also pull the ligaments attached to the eye-lens tightly. During this process the eye lens get stretched and the eye-lens becomes thin.



When the eye has to focus on the nearby objects, then in that case the ciliary muscles of the eye has to contract and make the suspensory ligaments loose.

Which results in the ligaments to stop pulling the eye lens. The eye lens bulges under its own elasticity and hence the eye lens got thick.



30. Question

How is the amount of light entering the eye controlled?

Answer

The part of eye which control the amount of light entering the eye is iris. It is responsible for the adjustment of pupil according to the intensity of light received by the eye. If the amount of light received by the eye is large, then the iris contracts the pupil and reduces the amount of light entering the eye. If the amount of light received by the eye is small, then the iris expands the pupil so that more light may enter the eye.

31. Question

What happens to the eye when you enter a darkened cinema hall from bright sunshine? Give reason for your answer.

Answer

at first we cannot see anything clearly when we enter the cinema hall from bright sunshine outside. This just for a short period of time. After that our vision improves. The reason behind that is, in bright sunshine the pupil of our eye is small and when we just enter the darkened room very little light enters our eye due to which we cannot see properly. After a while, when the pupil of our eye expands, more light enters our eye and we can see clearly.

32. Question

Why does it take some time to see objects in a dim room when you enter the room from bright sunshine outside?

Answer

Because of the intensity of the light entering the eye the pupil adjusts itself. This is the reason why it takes some time to see objects in a dim room when we enter the room from bright sunshine outside because it takes some time to the small pupil of our eye to become large so that more light enters our eye and we can see clearly.

33. Question

A person walking in a dark corridor enters into a brightly lit room:

(a) State the effect on the pupil of the eye.

(b) How does this affect the amount of light entering the eye ?

Answer

(a) When a person walking in a dark corridor enters into a brightly lit room, the Pupil becomes smaller.

(b) When a person walking in a dark corridor enters into a brightly lit room, the amount of light entering the eye is reduced.

34. Question

Ciliary muscles of human eye can contract or relax. How does it help in the normal functioning of the eye ?

Answer

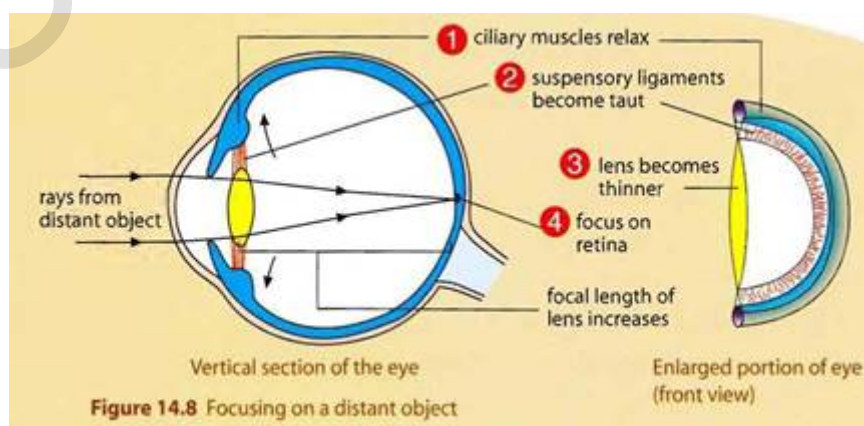
When the eye is looking at a distant object the ciliary muscles get relaxed and the eye lens becomes thin, in the same way when the eye is seeing a nearby object these muscles contract and make the eye-lens thick. By changing the thickness of the eye lens while focusing the ciliary muscles helps in normal functioning of the normal human eye.

35. Question

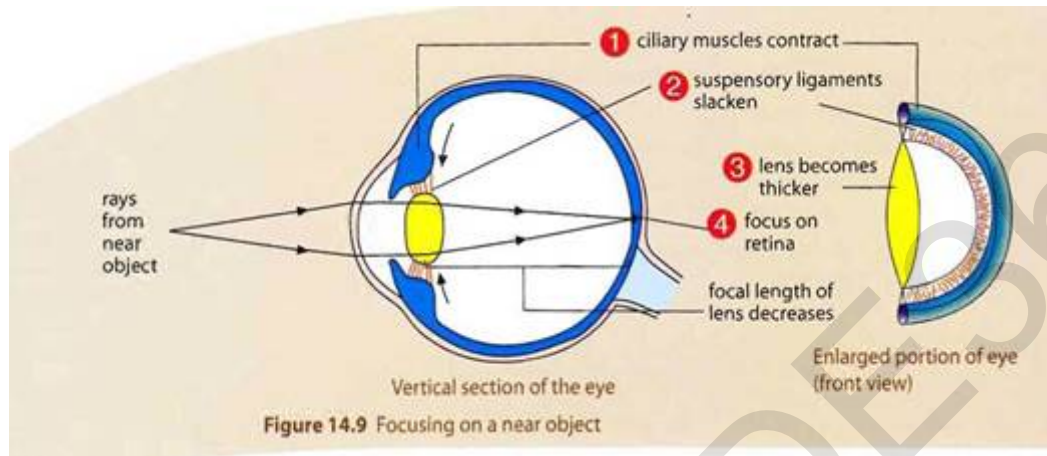
Describe and explain, how a normal eye can see objects lying at various distances clearly.

Answer

When an object is at a distance, the ciliary muscles of the eye get fully relaxed and pull the suspensory ligament attached to the eye-lens tightly. Which then, stretches the eye-lens and the eye-lens becomes thin. This thin eye-lens has large focal length and small converging power sufficient to converge the parallel rays of light coming from a distant object to form an image on the retina.



In the same way, to focus on nearby objects, there is contraction in the ciliary muscles and which make the suspensory ligament loose. The ligaments then stop pulling the eye-lens. The eye-lens bulges under its own elasticity and becomes thick. This thick eye-lens has small focal length and large converging power which converges the diverging rays coming from the nearby object to form an image on the retina.



36. Question

There are two types of light-sensitive cells in the human eye:

- Where are they found ?
- What is each type called?
- To what is each type of cell sensitive?

Answer

(a) There are two types of light-sensitive cells in the human eye and are found in the retina.

(b) There are two types of light-sensitive cells in the human eye and they are called rods and cones.

(c) For dim light rods are sensitive and for the bright light and colors cones are sensitive.

37. Question

What are rods and cones in the retina of an eye? Why is our night vision relatively poor compared to the night vision of an owl?

Answer

The rod shaped cells present in the retina of an eye is called rods these are sensitive to dim light.

The cone-shaped cells present in the retina of an eye is called cones and these are sensitive to the bright light.

Our night vision is relatively poor as compared to the night vision of an owl because the number of rods cells present in our eyes are relatively low in number.

38 A. Question

How does the convex eye-lens differ from the ordinary convex lens made of glass?

Answer

The convex eye-lens differ from the ordinary convex lens made of glass because the focal length of the convex eye-lens can be changed by the action of ciliary muscles, but the focal length of the ordinary convex lens made of glass is fixed.

38 B. Question

List, in order, the parts of the eye through which light passes to reach the retina.

Answer

the parts of the eye through which light passes to reach the retina are in order as follows Cornea, pupil, eye-lens, retina.

39 A. Question

What happens to the size of pupil of our eye

(i) in dim light (ii) in bright light ?

Answer

(i) the size of pupil of our eye becomes larger in dim light.

(ii) The size of pupil of our eye becomes small in bright light.

39 B. Question

Name the cells on the retina of an eye which are sensitive to

(i) bright light (ii) dim light (iii) sensation

Answer

(i) The cells on the retina of an eye which are sensitive to bright light is Cones.

(ii) The cells on the retina of an eye which are sensitive to the dim light is rods.

(iii) The cells on the retina of an eye which are sensitive to sensation is Cones.

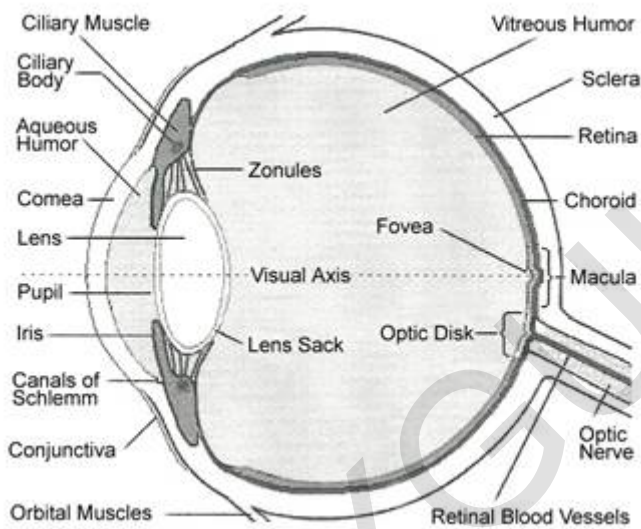
Long Answer Type Questions-Pg-271

40 A. Question

Draw a simple diagram of the human eye and label clearly the cornea, iris, pupil, ciliary muscles, eye

lens, retina, optic nerve and blind spot.

Answer



40 B. Question

Describe the working of the human eye with the help of the above diagram.

Answer

The working of the human eye starts with the light rays coming from the object kept in front of the eye enter the cornea, pass through the pupil and fall on the eye lens. The eye lens is a convex lens, so it converges the light rays and produces a real and inverted image of the object on the retina. The image formed on the retina is conveyed to the brain by the optic nerve and gives rise to the sensation of vision.

40 C. Question

How does the eye adjust itself to deal with light of varying intensity?

Answer

To deal with light of varying intensity the eye adjusts itself by the help of the iris. The iris adjusts the pupil automatically according to the intensity of light received by the eye. If the intensity of light is large, then the iris contracts the

pupil and reduces the amount of light entering the eye. And, if the intensity of light is small, then iris expands the pupil so that more light may enter the eyes.

41 A. Question

Explain the functions of the following parts of the eye :

(a) cornea (b) iris (c) pupil (d) ciliary muscles (e) eye-lens (f) retina (g) optic nerve

Answer

(a) The function of the cornea is to allow the light to enter the eye. It is the front part of the eye.

(b) The function of the iris is to control the amount of light entering the eye.

(c) The function of the pupil is to control the illumination in the eye.

(d) The function of the ciliary muscles is to change the focal length of the eye-lens by changing its shape.

(e) The function of the eye-lens is to focus light on to the retina.

(f) The function of the retina is to respond to the intensity of light and colour of objects respectively with the help of rods and cones present in it.

(g) The function of the optic nerve is to convey the image formed on the retina to the brain.

41 B. Question

If you walk from a dark room into sunlight and back again into dark room, how would your pupils alter in size? What makes this happen?

Answer

The pupil of the eye contracts, if we walk from a dark room into sunlight. But it expands on entering in the dark room. This happens because of the intensity of the light changes.

41 C. Question

Explain why, we cannot see our seats first when we enter a darkened cinema hall from bright light but gradually they become visible.

Answer

We cannot see our seats first when we enter a darkened cinema hall from bright light but gradually they become visible. This is due to the reason because in bright sunshine the pupil of our eye is small and when we just enter the darkened room very little light enters our eye due to which we

cannot see properly. After a while, when the pupil of our eye expands, more light enters our eye and we can see clearly.

Multiple Choice Questions (MCQs)-Pg-271

42. Question

The human eye forms the image of an object at its :

- A. cornea
- B. iris
- C. pupil
- D. retina

Answer

Retina is the part where the image is formed in the human eye.

43. Question

The change in focal length of an eye-lens is caused by the action of the:

- A. pupil
- B. retina
- C. ciliary muscles
- D. iris

Answer

The change in focal length of an eye-lens is caused by the action of the ciliary muscles.

44. Question

The least distance of distinct vision for a young adult with normal vision is about :

- A. 25 m
- B. 2.5 cm
- C. 25 cm
- D. 2.5 m

Answer

The least distance of distinct vision for a young adult with normal vision is about 25cm.

45. Question

Refraction of light in the eye occurs at:

- A. the lens only
- B. the cornea only
- C. both the cornea and the lens
- D. the pupil

Answer

Refraction of light in the eye occurs at both the cornea and the lens.

46. Question

To focus the image of a nearby object on the retina of an eye:

- A. the distance between eye-lens and retina is increased
- B. the distance between eye-lens and retina is decreased
- C. the thickness of eye-lens is decreased
- D. the thickness of eye-lens is increased

Answer

To focus the image of a nearby object on the retina of an eye the thickness of eye-lens is increased.

47. Question

The term "accommodation" as applied to the eye, refers to its ability to:

- A. control the light intensity falling on the retina
- B. erect the inverted image formed on the retina
- C. vary the focal length of the lens
- D. vary the distance between the lens and retina

Answer

The term "accommodation" as applied to the eye, refers to its ability to vary the focal length of the lens.

48. Question

Which of the following controls the amount of light entering the eye ?

- A. ciliary muscles
- B. lens
- C. iris
- D. cornea

Answer

The amount of light entering the eye is controlled by iris.

49. Question

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 colors
- C. focus on objects at different distances
- D. decide which of the two objects is closer.

Answer

The human eye possesses the power of accommodation. This is the power to focus on objects at different distances.

50. Question

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

Answer

In order to change the focus on near and distance objects the lens becomes thicker or thinner.

51. Question

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

Answer

when you walk out of bright sunshine into a poorly lit room the pupil becomes larger.

52. Question

The size of the pupil of the eye is adjusted by:

- A. cornea
- B. ciliary muscles
- C. optic nerve
- D. iris

Answer

The size of the pupil of the eye is adjusted by iris.

Questions Based on High Order Thinking Skills (HOTS)-Pg-272

53. Question

The descriptions of five kinds of images are given below:

- (a) diminished and virtual (b) enlarged and real
- (c) enlarged and erect (d) real and inverted
- (e) virtual and the same size

Which one of these describes the image formed:

- (i) on the retina of the eye?
- (ii) by a magnifying glass?
- (iii) by a convex driving mirror on a car?
- (iv) by a plane mirror?
- (v) on the screen of a slide projector?

Answer

- (i) The image formed by the eye on the retina is described by real and inverted.
- (ii) the image formed by the eye by a magnifying glass is enlarged and erect.
- (iii) the image formed by a convex driving mirror of a car is diminished and virtual.
- (iv) the image formed by a plane mirror is virtual and the same size.
- (v) on the screen of a slide projector the image formed is enlarged and real.

54. Question

What shape are your eye-lenses:

- (a) when you look at your hand ?
- (b) when you look at a distant tree ?

Answer

- (a) the shape of the eye lens when you look at your hand is thick (more convex).
- (b) When you look at a distance tree the eye-lens will be thinner (less convex).

55. Question

suggest how your irises help to protect' the retinas of your eyes from damage by bright light.

Answer

By adjusting the size of the pupil according to the intensity of light received by the eye the irises help to protect the retinas of our eyes from damage by bright light.

56 A. Question

Which parts of the eye cause rays of light to converge on the retina ?

Answer

Cornea and Eye-lens are the parts of the eye cause rays of light to converge on the retina.

56 B. Question

Which part causes the greatest convergence ?

Answer

Cornea causes the greatest convergence.

56 C. Question

Which part brings the image into sharp focus on the retina? How does it do this?

Answer

Eye-lens brings the image into sharp focus on the retina. It is done by changing the thickness on the lens and hence the converging power.

57. Question

An object is moved closer to an eye. What changes must take place in the eye in order to keep the image in Sharp focus?

Answer

The shape of the eye-lens should must be changed by the ciliary muscles to make it thicker and increase its converging power in order to keep the image sharp and focus.

58. Question

Why does the eye-lens not have to do all the work of converging incoming light rays?

Answer

The eye-lens do not have to do all the work of converging incoming light rays because cornea of the eye also converges light rays entering the eye.

59. Question

Explain why, when it is getting dark at night, it is impossible to make out the color of cars on the road.

Answer

When it is getting dark at night, it is impossible to make out the color of cars on the road because the color detecting cells of the retina of eye called 'cones' do not work well in dim light.

60. Question

Nocturnal animals (animals which sleep during the day and come out at night) tend to have wide pupils and lot of rods in their retinas. Suggest reasons for this.

Answer

Nocturnal animals (animals which sleep during the day and come out at night) tend to have wide pupils and lot of rods in their retinas because wide pupils allow more light to enter the eye during night. The reason behind is, Rod cells in the retina are sensitive to dim light and hence help to see in properly at night.

Very Short Answer Type Questions-Pg-279

1. Question

Name one of the common defects of vision and the type of lens used to remove it.

Answer

The common defects of vision is myopia. The type of lens used to correct it is concave lens.

2. Question

Name the defect of vision in a person;

(a) whose near point is more than 25 cm away.

(b) whose far point is less than infinity

Answer

(a) The defect of vision in a person whose near point is more than 25 cm away is hypermetropia.

(b) The defect of vision in a person whose far point is less than infinity is myopia.

3. Question

Which defect of vision can be rectified:

(a) by using a concave lens ?

(b) by using a convex lens?

Answer

(a) Myopia is the defect of vision which can be rectified by using a concave lens.

(b) Hypermetropia is the defect of vision which can be rectified by using a convex lens.

4. Question

What type of lens is used to correct

(a) hypermetropia

(b) myopia?

Answer

(a) The type of lens which is used to correct hypermetropia is convex lens.

(b) The type of lens which is used to correct myopia is concave lens.

5. Question

What is the other name for

(a) myopia

(b) hypermetropia?

Answer

(a) The other name for myopia is near sightedness.

(b) The other name for hypermetropia is far sightedness.

6. Question

What is the scientific name of

(a) short-sightedness, and (b) long-sightedness?

Answer

(a) The scientific name of short-sightedness is myopia.

(b) The scientific name of long-sightedness is hypermetropia.

7. Question

What kind of lens is used to correct (a) short-sightedness (b) long-sightedness?

Answer

(a) The kind of lens which is used to correct short-sightedness is concave lens.

(b) The kind of lens which is used to correct long-sightedness is convex lens.

8. Question

State whether the following statement is true or false : Short-sightedness can be cured by using a concave lens.

Answer

True, Short-sightedness can be cured by using a concave lens.

9. Question

Name the defect of vision in which the eye-lens loses its power of accommodation due to old age.

Answer

Presbyopia, the defect of vision in which the eye-lens loses its power of accommodation due to old age.

10. Question

Name the defect of vision which makes the eye-lens cloudy resulting in blurred vision.

Answer

Cataract, the defect of vision which makes the eye-lens cloudy resulting in blurred vision.

11. Question

What is the other name of old age hypermetropia?

Answer

Presbyopia is the other name of old age hypermetropia.

12. Question

Name any two defects of vision which can be corrected by using spectacles.

Answer

The two defects of vision which can be corrected by using spectacles are myopia and hypermetropia.

13. Question

Name one defect of vision (or eye) which cannot be corrected by any type of spectacle lenses.

Answer

The one defect of vision (or eye) which cannot be corrected by any type of spectacle lenses cataract.

14. Question

Name the body part with which the terms myopia and hypermetropia are connected.

Answer

The body part with which the terms myopia and hypermetropia are connected is eye.

15. Question

What is the far point of a person suffering from myopia (or short-sightedness)?

Answer

The far point of a person suffering from myopia (or short-sightedness) is less than infinity.

16. Question

Where is the near point of a person suffering from hypermetropia (or long-sightedness)?

Answer

The near point of a person suffering from hypermetropia (or long-sightedness) is farther away from the normal near point (25cm).

17. Question

Your friend can read a book perfectly well but cannot read the writing on blackboard unless she sits on the front row in class.

(a) Is she short-sighted or long-sighted?

(b) What type of lenses-converging or diverging-would an optician prescribe for her?

Answer

(a) Your friend can read a book perfectly well but cannot read the writing on blackboard unless she sits on the front row in class she is having short-sightedness.

(b) An optician prescribe her a diverging lens.

18. Question

A man can read the number of a distant bus clearly but he finds difficulty in reading a book.

(a) From which defect of the eye is he suffering?

(b) What type of spectacle lens should he use to correct the defect?

Answer

(a) He is suffering from hypermetropia (long-sightedness).

(b) He should use convex lens to correct this defect.

19. Question

A student sitting in the last row of the class-room is not able to read clearly the writing on the blackboard.

(a) Name the type of defect he is suffering from.

(b) How can this defect be corrected?

Answer

(a) The type of defect he is suffering from is myopia.

(b) This defect can be corrected by concave lens.

20. Question

Complete the following sentences:

(a) A short-sighted person cannot see _____ objects clearly. Short-sightedness can be corrected by using _____ lenses.

(b) A long-sighted person cannot see _____ objects clearly. Long-sightedness can be corrected by using _____ lenses.

Answer

(a) A short-sighted person cannot see distant objects clearly. Short-sightedness can be corrected by using Concave lenses.

(b) A long-sighted person cannot see nearby objects clearly. Long-sightedness can be corrected by using convex lenses.

Short Answer Type Questions-Pg-279

21. Question

What are the two most common defects of vision (or defects of eye)? How are they corrected?

Answer

Myopia and Hypermetropia are the two most common defects of vision (or defects of eye). By using concave lens Myopia can be corrected and by using a convex lens hypermetropia can be corrected.

22. Question

Differentiate between myopia and hypermetropia. What type of spectacles should be worn by a person having the defects of myopia as well as hypermetropia? How does it help ?

Answer

By using concave lens Myopia can be corrected and by using a convex lens hypermetropia can be corrected. A person having the defects of myopia as well as hypermetropia should use spectacles having bifocal lenses in which upper part consists of concave lens and lower part consists of convex lens.

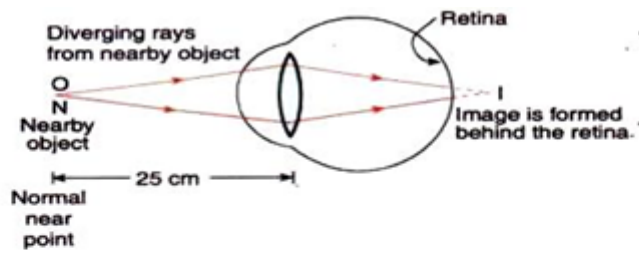
23. Question

Name the defect of vision which can be corrected by a converging lens. Show clearly by a ray diagram how the lens corrects the defect.

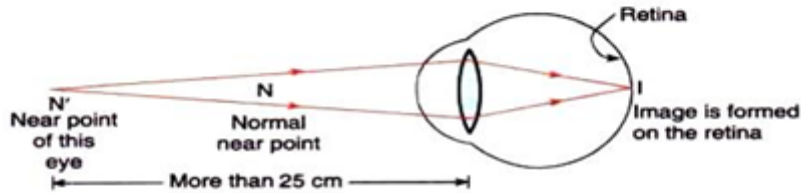
Answer

The defect of vision which can be corrected by a converging lens is Hypermetropia.

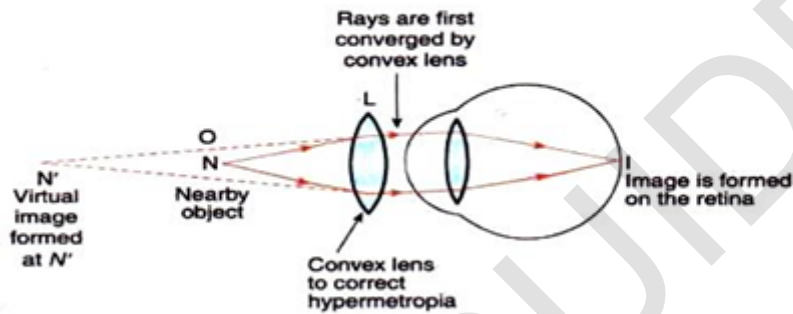
Its ray diagram can be shown as:-



(a) In a hypermetropic eye, the image of nearby object lying at normal near point N (at 25 cm) is formed behind the retina.



(b) The near point N' of hypermetropic eye is farther away from the normal near point N



(c) Correction of hypermetropia. The convex lens forms a virtual image of the object (lying at normal near point N) at the near point N' of this eye.

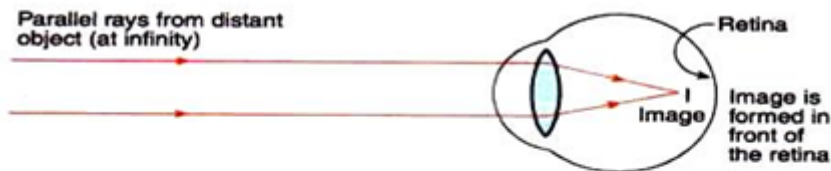
24. Question

Name the defect of vision which can be corrected by a diverging lens. Show clearly by a ray diagram how the lens corrects the defect.

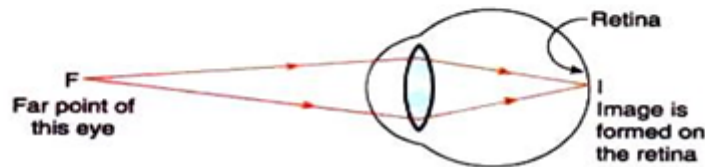
Answer

The defect of vision which can be corrected by a diverging lens is myopia.

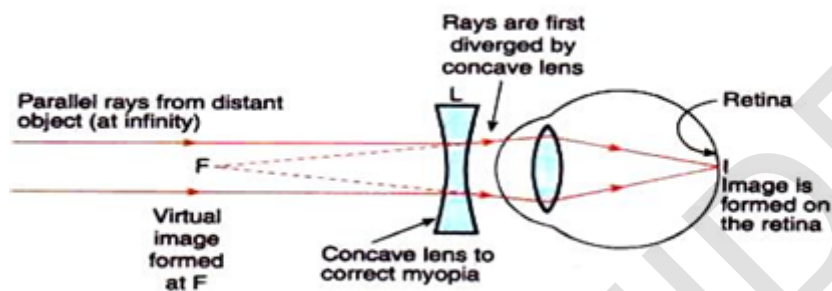
A ray diagram for it can be shown as :-



(a) In a myopic eye, image of distant object is formed in front of the retina (and not on the retina)



(b) The far point (F) of a myopic eye is less than infinity



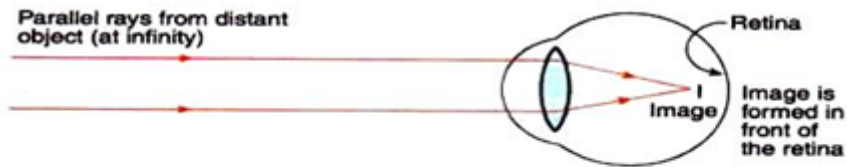
(c) *Correction of myopia.* The concave lens placed in front of the eye forms a virtual image of distant object at far point (F) of the myopic eye

25. Question

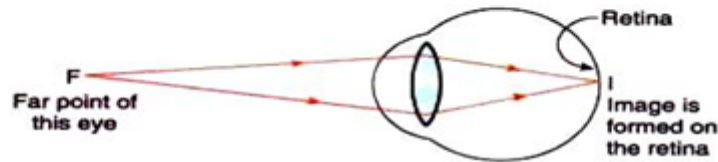
Explain with the help of labelled ray diagram, the defect of vision called myopia and how it is corrected by a lens.

Answer

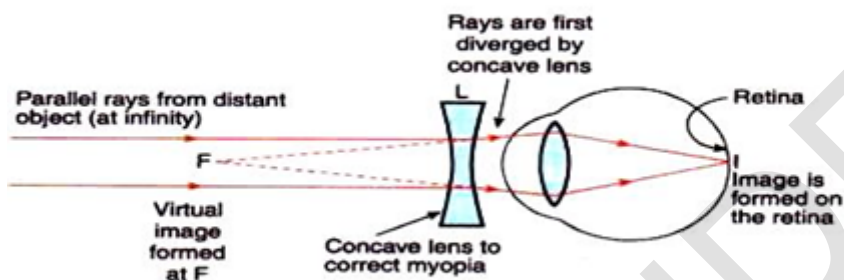
The defect of vision due to which a person cannot see the distance objects clearly (though he can see the nearby objects clearly) is known as myopia or short sightedness. By using concave lens this eye defect can be corrected.



(a) In a myopic eye, image of distant object is formed in front of the retina (and not on the retina)



(b) The far point (F) of a myopic eye is less than infinity



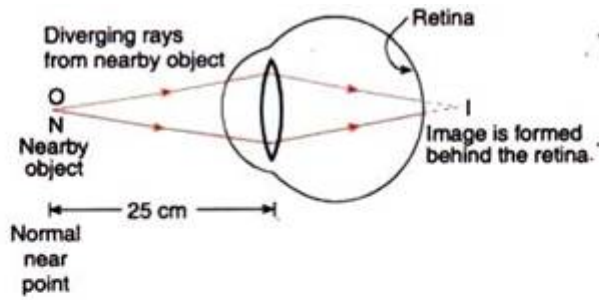
(c) *Correction of myopia.* The concave lens placed in front of the eye forms a virtual image of distant object at far point (F) of the myopic eye

26. Question

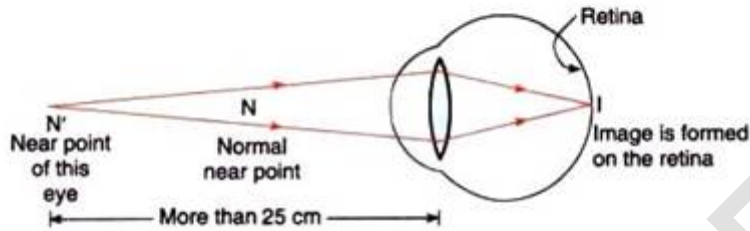
Explain with the help of labelled ray-diagram, the defect of vision called hypermetropia, and how it is corrected by a lens.

Answer

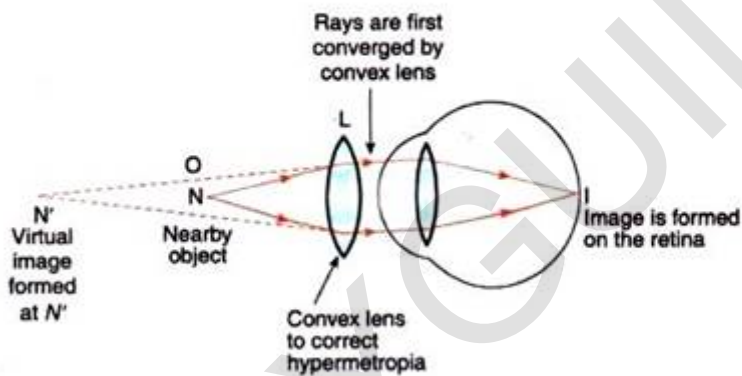
The defect of vision due to which a person cannot see the nearby objects clearly (though he can see the distant object clearly) is known as hypermetropia. By using convex lens this defect of vision can be corrected.



(a) In a hypermetropic eye, the image of nearby object lying at normal near point N (at 25 cm) is formed behind the retina.



(b) The near point N' of hypermetropic eye is farther away from the normal near point N



(c) Correction of hypermetropia. The convex lens forms a virtual image of the object (lying at normal near point N) at the near point N' of this eye.

27. Question

A person suffering from the eye-defect myopia (short-sightedness) can see clearly only up to a distance of 2 metres. What is the nature and power of lens required to rectify this defect?

Answer

A person suffering from the eye-defect myopia (short-sightedness) can see clearly only up to a distance of 2 meters should must use concave lens.

Calculation of the power is given by

Here, far point of myopic eye = 2m

The object kept at infinity can be seen clearly if the image of this objects is formed at 2 m.

So, object distance, $u = \infty$

Image distance , $v = 2\text{m}$

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{-2} - \frac{1}{\infty} = \frac{1}{f}$$

$$f = -2\text{m}$$

$$P = \frac{1}{f} = \frac{1}{-2} = -0.5\text{D}$$

28. Question

The near-point of a person suffering from hypermetropia is at 50 cm from his eye. What is the nature and power of the lens needed to correct this defect? (Assume that the near-point of the normal eye is 25 cm).

Answer

Convex lens is needed to rectify the defect.

Its calculation for the power of the lens is given by

The defected eye can see the nearby object kept at 25 cm clearly if the image is formed at its own near point i.e. 50 cm.

Object distance, $u = -25\text{ cm}$

Image distance, $v = -50\text{ cm}$

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{-50} - \frac{1}{-25} = \frac{1}{f}$$

$$f = 50\text{ cm}$$

$$P = \frac{100}{f} = \frac{100}{50} = 2\text{D}$$

29. Question

A person needs a lens of power, - 5.5 dioptres for correcting his distant vision. For correcting his near vision, he needs a lens of power, +1.5 dioptres. What is the focal length of the lens required for correcting

(i) distant vision, and (ii) near vision?

Answer

(i) For distant vision:

$$P = -5.5D$$

$$P = 1/f$$

$$f = 1/P = 1/(-5.5) = -0.1818 \text{ m} = -18.18\text{cm}$$

(ii) For Near Vision:

$$P = 1.5D$$

$$P = 1/f$$

$$f = 1/P = 1/1.5 = 0.6666 = 66.66 \text{ cm}$$

30. Question

What is presbyopia? Write two causes of this defect. Name the type of lens which can be used to correct presbyopia.

Answer

The defect of vision due to which an old person cannot see the nearby objects clearly due to loss of power of accommodation of the eye is known as presbyopia.

The two cases are :-

- 1) ciliary muscles gets weakened gradually with time.
- 2) Eye lens loses its flexibility.

31. Question

When is a person said to have developed cataract in his eye ? How is the vision of a person having cataract restored?

Answer

When the eye lens becomes progressively cloudy resulting in blurred vision then at that time a person is said to have developed cataract in his eye.

32. Question

Fill in the following blanks with suitable words:

A person is short-sighted if his eyeball is too ____ Spectacles with a ____ lens are needed. A person is long-sighted if his eyeball is too ____ Spectacles with a ____ lens are needed. These focus light rays exactly on to the ____

Answer

A person is short-sighted if his eyeball is too **long** Spectacles with a **concave** lens are needed. A person is long-sighted if his eyeball is too **short**. Spectacles

with a **convex** lens are needed. These focus light rays exactly on to the **retina**.

Long Answer Type Questions-Pg-280

33 A. Question

What is short-sightedness ? State the two causes of short-sightedness (or myopia). With the help of ray diagrams, show:

- (i) the eye-defect short-sightedness.
- (ii) correction of short-sightedness by using a lens.

Answer

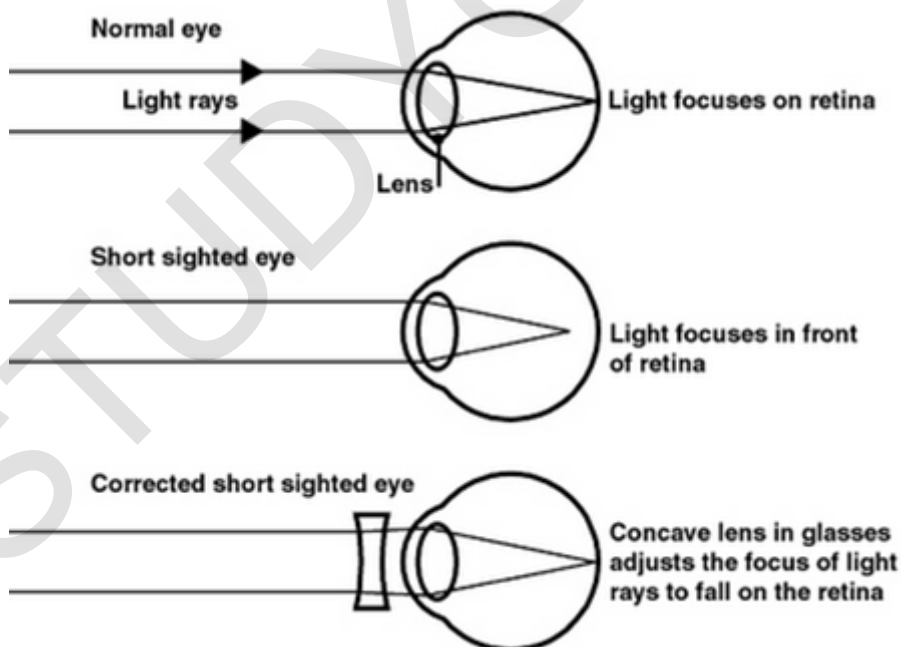
The defect of vision due to which a person can see nearby objects clearly but cannot see distant objects clearly is known as short-sightedness.

The two of its causes are :-

- 1) Excessive curvature of the eye lens
- 2) Elongation of the eyeball.

Its ray diagram can be shown as :-

(i)



(ii) The 3rd diagram shows the correction of short-sightedness by using a lens.

33 B. Question

A person having short-sight cannot see objects clearly beyond a distance of 1.5 m. What would be the nature and power of the corrective lens to restore proper vision?

Answer

A person having short-sight cannot see objects clearly beyond a distance of 1.5 m. The nature and power of the corrective lens to restore proper vision is concave.

The calculation of the power is shown as:-

Here, far point of myopic eye = 1.5 m

The object kept at infinity can be seen clearly if the image of this object is formed at 1.5m.

So, object distance = $u = \infty$

Image distance, $v = 1.5$ m

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{-1.5} - \frac{1}{\infty} = \frac{1}{f}$$

$$f = -1.5 \text{ m}$$

$$P = \frac{1}{f} = \frac{1}{-1.5} = 0.67 \text{ D}$$

34 A. Question

What is long-sightedness? State the two causes of long-sightedness (or hypermetropia). With the help of ray diagrams, show:

- (i) the eye-defect long-sightedness.
- (ii) correction of long-sightedness by using a lens.

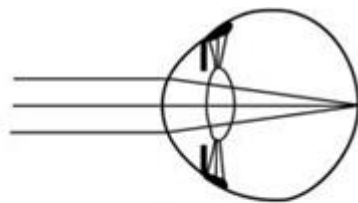
Answer

The defect of vision due to which a person cannot see the nearby objects clearly but he can see the distant objects clearly is known as long-sightedness.

The two causes of long-sightedness are:-

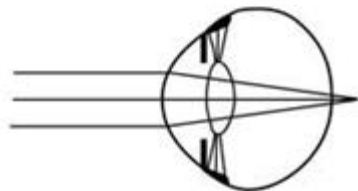
- 1) Focal length of the eye lens is too long.
- 2) The eyeball has become too small.

(i) The ray diagram is:-

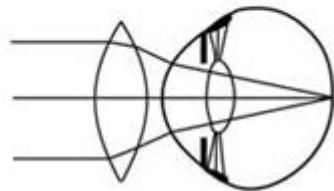


Normal eye

Hypermetropia



Light focused behind the retina



Corrected with convex lens

(ii) The 3rd diagram shows the correction of long-sightedness by using a lens.

34 B. Question

An eye has a near point distance of 0.75 m. What sort of lens in spectacles would be needed to reduce the near point distance to 0.25 m? Also calculate the power of lens required. Is this eye long-sighted or short sighted?

Answer

If an eye has a near point distance of 0.75 m, then convex lenses should be used.

$$v = -0.75 \text{ m}$$

$$u = -0.25 \text{ m}$$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{f} = \frac{1}{-0.75} - \frac{1}{-0.25}$$

$$\Rightarrow \frac{1}{f} = \frac{2}{.75}$$

$$\Rightarrow f = 0.375$$

Hence Power = $1/f = 1/0.375 = +2.67\text{D}$

Hence, this eye is long-sighted.

34 C. Question

An eye has a far point of 2 m. What type of lens in spectacles would be needed to increase the far point to infinity? Also calculate the power of lens required. Is this eye long-sighted or short-sighted?

Answer

This is a case of short sightedness. Concave lens of focal length 2m should be used to curb this defect. The power of this lens should be:

Power = $1/\text{focal length}$

Power = $1/(-2)$

Power = -0.5 D .

Multiple Choice Questions (MCQs)-Pg-280

35. Question

The human eye can focus objects at different distances by adjusting the focal length of the eye-lens. This is due to:

- A. presbyopia
- B. Accommodation
- C. near-sightedness
- D. far-sightedness

Answer

The human eye can focus objects at different distances by adjusting the focal length of the eye-lens. This is due to accommodation.

36. Question

The defect of vision which cannot be corrected by using spectacles is :

- A. myopia
- B. presbyopia
- C. cataract
- D. hypermetropia

Answer

The defect of vision which cannot be corrected by using spectacles is cataract.

37. Question

A person cannot see the distant objects clearly (though he can see the nearby objects clearly). He is suffering from the defect of vision called :

- A. cataract
- B. hypermetropia
- C. myopia
- D. presbyopia

Answer

A person cannot see the distant objects clearly (though he can see the nearby objects clearly). He is suffering from the defect of vision called myopia.

38. Question

Though a woman can see the distant objects clearly, she cannot see the nearby objects clearly. She is suffering from the defect of vision called:

- A. long-sight
- B. short-sight
- C. hind-sight
- D. mid-sight

Answer

Though a woman can see the distant objects clearly, she cannot see the nearby objects clearly. She is suffering from the defect of vision called long-sightedness.

39. Question

A young man has to hold a book at arm's length to be able to read it clearly. The defect of vision is:

- A. astigmatism
- B. myopia
- C. presbyopia

D. hypermetropia

Answer

A young man has to hold a book at arm's length to be able to read it clearly. The defect of vision is hypermetropia.

40. Question

After testing the eyes of a child, the optician has prescribed the following lenses for his spectacles:

Left eye : + 2.00 D Right eye : + 2.25 D

The child is suffering from the defect of vision called :

- A. short-sightedness
- B. long-sightedness
- C. cataract
- D. presbyopia

Answer

The child is suffering from the defect of vision called long-sightedness.

41. Question

A person got his eyes tested. The optician's prescription for the spectacles reads:

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

The person is having a defect of vision called :

- A. presbyopia
- B. myopia
- C. astigmatism
- D. hypermetropia

Answer

The person is having a defect of vision called myopia.

42. Question

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

Answer

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. The far point of his eyes has come closer to him.

43. Question

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.

Answer

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. It shows that, the near point of his eyes has receded away.

44. Question

The defect of vision in which the eye-lens of a person gets progressively cloudy resulting in blurred vision is called:

- A. myopia
- B. presbyopia
- C. colourblindness
- D. cataract

Answer

The defect of vision in which the eye-lens of a person gets progressively cloudy resulting in blurred vision is called cataract.

45. Question

A person cannot see distant objects clearly. His vision can be corrected by using the spectacles containing:

- A. concave lenses
- B. plane lenses
- C. contact lenses
- D. convex lenses

Answer

A person cannot see distant objects clearly. His vision can be corrected by using the spectacles containing concave lenses.

46. Question

A person finds difficulty in seeing nearby objects clearly. His vision can be corrected by using spectacles containing :

- A. converging lenses
- B. diverging lenses
- C. prismatic lenses
- D. chromatic lenses

Answer

A person finds difficulty in seeing nearby objects clearly. His vision can be corrected by using spectacles containing converging lenses.

Questions Based on High Order Thinking Skills (HOTS)-Pg-281

47. Question

In a certain murder investigation, it was important to discover whether the victim was long-sighted or short-sighted. How could a detective decide by examining his spectacles?

Answer

The examination of the spectacles can be done by determining the type of lens used in it. If spectacle lenses are convex, the person was long-sighted but if spectacle lenses are concave, then the person was short-sighted.

48. Question

The picture given here shows a person wearing 'half-moon' spectacles. What sort of eye-defect do you think he has ? Why are these particular spectacles useful to him?



Answer

The picture given here shows a person wearing 'half-moon' spectacles. The eye defect he may have is Long-sightedness (Hypermetropia). This particular spectacles help him because the convex lenses of spectacles form the image of nearby object at the near point of his eye.

49. Question

A short-sighted person has a near point of 15 cm and a far point of 40 cm.

(a) Can he see clearly an object at a distance of:

(i) 5 cm ? (ii) 25 cm ? (iii) 50 cm ?

(b) To see clearly an object at infinity, what kind of spectacle lenses does he need ?

Answer

(a) i) A short-sighted person has a near point of 15 cm and a far point of 40 cm. He cannot see an object clearly when it is at a distance of 5cm.

ii) A short-sighted person has a near point of 15 cm and a far point of 40 cm. He can see an object clearly when it is at a distance of 5cm.

iii) A short-sighted person has a near point of 15 cm and a far point of 40 cm. He can see an object clearly when it is at a distance of 50cm.

(b) To see clearly an object at infinity spectacles should must have a concave lenses.

50. Question

The near point of a long-sighted person is 50 cm from the eye.

(a) Can she see clearly an object at:

(i) a distance of 20 cm ? (ii) at infinity ?

(b) To read a book held at a distance of 25 cm, will she need converging or diverging spectacle lenses?

Answer

(a) (i) The near point of a long-sighted person is 50 cm from the eye so he cannot see clearly an object at a distance of 20cm.

(ii) The near point of a long-sighted person is 50 cm from the eye so he cannot see clearly an object at infinity.

(b) To read a book held at a distance of 25 cm, she will need converging spectacle lens.

51. Question

A person can read a book dearly only if he holds it at an arm's length from him. Name the defect of vision:

(a) if the person is an old man

(b) if the person is a young man

Answer

(a) Presbyopia is the name of the defect when a person can read a book dearly only if he holds it at an arm's length from him. In case of old man.

(b) Hypermetropia is the name of the defect when a person can read a book dearly only if he holds it at an arm's length from him. In case of a young man.

Very Short Answer Type Questions-Pg-283

1. Question

How much is our field of view:

(a) with one eye open?

(b) with both eyes open?

Answer

(a) Our field of view with one eye open is about 150°

(b) Our field of view with both eye open is about 180° .

2. Question

Which of the following have a wider field of view?

(a) Animals having two eyes on the opposite sides of their head.

(b) Animals having two eyes at the front of their head.

Answer

Animals having two eyes on the opposite sides of their head.

3. Question

Out of animals of prey and predators, which have their eyes:

(i) at the front of their head?

(iii) on the opposite sides of their head?

Answer

(i) Out of animals of prey and predators who have their eyes at the front of their head are predators.

(ii) Out of animals of prey and predators who have their eyes on the opposite sides of their head are animal of prey.

4. Question

State whether the following statement is true or false: Rabbit has eyes which look sideways.

Answer

True, Rabbit has eyes which look sideways.

5. Question

Fill in the following blanks with suitable words:

(a) Having two eyes gives a ____ field of view.

(b) Having two eyes enables us to judge ____ more accurately.

Answer

(a) Having two eyes gives a wider field of view.

(b) Having two eyes enables us to judge distance more accurately.

Short Answer Type Questions-Pg-284

6. Question

What are the advantages of having two eyes instead of just one?

Answer

The advantages of having two eyes instead of just one is that one can see to about 180° .

7. Question

Explain clearly why, a person who has lost the sight of one eye is at a disadvantage compared with the normal person who has two good eyes.

Answer

A person who has lost the sight of one eye is at a disadvantage compared with the normal person who has two good eyes. This is because with one eye one can only see to about 150° but with two eyes one can see about 180° .

8. Question

Name two animals having eyes:

- (a) on the sides of the head.
- (b) at the front of the head.

Answer

- (a) two animals having eyes on the side of the head are rabbit and deer.
- (b) The two animals having eyes at the front of the head are Tiger and Lion.

9. Question

Among animals, the predators (like lions) have their eyes facing forward at the front of their heads, whereas the animals of prey (like rabbit) usually have eyes at the sides of their head. Why is this so?

Answer

The animals of prey (like rabbit) usually have eyes at the side of their head, because this gives them a larger field of view. So that they can see their enemy easily but the predators do not have such larger field of view.

10. Question

Five persons A, B, C, D and E have diabetes, leukaemia, asthma, meningitis and hepatitis, respectively.

- (a) Which of these persons can donate eyes?
- (b) Which of these persons cannot donate eyes?

Answer

- (a) The people with diabetes and asthma can donate their eyes.

(b) Person with leukaemia, meningitis and hepatitis cannot donate their eyes.

Multiple Choice Questions (MCQs)-Pg-284

11. Question

The animal which does not have eyes that look sideways is:

- A. Horse
- B. Chicken
- C. Lion
- D. Fish

Answer

The animal which does not have eyes that look sideways is Lion.

12. Question

With both eyes open, a person's field of view is about:

- A. 90°
- B. 150°
- C. 180°
- D. 360°

Answer

With both eyes open, a person's field of view is about 180°.

13. Question

Having two eyes gives a person:

- A. deeper field of view
- B. coloured field of view
- C. rear field of view
- D. wider field of view

Answer

Having two eyes gives a person wider field of view.

14. Question

The animals of prey have:

- A. two eyes at the front
- B. two eyes at the back
- C. two eyes on the sides
- D. one eye at the front and one on the side

Answer

The animals of prey have two eyes on the sides.

15. Question

The animals called predators have:

- A. both the eyes on the sides
- B. one eye on the side and one at the front
- C. one eye on the front and one at the back
- D. both the eyes at the front

Answer

The animals called predators have both the eyes at the front.

Very Short Answer Type Questions-Pg-288

1. Question

As light rays pass from air into a glass prism, are they refracted towards or away from the normal?

Answer

As light rays pass from air into a glass prism, they get refracted towards the normal.

2. Question

As light rays emerge from a glass prism into air, they get refracted towards or away from the normal ?

Answer

As light rays emerge from a glass prism into air, they get reflected away from the normal.

3. Question

Name a natural phenomenon which is caused by the dispersion of sunlight in the sky.

Answer

Rainbow is a natural phenomenon which is caused by the dispersion of sunlight in the sky.

4. Question

What information do we get about sunlight from the formation of a rainbow?

Answer

With the formation of the rainbow we got the information that sunlight consist of seven colors.

5. Question

What did Newton demonstrate by his experiments with the prism?

Answer

The white light consist of a mixture of seven colors, demonstrated by his experiment with a prism.

6. Question

What colours make up white light?

Answer

The seven color make up to form white light, which are Violet, indigo, blue, green, yellow, orange, red.

7. Question

Give the meaning of the term VIBGYOR. With which phenomenon is it connected?

Answer

the term VIBGYOR stands for the seven color of the spectrum of white light where V stands for Violet, I for Indigo, B for Blue, G for Green, Y for Yellow, O for Orange and R for Red.

8. Question

In the formation of spectrum of white light by a prism :

(i) which colour is deviated least?

(ii) which colour is deviated most?

Answer

(i) Red color is least deviated.

(ii) Violet color is most deviated color.

9. Question

What colours lie on the two sides of the 'green colour' in the spectrum of white light?

Answer

on the two sides of the 'green color' in the spectrum of white light are Yellow and Blue.

10. Question

Name the scientist who discovered that sunlight consists of seven colours.

Answer

Newton was the scientist who discovered that sunlight consists of seven colors.

11. Question

What is the order of colours in a rainbow, from the outside to the inside?

Answer

Red, Orange, Yellow, Green, Blue, Indigo and Violet this is the order of color in a rainbow, from the outside to the world.

12. Question

Which colour of the spectrum has

(a) longest wavelength, and

(b) shortest wavelength ?

Answer

(a) Red has longest wavelength.

(b) Violet has the shortest wavelength.

13. Question

Which light has the longer wavelength : red light or blue light ?

Answer

Red light has the longer wavelength.

14. Question

Which colour of light has the shorter wavelength - red or violet ?

Answer

Violet has the shortest wavelength.

15. Question

Fill in the blanks with suitable words:

(a) When a ray of light enters a prism, it bends.....the normal; as it leaves the prism, it bends the normal.

(b) White light is composed ofcolours. The colour of white light deviated through the largest angle by a prism is.....

Answer

(a) When a ray of light enters a prism, it bends **towards** the normal; as it leaves the prism, it bends **away from** the normal.

(b) White light is composed of **seven** colors. The color of white light deviated through the largest angle by a prism is **violet**.

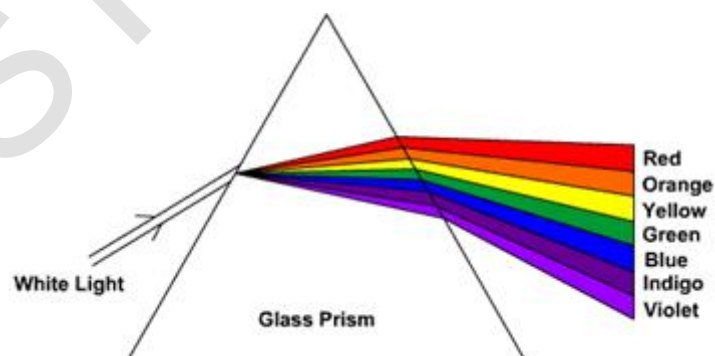
Short Answer Type Questions-Pg-288

16 A. Question

A ray of white light breaks up into its components while passing through a glass prism.

Draw a ray diagram to show the path of rays.

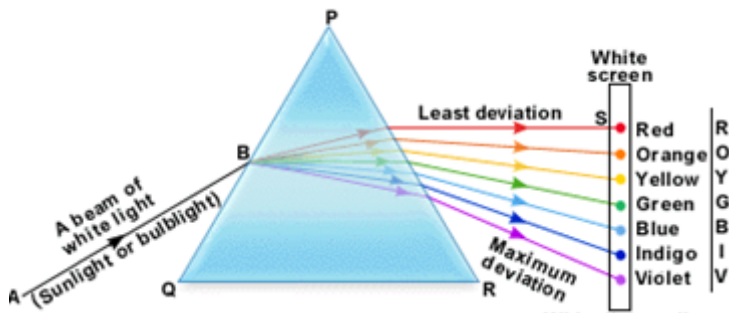
Answer



16 B. Question

Mark the least deviated colour in your diagram.

Answer



16 C. Question

Why do different coloured rays deviate differently in a prism?

Answer

Different color have different speed of travelling so different color deviates differently in prism.

17 A. Question

What happens when a ray of ordinary light is passed through a triangular glass prism?

Answer

A band of seven colors appears when a ray of ordinary light is passed through a triangular glass prism.

17 B. Question

What will happen if another similar glass prism is placed upside down behind the first prism?

Answer

When another similar glass prism is placed upside down behind the first prism, then the seven colored rays from the first prism which are incident on the second prism recombine to form the original white beam.

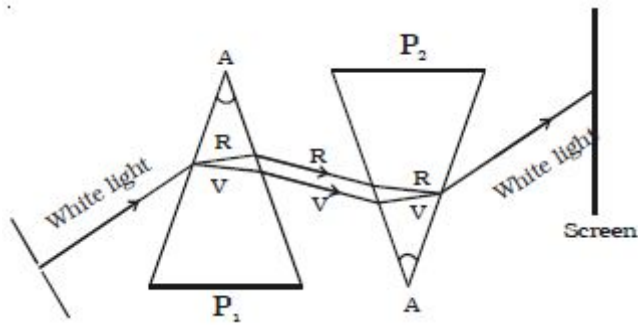
18. Question

When a beam of white light is passed through a prism, it splits to form lights of seven colours. Is it possible to recombine the lights of seven colours to obtain the white light again? Explain your answer.

Answer

Yes, it is possible to recombine the lights of seven colours to obtain the white light again, and this can be done by placing another similar prism alongside

the first prism used but it should be in inverted position. The positions of both prisms are shown bellow,



When the beam of white light enters the prism 1 then it gets dispersed in to seven colors, the prism 2 which is kept alongside the prism 1 but in inverted direction receives the all seven colors then the prism 2 recombines the all colors to form a single white light. This is due to the refraction produced by the second prism is equal and opposite to that of the refraction produced by the first prism.

19 A. Question

What is spectrum? What is the name of glass shape used to produce a spectrum?

Answer

When a beam of white light is passed through a glass prism, and a band of seven colors formed on a white screen then this phenomenon is termed as spectrum. The name of glass shape used to produce a spectrum is prism.

19 B. Question

How many colours are there in a full spectrum of white light? Write the various colours of spectrum in the order, starting with red.

Answer

In a full spectrum of white light there are seven colors. The colors are Red, Orange, Yellow, Green, Blue, Indigo and Violet.

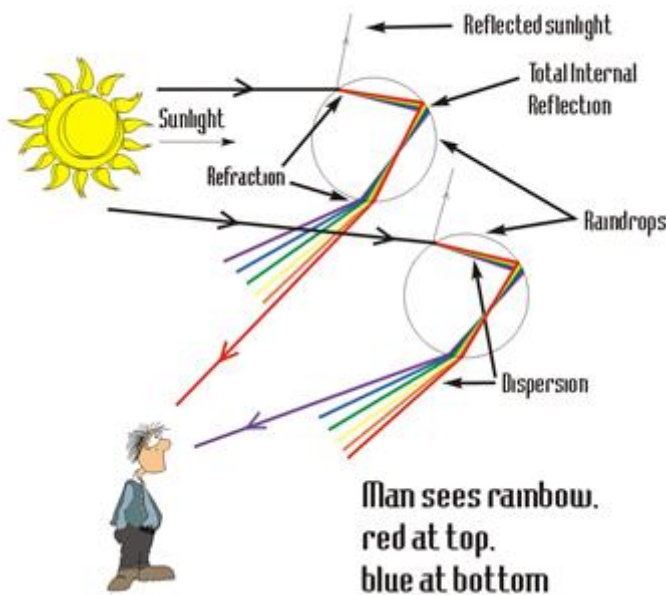
20. Question

What is meant by dispersion of white light? Describe the formation of rainbow in the sky with the help of a diagram.

Answer

When the white light splits into seven color on passing through a transparent medium like a glass prism is called dispersion of light.

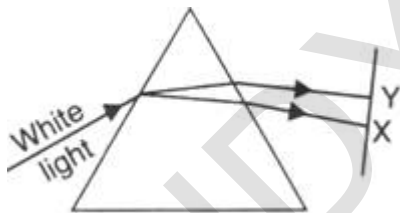
The formation of a rainbow can be shown in the fig. given bellow:-



Like the prism acts the raindrop. During the rain when sunlight enters and leaves these raindrops, the various colored rays in white light are refracted by different amounts due to which an arc of seven colors called rainbow is formed.

21. Question

In the figure given alongside, a narrow beam of white light is shown to pass through a triangular glass prism. After passing through the prism, it produces a spectrum YX on the screen.



(a) State the colour seen (i) at X, and (ii) at Y.

(b) Why do different colours of white light bend through different angles with respect to the incident beam of light?

Answer

(a) i) The color seen at X is violet. ii) the color seen at Y is red.

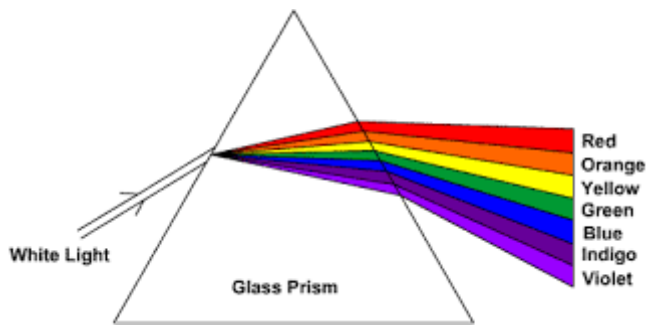
(b) Different colors of white light bend through different angles with respect to the incident beam of light because every color has its own wave length, so they bend at different angles.

22. Question

Draw a diagram to show how white light can be dispersed into a spectrum by using a glass prism. Mark the various colours of the spectrum.

Answer

a diagram to show how white light can be dispersed into a spectrum by using a glass prism can be shown as:-

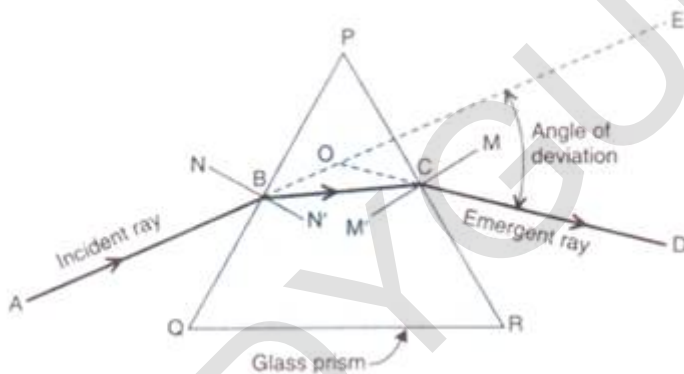


23. Question

Make two diagrams to explain refraction and dispersion.

Answer

Refraction can be shown like :-



Dispersion can be shown by :-



24. Question

Describe how you could demonstrate that white light is composed of a number of colors.

Answer

When we allow a white light's beam to pass through a glass prism, then the white light splits to form a band of seven color. This shows that white light is composed of seven colors.

25. Question

How could you show that the colours of the spectrum combine to give white light ?

Answer

when the colors of a spectrum from one prism are allowed to fall on a similar prism placed adjacent to the first prism, but in inverted position. Then the refraction produced by second prism is equal and opposite to that produced by the first prism. Which makes the colors of the spectrum combine to give white light.

26. Question

Which is refracted most by a prism : red light or violet light ? Explain why?

Answer

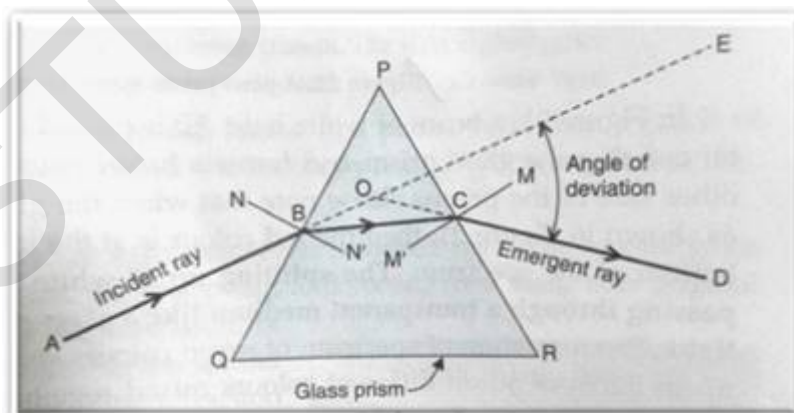
Violet light is refracted most by a prism. This is because violet colored light has the least speed in glass prism.

Long Answer Type Questions-Pg-289

27 A. Question

Draw a diagram to show the refraction of light through a glass prism. On this diagram, mark (i) incident ray (ii) emergent ray, and (iii) angle of deviation.

Answer



27 B. Question

What is a rainbow? What are the two conditions necessary for the formation of a rainbow in the sky?

Answer

An arch of seven colors visible in the sky which is produced by the dispersion of sun's light by raindrops in the atmosphere is known as rainbow. The two conditions necessary for the formation of the rainbow are:-

I) there should must be a shining sun in the sky,

II) it should must be raining at the same time.

27 C. Question

What acts as tiny prisms in the formation of a rainbow?

Answer

Raindrops act as tiny prisms in the formation of a rainbow.

27 D. Question

Name the process which is involved in the formation of a rainbow.

Answer

The process which is involved in the formation of a rainbow is known as dispersion of light.

27 E. Question

What are the seven colours seen in a rainbow?

Answer

The seven colors seen in a rainbow are Red, Orange, Yellow, Green, Blue, Indigo and Violet.

Multiple Choice Questions (MCQs)-Pg-289

28. Question

A beam of white light is shone onto a glass prism. The light cannot be:

A. deviated

B. dispersed

C. focused

D. refracted

Answer

A beam of white light is shone onto a glass prism. The light cannot be focused.

29. Question

A beam of white light falls on a glass prism. The colour of light which undergoes the least bending on passing through the glass prism is :

- A. violet
- B. red
- C. green
- D. blue

Answer

A beam of white light falls on a glass prism. The colour of light which undergoes the least bending on passing through the glass prism is red.

30. Question

The colour of white light which suffers the maximum bending (or maximum refraction) on passing through a glass prism is :

- A. yellow
- B. orange
- C. red
- D. violet

Answer

The color of white light which suffers the maximum bending (or maximum refraction) on passing through a glass prism is violet.

31. Question

Which of the following colour of white light is least deviated by the prism?

- A. green
- B. violet
- C. indigo
- D. yellow

Answer

Yellow color of white light is least deviated by the prism.

32. Question

The colour of white light which is deviated the maximum on passing through the glass prism is:

- A. blue
- B. indigo
- C. red
- D. orange

Answer

The colour of white light which is deviated the maximum on passing through the glass prism is indigo.

33. Question

The splitting up of white light into seven colours on passing through a glass prism is called :

- A. refraction
- B. deflection
- C. dispersion
- D. scattering

Answer

The splitting up of white light into seven colours on passing through a glass prism is called dispersion.

34. Question

Which of the following coloured light has the least speed in glass prism ?

- A. violet
- B. yellow
- C. red
- D. green

Answer

violet colored light has the least speed in glass prism.

35. Question

The coloured light having the maximum speed in glass prism is :

- A. blue
- B. green
- C. violet
- D. yellow

Answer

The yellow colored light having the maximum speed in glass prism.

36. Question

Which of the following colour of white light has the least wavelength?

- A. red
- B. orange
- C. violet
- D. blue

Answer

Violet color of white light has the least wavelength.

37. Question

Out of the following, the colour of light having the maximum wavelength is:

- A. violet
- B. indigo
- C. green
- D. orange

Answer

The color of light having the maximum wavelength is orange.

Questions Based on High Order Thinking Skills (HOTS)-Pg-290

38. Question

Why do you not see a spectrum of colours when light passes through a flat pane of glass ?

Answer

Due to the parallel sides of the flat plane glass we do not see a spectrum of colors when light passes through a flat pane of glass.

39. Question

Name some everyday objects:

- (a) which reflect all the colors in sunlight
- (b) which absorb all the colors in sunlight

Answer

- (a) White paper reflects all the colors in sunlight.
- (b) Blackboard absorb all the colors in sunlight.

40. Question

Where in nature can you find evidence that white sunlight may be made of different colours?

Answer

White sunlight may be made of different colors can be evidenced in the nature during the formation of rainbow in the sky.

Very Short Answer Type Questions-Pg-292

1. Question

Name the phenomenon which causes the twinkling of stars.

Answer

The phenomenon which causes the twinkling of stars is atmospheric refraction of light.

2. Question

Name two effects produced by the atmospheric refraction.

Answer

The two effects produced by the atmospheric refraction are:-

- 1) Twinkling of stars
- 2) Advance sunrise and delayed sunset.

3. Question

Which phenomenon makes us see the sun:

(a) a few minutes before actual sunrise?

(b) a few minutes after actual sunset?

Answer

(a) The phenomenon which makes us see the sun a few minutes before actual sunrise is atmospheric refraction of light.

(b) The phenomenon which makes us see the sun a few minutes after actual sunset is atmospheric refraction of sunlight.

4. Question

Atmospheric refraction causes advance sunrise and delayed sunset. By how much time is:

(a) sunrise advanced?

(b) sunset delayed?

Answer

(a) Atmospheric refraction causes advance sunrise by about 2 minutes.

(b) Atmospheric refraction causes delayed sunset is by about 2 minutes.

5. Question

State whether the following statement is true or false:

The planets twinkle at night due to atmospheric refraction of light.

Answer

False, the stars twinkle at night due to atmospheric refraction of light.

6. Question

Name the phenomenon due to which the stars seem higher in the sky than they actually are.

Answer

The phenomenon due to which the stars seem higher in the sky than they actually is atmospheric refraction of sunlight.

7. Question

Fill in the following blanks with suitable words:

We can see the sun about.....minutes before the actual sunrise and about.....minutes after the actual sunset because of atmospheric.....

Answer

We can see the sun about **two** minutes before the actual sunrise and about **two** minutes after the actual sunset because of atmospheric **refraction**.

Short Answer Type Questions-Pg-292

8. Question

Why do stars seem higher than they actually are? illustrate your answer with the help of a diagram.

Answer

Because of atmospheric refraction of light coming from the star while passing through the successive denser layers of earth's atmosphere stars seem higher than they actually are. It can be illustrated through a diagram:-



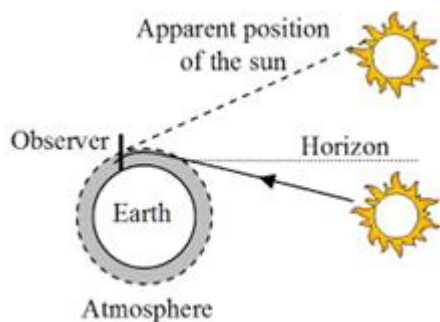
9. Question

Explain why, the sun can be seen about two minutes before actual sunrise. Draw a diagram to illustrate your answer.

Answer

Because of atmospheric refraction of sun's light the sun can be seen about two minutes before actual sunrise. When the sun is slightly below the horizon, then the sun's light coming from less dense air to more dense air is refracted downwards as it passes through the atmosphere and the appears to be raised above the horizon.

Let us see a diagram to illustrate it:-



10. Question

Explain why, if we look at objects through the hot air over a fire, the objects appear to be moving (or shaking) slightly.

Answer

When we look at objects through the hot air over a fire, the objects appear to be moving (or shaking) slightly this happens because the air just above the fire becomes hotter. This hotter air is optically rarer but the colder air further up is optically denser, so when we see the objects by the light coming from them through hot and cold air layers having different optical densities, then refraction of light takes place randomly.

Long Answer Type Questions-Pg-292

11 A. Question

What is atmospheric refraction? What causes atmospheric refraction?

Answer

When the refraction of light takes place due to the atmosphere is known as atmospheric refraction. Due to the varying optical densities of different layers of earth's atmosphere atmospheric refraction takes place.

11 B. Question

Why do stars twinkle on a clear night ?

Answer

When the light from stars reaches us it has to travel through the different layers of the earth's atmosphere. Due to the varying optical densities of air at various altitudes. The continuously changing atmosphere refracts the light from the star by different amounts from one moment to the next. Thus, the star-light reaching our eyes increases and decreases continuously and the star appears to twinkle.

11 C. Question

Explain why, the planets do not twinkle at night.

Answer

As the planets are near to earth so they appear big and so they have a collection of many point sources of light. The dimming effect produced by some of the point sources is nullified by brighter effect produced by some other point sources. That is why, the overall brightness remains the same and the planets do not appear to twinkle.

Multiple Choice Questions (MCQs)-Pg-292

12. Question

The twinkling of stars is due to atmospheric:

- A. reflection of light
- B. dispersion of light
- C. interference of light
- D. refraction of light

Answer

The twinkling of stars is due to atmospheric refraction of light.

13. Question

The atmospheric refraction of light causes the twinkling of:

- A. planets only
- B. stars only
- C. planets and stars
- D. stars and satellites

Answer

The atmospheric refraction of light causes the twinkling of stars only.

14. Question

The stars appear higher in the sky than they actually are, due to:

- A. diffraction of light
- B. scattering of light
- C. refraction of light
- D. reflection of light

Answer

The stars appear higher in the sky than they actually are, due to refraction of light.

15. Question

The stars twinkle but the planets do not twinkle at night because:

- A. the stars are small but the planets are large
- B. the stars are very large but planets are small
- C. the stars are much nearer but planets are far off
- D. the stars are far off but planets are nearer to earth

Answer

The stars twinkle but the planets do not twinkle at night because the stars are far off but planets are nearer to earth.

16. Question

As light from a far off star comes down towards the earth:

- A. it bends away from the normal
- B. it bends towards the normal
- C. it does not bend at all
- D. it is reflected back

Answer

As light from a far off star comes down towards the earth it bends towards the normal.

17. Question

We can see the sun before the actual sunrise by about:

- A. 5 minutes
- B. 2 minutes
- C. 2 hours
- D. 20 minutes

Answer

We can see the sun before the actual sunrise by about 2 minutes.

18. Question

Due to atmospheric refraction of sunlight, the time from sunrise to sunset is lengthened by about:

- A. 6 minutes
- B. 2 minutes
- C. 4 minutes
- D. 5 minutes

Answer

Due to atmospheric refraction of sunlight, the time from sunrise to sunset is lengthened by about 4 minutes.

19. Question

The day is longer on the earth by about 4 minutes because:

- A. the earth is round in shape
- B. the earth rotates on its axis
- C. the earth revolves around the sun
- D. the earth has atmosphere

Answer

The day is longer on the earth by about 4 minutes because the earth has atmosphere.

Questions Based on High Order Thinking Skills (HOTS)-Pg-293

20. Question

We know that light refracts (or bends) when it goes from one medium to another. Now, the atmosphere contains only air. Then how does light get refracted on passing through only air in the atmosphere?

Answer

We know that light refracts (or bends) when it goes from one medium to another. Now, the atmosphere contains only air but still refraction occurs this is due to the reason that all the air present in the atmosphere is not at same temperature. Some of the air layers are cold whereas others are comparatively warm. The cooler air layers of the atmosphere behave as optically denser medium for the light rays whereas the warmer air layers behave as optically rarer medium.

21. Question

By how much time the day would have been shorter if the earth had no atmosphere?

Answer

By about 4 minutes the day would have been shorter if the earth had no atmosphere.

22. Question

A student claims that because of atmospheric refraction, the sun can be seen after it has set, and the day is, therefore, longer than if the earth had no atmosphere.

(a) What does the student mean by saying that the sun can be seen after it has set?

(b) Do you think that the students' conclusion is correct?

Answer

The student mean by saying that the sun can be seen after it has set, is due to the atmospheric refraction we continue to see the sun about two minutes after the actual sunset. This is because earth has atmosphere which cause refraction and this is the reason for having longer day.

(b) Yes, the students conclusion is correct.

Very Short Answer Type Questions-Pg-297

1. Question

What is the colour of the sunlight:

(a) scattered by the dust particles in the atmosphere?

(b) scattered by the air molecules in the atmosphere?

Answer

(a) The color of the sunlight scattered by the dust particles in the atmosphere is white.

(b) The color of the sunlight scattered by the air molecules in the atmosphere is blue.

2. Question

Which of the two is scattered more easily: light of shorter wavelengths or light of longer wavelengths?

Answer

Light of shorter wavelengths scatters more easily.

3. Question

State whether the following statements are true or false:

(a) The scattering away of red light makes the sky appear blue during the day time.

(b) The scattering away of blue light makes the sun appear red at sunset.

Answer

(a) False, The scattering away of blue light makes the sky appear blue during the day time

(b) True, The scattering away of blue light makes the sun appear red at sunset.

4. Question

What colour does the sky appear to an astronaut?

Answer

Dark (or black) color appear to the astronaut.

5. Question

Which effect is illustrated by the observation that when a beam of sunlight enters a dusty room, then its path becomes visible to us.

Answer

Tyndall effect is illustrated by the observation that when a beam of sunlight enters a dusty room, then its path becomes visible to us.

6. Question

State two effects produced by the scattering of light by the atmosphere.

Answer

The two effects produced by the scattering of light by the atmosphere are:-

1) Sky appears blue

2) Sun appears red at sunrise and sunset.

Short Answer Type Questions-Pg-297

7. Question

What is Tyndall effect? Explain with an example.

Answer

Tyndall effect (scattering of light) is the scattering of light by particles in its path.

Example. When through a window, sunlight enters a dusty room then its path becomes visible to us due to the scattering of the light by the dust particles present in the air.

8. Question

What happens when a beam of sunlight enters a dusty room through a window ? Explain your answer.

Answer

The path of the light becomes visible to us, when a beam of light enters a dusty room through a window. The tiny dust particles present in the air of room scatter the beam of light all around the room.

9. Question

Why does the sky appear blue on a clear day ?

Answer

The scattering of blue component of white sunlight by air molecules presents in the atmosphere cause the sky to look blue during a clear day. When sunlight passes through the atmosphere, most of the longer wavelength lights do not get scattered much and hence pass straight through the atmosphere. The shorter wavelength blue light is, however, scattered all around the sky and whichever direction we look, some of this scattered blue light enters our eyes.

10. Question

Why does the sky appear dark (or black) to an astronaut instead of blue?

Answer

The sky appears dark (or black) to an astronaut instead of blue because in the outer space there is no atmosphere which contains air due to which there is no scattering of light takes place. And when there is no scattered light to reach our eyes in outer space, therefore the sky looks dark and black there.

11. Question

Why does the sun appear red at sunrise ?

Answer

At the sunrise the sun and the surrounding appears to be red because at that time most of the blue color present in sunlight has been scattered out and away from our line of sight, leaving behind mainly red color in the direct sunlight beam that reaches our eyes.

12. Question

Why does the sun appear red at sunset ?

Answer

During the sunset the sun and the surrounding appears to be red, the reason is, at that time most of the blue color present in sunlight has been scattered out and away from our line of sight, leaving behind mainly red color in the direct sunlight beam that reaches our eyes.

13. Question

Why are the 'danger signal' lights red in colour?

Answer

The red colored light having longer wavelength is the least scattered by fog or smoke particles. Due to this the red light can be seen in the same color even from a distance. This is the reason why 'Danger' signals are red in color.

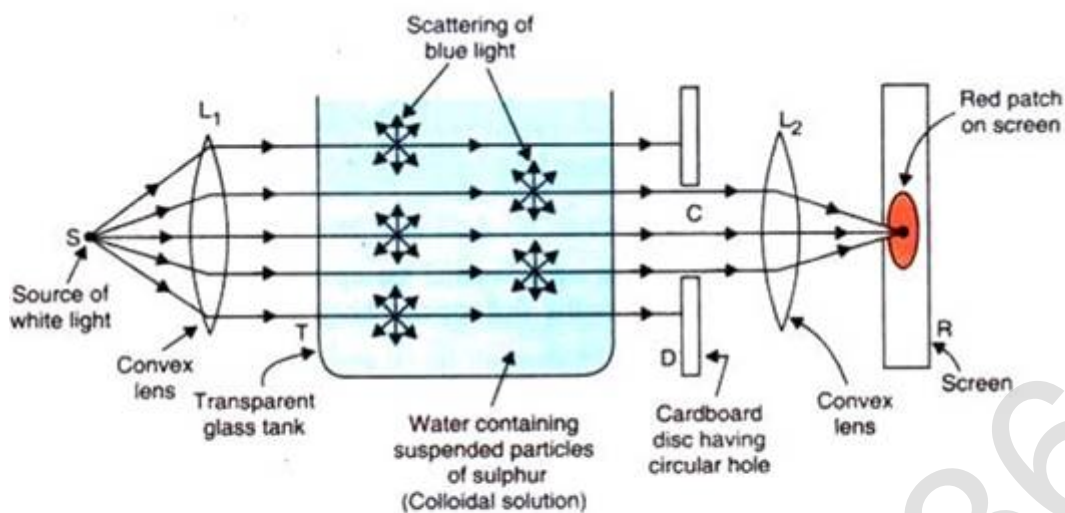
Long Answer Type Questions-Pg-298

14 A. Question

Draw a neat and labelled diagram of the experimental set up for observing the scattering of light in a colloidal solution of sulphur to show how the sky appears blue, and the sun appears red at sunrise and sunset.

Answer

A neat and labelled diagram of the experimental set up for observing the scattering of light in a colloidal solution of sulphur to show how the sky appears blue, and the sun appears red at sunrise and sunset is shown below:-



An arrangement for observing the scattering of light in a colloidal solution to show how the sky appears blue, and the sun appears red at sunrise and sunset.

14 B. Question

Out of blue light and red light, which one is scattered more easily?

Answer

Blue light scattered more easily.

14 C. Question

Which component of sunlight is scattered away when the sun appears red at sunrise or sunset?

Answer

Blue component of sunlight is scattered away when the sun appears red at sunrise or sunset.

14 D. Question

What causes the scattering of blue component of sunlight in the atmosphere?

Answer

The scattering of blue component of sunlight in the atmosphere is caused by the gas molecules present in the air.

Multiple Choice Questions (MCQs)-Pg-298

15. Question

The blue colour of sky is due to:

A. refraction of light

- B. diffraction of light
- C. dispersion of light
- D. scattering of light

Answer

The blue colour of sky is due to scattering of light.

16. Question

The red colour of the sun at the time of sunrise and sunset is because:

- A. red colour is least scattered
- B. blue colour is least scattered
- C. red colour is most scattered
- D. blue colour is most scattered

Answer

The red color of the sun at the time of sunrise and sunset is because the blue color is most scattered.

17. Question

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

Answer

Sun appearing red at sunset is not caused by the atmospheric refraction of light.

18. Question

The sky appears blue because some of the blue component of sunlight is scattered by:

- A. gas molecules present in air
- B. dust particles present in air
- C. water droplets suspended in air

D. soot particles present in air

Answer

The sky appears blue because some of the blue component of sunlight is scattered by gas molecules present in air.

19. Question

Sunset is red because at that time the light coming from the sun has to travel:

- A. lesser thickness of earth's atmosphere
- B. greater thickness of earth's atmosphere
- C. varying thickness of earth's atmosphere
- D. along the horizon

Answer

Sunset is red because at that time the light coming from the sun has to travel greater thickness of earth's atmosphere.

Questions Based on High Order Thinking Skills (HOTS)-Pg-298

20. Question

In an experiment to study the scattering of light by passing a beam of white light through a colloidal solution of sulphur in a transparent glass tank :

(a) Which colour is observed from the front of the glass tank? Does this colour correspond to the colour of sky on a clear day or the colour of sky around the sun at sunset ?

(b) Which colour is observed from the sides of the glass tank? Does this colour correspond to the colour of sky on a clear day or the colour of sky around the sun at sunset ?

Answer

(a) Red color is observed from the front of the glass tank. This color correspond to the color of sky around the sun at sunset.

(b) Blue color is observed from the sides of the glass tank. This color correspond to the color of sky on a clear day.

21. Question

Explain why, when the sun is overhead at noon, it appears white, but when the same sun is near the horizon at sunset, it appears red.

Answer

The light coming from the sun has to travel a relatively shorter distance through the atmosphere to reach us, when the sun is overhead. During the shorter journey of sunlight, only a little of the blue color of the white light is scattered. Since light coming from the overhead sun has almost all its component colors in the right proportion, therefore the sun in the sky overhead appears white to us.

The sunlight has to travel the greatest distance through the atmosphere to reach us, when the same sun is near the horizon at sunset. During this long journey of sunlight, most of the shorter wavelength blue color present in it is scattered out and away from our line of sight. So, the light reaching us directly from the setting sun consists mainly of longer wavelength red color due to which the sun appears red.

22. Question

Complete the following statements:

When the sun is setting, the light from it has to travel athickness of the earth's atmosphere and only wavelength light is able to reach us. Sunset is therefore

Answer

When the sun is setting, the light from it has to travel a **greater** thickness of the earth's atmosphere and only **longer** wavelength **red** light is able to reach us. Sunset is therefore **red**.