Class 10th Science

Chapter - 11

The Human Eye and the colourful World

Textual Questions and Answers :

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Q.1. What is the meant by power of accommodation of the eye?

Ans :- The ability of the eye to fours both near and distant objects, by adjusting its focal length is called the power of accommodation of the eye.

Q.2. A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of the corrective lens used to restore proper vision?

Ans :- Diverging or concave lens.

Q.3. What is the far point and near point of the human eye with normal vision?

Ans :- The farthest point upto which the eye can see objects clearly is called the far point of the eye.

The minimum distance, at which objects can be seen most distinctly without strain is called the near point of the eye.

Q.4. A student has difficulty reading the black board while sitting in the last row. What could be the defect the child is suffering from? How can it be corrected?

Ans :- The student is suffering from myopia. He should be use concave lenses of suitable focal length.

EXERCISES

Q.1. 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.

Ans :- (b) Accommodation.

Q.2. The human eye forms the image of an object at its-

(a) Cornea.

(b) Iris.

(d) Retina.

Ans :- (d) Retina.

Q.3. 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

Ans :- (c) 25 cm.

Q.4. 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.

Ans :- (c) Ciliary muscles.

Q.5. A person needs a lens of power -5.5 diopters for correcting his distant vision. For correcting his near di vision he needs a lens What is od ji the focal length of he lens required for correcting

(i) Distant vision and

(ii) Near vision?

Ans :- (I) Here $p = -5.5\ D$

$f = ?$

We have, $p = \frac{1}{f}$

$\Rightarrow f = \frac{1}{p}$

$= \frac{1}{-5.5D}$

$= \frac{1}{-5.5}\ m$

$= -0.18m$

(ii) Here, $p = +1.5D$

$f = ?$

We have $p = \frac{1}{f}$

$$\Rightarrow f = \frac{1}{p}$$

$$= \frac{1}{+1.5D}$$

$$= \frac{1}{+1.5}m$$

$$= +0.666m$$

$$= +0.67m.$$

Q.6. The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to corrects the problem?

Ans :- Here,

Object distance $u = \infty$ (infinity)

Image distance $v = -80$ cm.

focal length $f = ?$

We have,

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

$$\Rightarrow -\frac{1}{80} - \frac{1}{\infty} = \frac{1}{f}$$

$$\Rightarrow -\frac{1}{80} - \frac{1}{\frac{1}{0}} = \frac{1}{f}$$

$$\Rightarrow -\frac{1}{80} - 0 = \frac{1}{f}$$

$$\Rightarrow \frac{1}{f} = -\frac{1}{80}$$

$$\Rightarrow f = -80$$

$$\therefore \quad f = -80\text{cm}.$$

Thus, the focal length of the required concave lens is 80cm.

$$\text{Now, Power (P)} = \frac{1}{f}$$

$$= \frac{1}{-80\text{cm}}$$

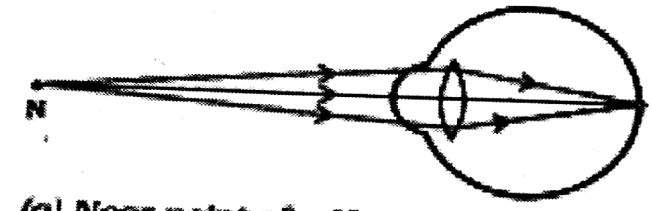
$$= - \frac{1}{0.8\text{cm}}$$

$$= - \frac{1}{0.8} \text{ D}$$

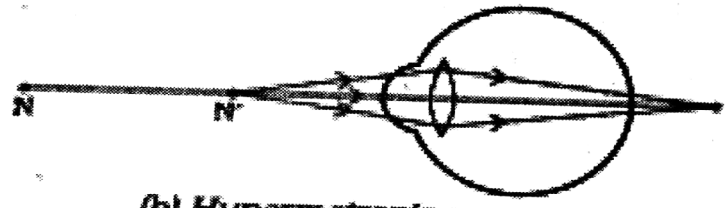
$$= - 1.25 \text{ D}$$

Q.7. Make a diagram to show how hypermetropia is corrected the near point of a hypermetropic eye is 1m. What is the power of the lens required to correct this defect? Assume that the near point of the normal eye is 25 cm.

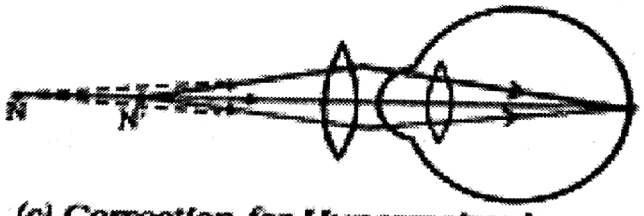
Ans :- Diagram :-



(a) Near point of a Hypermetropic eye



(b) Hypermetropic eye



(c) Correction for Hypermetropic eye

2nd part :-

Here, Object distance u = –25 cm / For convex lens.

image distance v = – 1m

= – 100 cm

focal length f = ?

We have,

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

$$\Rightarrow \quad \frac{1}{f} = \frac{1}{v} = \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{-100} + \frac{1}{25}$$

$$= \frac{-1+4}{100}$$

$$= \frac{3}{100}$$

$$\therefore \quad f = \frac{100}{3}$$

$$= 33.3\text{cm}.$$

Now , Power

$$P = \frac{1}{f}$$

$$= \frac{1}{+33.3\text{cm}}$$

$$= \frac{1}{0.33\text{m}}$$

$$= + \frac{100}{33} D$$

$$= + 3.0D$$

Q.8. Why is a normal eye not able to see clearly the objects idpiln placed closer than 25 cm?

Ans :- A distance less than 25 cm, the ciliary muscles can not bulge the eye less any more, the object cannot be focussed on the retina and it appears blurred to the eye.

Q.9. What happens to the image distance in the eye when we increase the distance of an object from the eye?

Ans :- In the eye, the image distance is fixed which cannot be changed. So, when we increase the distance of an object from the eye. There is no change in the image distance inside the eye.

Q.10. Why do stars twinkle?

Ans :- The twinkling of a star is due to atmospheric refraction of starlight. The starlight, on entering the earth's atmosphere, undergoes refraction continuously before it reaches the earth. The atmospheric refraction occurs in a medium of gradually changing refractive index. Since the atmosphere bends light towards the

normal, the apparent position of the star is slightly different from its actual position. The star appears slightly higher than its actual position when viewed near the horizon.

Further, this apparent position of the star is not stationary but keeps on changing slightly, since the physical conditions of the earth's atmosphere are not stationary. Since the stars are very distant, they approximate point sized sources of light. As the part of rays of light coming from the star goes on varying slightly. The apparent position of the star fluctuates and the amount of starlight entering the eye flickers - the star sometimes appears brighten and at some other time fainter, which is the twinkling effect.

Q.11. Explain why the planets do not twinkle.

Ans :- The planets are much closer to the earth and are extended sources. If we consider a planet as a collection of a large us seen as number of point sized sources of light, the total variation in the amount of light entering our from all the individual point-sized sources will average out to zero. There by nullifying the twinkling effect.

Q.12. Why does the Sun appear reddish early in the morning?

Ans :- The sun and the surrounding sky appear red at sun rise because at that time most of the blue colour present in sunlight has been scattered out and away

from our line of sight, leaving behind mainly red colour in the direct sunlight beam that reaches our eyes.

Q.13. Why does the sky appear dark instead of blue to an astronaut?

Ans :- This is because in outer space, there is no atmosphere to scatter sunlight. Since there is no scattering of blue component of white sunlight which ca reach the eyes of an astronaut in outer space, therefore the sky appears dark to the astronaut instead of blue.

Additional Questions :

Q.1. What are the main parts of human eye?

Ans :- The main parts of human eye are :- Cornea, Iris, Pupil, Ciliary muscles, Eye lines, Retina and Optic nerve.

Q.2. Name the part of the eye :

(a) Which control the amount of light entering the eye.

(b) On which the image is formed.

(c) Which changes the focal length of eye lens.

Ans : (a) Iris.

(b) Retina.

(c) Ciliary muscles.

Q.3. What is the name of

(a) The curved, transparent front surface of the eye?

(b) The light-sensitive layer in the eye?

Ans :- (a) Cornea.

(b) Retina.

Q.4. 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.

Ans :- (a) Optic nerve.

(b) Citeary muscles.

(c) Pupil.

(d) Cornea.

(e) Eye lens.

Q.5. Define the following :

(a) Myopia.

(b) Hypermetropia.

(c) Presbyopia.

(d) Cataract.

Ans :- (a) Myopia :- Myopia is that defect of vision due to which a person cannot see the distant objects clearly though he can see the nearby objects clearly.

(b) Hypermetropia :- Hypermetropia is that defect of vision due to which a person cannot see the nearby objects clearly though he can see the distant objects clearly.

(c) Presbyopia :- Presbyopia is that of vison due to which an old person cannot see the nearby objects clearly due to loss of power of accommodation of the eye.

(d) Cataract :- The medical condition in which the lens of the eye of a person becomes progressively cloudy resulting in blurred vision is called cataract.

Q.6. State whether the following statement is true or false : Short-sightedness can be cured by using a concave lens.

Ans :- True.

Q.7. Name one defect of vision which cannot be corrected by any type of spectacle lenses.

Ans :- Cataract.

Q.8. 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?

Ans :- (i) No.

(ii) Yes.

(iii) No.

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

Ans :- Concave lenses.

(c) In the formation of spectrum of white light by a prism:

(i) Which colour is deviated least ?

(ii) Which colour is deviated most?

Ans :- (i) Red.

(ii) Violet.

Q.10. Name the phenomenon which causes the twinkling of stars.

Ans :- Atmospheric refraction of light.

Q.11. What is Tyndall Effect?

Ans :- The scattering of light by particles in its path is called Tyndall effect.

Q.12. Why the sky is blue?

Ans :- The scattering of blue component of the while sunlight by air molecules present in the atmosphere causes the blue colour of the sky.

Multiple Choice Questions :

Q.1. The human eye forms the image of an object at its :

(a) Cornea.

(b) Iris.

(c) Pupil.

(d) Retina.

Ans :- (d) Retina.

Q.2. 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.

Ans :- (c) Ciliary muscles.

Q.3. 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 cm

Ans :- (c) 25 cm

Q.4. Refraction of light in the eye occurs at :

(a) The lens only.

(b) The cornea only.

(c) Both the cornea and lens.

(d) The pupil.

Ans :- (c) Both the cornea and lens.

Q.5. 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.

Ans :- (b) Accommodation.

Q.6. 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.

Ans :- (a) Concave lenses.

Q.7. 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.

Ans :- (a) Converging lenses.

Q.8. The animal which does not have eyes that 100 side ways is :

(a) Horse.

(b) Chicken.

(c) Lion.

(d) Fish.

Ans :- (c) Lion.

Q.9. With both eyes open, a person's field of view is about :

(a) 90°

(b) 150°

(c) 180°

(d) 360°

Ans :- (c) 180°

Q.10. A beam of white light is shone onto a glass prism. The light cannot be :

(a) Deviated.

(b) dispersed.

(c) Focused.

(d) Refracted.

Ans :- (c) Focused.

Q.11. The colour of white light which suffers the maximum bending on passing through a glass prism is :

(a) Yellow.

(b) Orange.

(c) Red.

(d) Violet.

Ans :- (d) Violet.

Q.12. Which of the following colour of white light is least deviated by the prism?

(a) Green.

(b) Violet.

(c) Indigo.

(d) Yellow.

Ans :- (d) Yellow.

Q.13. 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.

Ans :- (c) Dispersion.

Q.14. Which of the following colour of white light has the least wavelength?

(a) Red.

(b) Orange.

(c) Violet.

(d) Blue.

Ans :- (c) Violet.

Q.15. The twinling of stars in due to atmospheric.

(a) Reflection of light.

(b) Dispersion of light.

(c) Interference of light.

(d) Refraction of light.

Ans :- (d) Refraction of light.

Q.16. The atmosphere refraction of light causes the twinkling of :

(a) Planets only.

(b) Stars only.

(c) Planets and stars.

(d) Stars and satellites.

Ans :- (b) Stars only.

Q.17. The stars appear higher in the than they actually are due to :

(a) Diffraction of light.

(b) Scattering of light.

(c) Refraction of light.

(d) Reflection of light.

Ans :- (c) Refraction of light.

Q.18. The stars twinkle but the planets do not twinkle at night because.

(a) The stars are small but the planets are larte.

(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 the earth.

Ans :- (d) The stars are far off but planets are nearer the earth.

Q.19. As light from a far off stars 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.

Ans :- (b) It bends towards the normal.

Q.20. We can se the sun before the actual sunrise by about :

(a) 5 minutes.

(b) 2 minutes.

(c) 2 hours.

(d) 20 minutes.

Ans :- (b) 2 minutes.

Q.21. Due to atmospheric refraction of sunlight the time from sunrise sunset is lengthened by about :

(a) 6 minutes.

(b) 2 minutes.

(c) 4 minutes.

(d) 5 minutes.

Ans :- (c) 4 minutes.

Q.22. 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 round the sun.

(d) The earth has atmosphere.

Ans :- The earth has atmosphere.

Q.23. The blue colour of sky is due to :

(a) Refraction of light.

(b) Dispersion of light.

(c) Diffraction of light.

(d) Scattering of light.

Ans :- (d) Scattering of light.

Q.24. The red colour of 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.

Ans :- (d) Blue colour is most scattered.

Q.25. Which of the following is not caused by the atmospheric refraction of light?

(a) Twinkle 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.

Ans :- (d) Sun appearing red at sunset.

Q.26. The sky appears blue because some of the blue component of sunlight is scattered by :

(a) Gas molecules present in air.

(b) Dust particles prescut in air.

(c) Water droplets suspended in air.

(d) Soot particles present in air.

Ans :- (a) Gas molecules present in air.

Q.27. Sunset kis 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.

Ans :- (b) Greater thickness of earth's atmosphere.

Q.28. 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.

Ans :- (b) Red.

Q.29. 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.

Ans :- (b) Indigo.

Q.30. Which of the following coloured light has the least speed in glass prism?

(a) Violet.

(b) Yellow.

(c) Red.

(d) Green.

Ans :- (a) Violet.

Q.31. The colored light having the maximum speed in glass prism is :

(a) Blue.

(b) Green.

(c) Violet.

(d) Yellow.

Ans :- (d) Yellow.

Q.32. Out of the following, the colour of light having the maximum wave length is :

(a) Violet.

(b) Indigo.

(c) Greene.

(d) Orange.

Ans :- (d) Orange.

Q.33. Having two eyes gives a person :

(a) Deeper field of view.

(b) Colour field of view.

(c) Rear field of view.

(d) Wider field of view.

Ans :- (d) Wider field of view.

Q.34. 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.

Ans :- (c) Two eyes on the sides.

Q.35. 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.

Ans :- (d) Both the eyes at the front.

Q.36. The defect of vision which cannot be corrected by using spectacles is :

(a) Myopia.

(b) Presbyopia.

(c) Cataract.

(d) Hypermetropia.

Ans :- (c) Cataract.

Q.37. A person cannot see the distant object clearly. He is suffering from the defect of vision called :

(a) Cataract.

(b) Hypermetropia.

(c) Myopia.

(d) Presbyopia.

Ans :- (c) Myopia.

Q.38. Though a woman can see the distant objects clearly, she cannot sea the nearby object clearly. She is suffering from the defect of vison called :

(a) Long-sight.

(b) Short-sight.

(c) Hind-sight.

(d) Mid-sight.

Ans :- (a) Long-sight.

Q.39. 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.

Ans :- (d) Hypermetropia.

Q.40. After testing the eyes of a child, the optician has prescribed the following lenses for his spectacles Left eye : +2.25 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.

Ans :- (b) Long-sightedness.

Q.41. A person got his eyes tested the opticiav's prescription for his 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.

Ans :- (b) Myopia.

Q.42. A student sitting on the last bench in the class cannot read the writing on the black board 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 then.

(c) The far point of his eyes has receded away.

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

Ans :- (d) The far point of his eyes has come closer to him.

Q.43. 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 has receded away.

(b) The war 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.

Ans :- (a) The near point of his has receded away.

Q.44. The defect of vision in which the eye lans of a person gets progressively cloudy resulting in blurred vision is called :

(a) Myopia.

(b) Presbyopia.

(c) Colourblindness.

(d) Cataract.

Ans :- (d) Cataract.

Q.45. To focus the image of a nearby object on the retina of an eye :

(a) the distant between eye and 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.

Ans :- (d) The thickness of eye-lens is increased.

Q.46. 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) Very the distance between the lens and retina.

Ans :- (c) Vary the focal length of the lens.

Q.47. Which of the following controls the amount of light entering the eye?

(a) Ciliary muscles.

(b) Lens .

(c) Iris.

(d) Cornea.

Ans :- (c) Iris.

Q.48. 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 on objects at different distances.

(d) Decide which of the two objects is closer.

Ans :- (c) Focus on objects at different distances.

Q.49. How does the eye change in order to focus an near or distant objects?

(a) The lens moves in or out.

(b) The ratines moves in or act.

(c) The lens becomes thicker or thinner.

(d) The pupil gets larger or smaller.

Ans :- (c) The lens becomes thicker or thinner.

Q.50. Which of the following changes occur when you walkout of bright sunshine in to a poorly lit room?

(a) The pupil becomes larger.

(b) The lens becomes thicker.

(c) The ciliary muscle relaxes.

(d) The pupil becomes smaller.

Ans :- (a) The pupil becomes larger.

Q.51. The size of the pupil of the eye is adjusted by :

(a) Cornea.

(b) Ciliary muscles.

(c) Optic nerve.

(d) Iris.

Ans :- (d) Iris.