

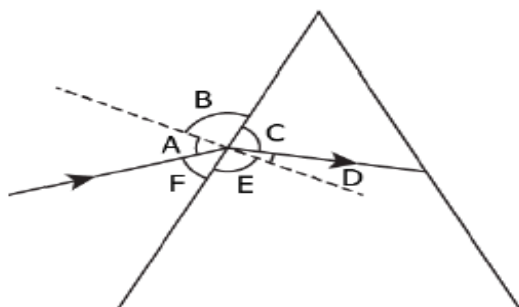


INDIAN SCHOOL AL WADI AL KABIR

Class: X	DEPARTMENT OF SCIENCE -2023-24 SUBJECT: PHYSICS	DATE: 28.8.2023
WORKSHEET NO:3 WITH ANSWERS	TOPIC: HUMAN EYE AND THE COLOURFUL WORLD	A4 FILE FORMAT
CLASS & SEC:	NAME OF THE STUDENT:	ROLL NO.

OBJECTIVE TYPE QUESTIONS(1M)

1. The image shows a light ray incident on a glass prism.



The various angles are labelled in the image. Which angle shows the angle of incidence and angle of refraction, respectively?

- (a) A and D (b) B and E (c) C and F (d) D and F

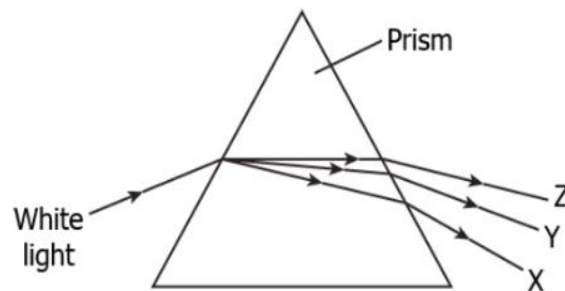
2. The change in the focal length of human eye is caused due to

- (a) Ciliary muscles (b) Pupil
(c) Cornea (d) Iris

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

- (a) is scattered the most by smoke or fog
(b) is scattered the least by smoke or fog
(c) is absorbed the most by smoke or fog
(d) moves fastest in the air

4. A person went for a medical check-up and found that the curvature of his eye lens is increasing. Which defects is he likely to suffer from?
- (a) myopia
 - (b) cataract
 - (c) presbyopia
 - (d) hypermetropia
5. A person gets out in the sunlight from a dark room. How does his pupil regulate and control the light entering in the eye?
- (a) The size of pupil will decrease, and less light will enter the eye
 - (b) The size of pupil will decrease, and more light will enter the eye
 - (c) The size of pupil will remain the same, but more light will enter the eye
 - (d) The size of pupil will remain the same, but less light will enter the eye
6. The danger signals installed at the top of tall buildings are red in colour. These can be easily seen from a distance because among all other colours, the red light
- (a) is scattered the most by smoke or fog
 - (b) is scattered the least by smoke or fog
 - (c) is absorbed the most by smoke or fog
 - (d) moves fastest in air
7. The splitting of white light into different colours on passing through a prism is called
- (a) Reflection
 - (b) Refraction
 - (c) Dispersion
 - (d) Deviation
8. The image shows the dispersion of the white light in the prism.



What will be the colours of the X, Y and Z?

- (a) X: red; Y: green; Z: violet
 - (b) X: violet; Y: green; Z: red
 - (c) X: green; Y: violet; Z: red
 - (d) X: red; Y: violet; Z: green
9. A person gets out in the sunlight from a dark room. How does his pupil regulate and control the light entering the eye?
- (a) The size of the pupil will decrease, and less light will enter the eye
 - (b) The size of the pupil will decrease, and more light will enter the eye
 - (c) The size of the pupil will remain the same, but more light will enter the eye
 - (d) The size of the pupil will remain the same, but less light will enter the eye
10. At noon the sun appears white as
- (a) Light is least scattered
 - (b) all the colours of the white light are scattered away
 - (c) blue colour is scattered the most
 - (d) red colour is scattered the most

VERY SHORT ANSWER QUESTIONS (2M)

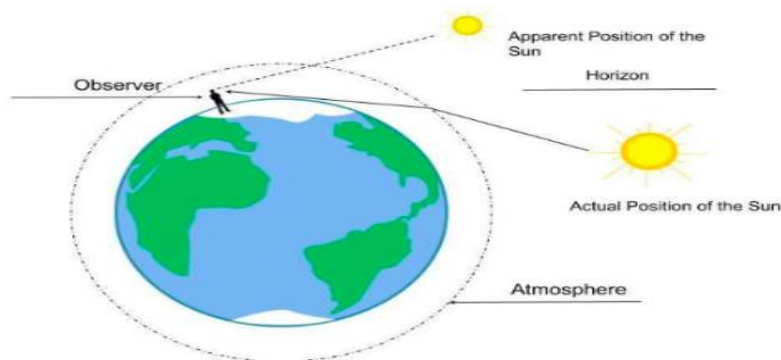
- 11. Why is a normal eye not able to see clearly the objects placed closer than 25cm?
- 12. Give an example in nature which shows that sunlight may be made of different colours.
- 13. Define the term power of accommodation.
- 14. Mention the role of optic nerve in the human eye.

ASSERTION AND REASON QUESTIONS (1M)

- 15. **Assertion (A) :** White light is dispersed into its seven-colour components by a prism.
Reason (R) : Different colours of light bend through different angles with respect to the incident ray as they pass through a prism.
- 16. **Assertion (A):** A normal human eye can clearly see all the objects beyond certain minimum distance.
Reason (R) : The human eye has capacity of adjusting the focal length of eye lens.
- 17. **Assertion(A):** Hypermetropia is the defect of the eye in which only farther objects are seen.
Reason (R) : Hypermetropia is corrected by using converging lens.
- 18. **Assertion(A) :** Danger signals are made of red colour.
Reason (R) : Velocity of red light in air is maximum, so signals are visible even in dark.

CASE STUDY BASED QUESTIONS

CASE : Atmospheric refraction is the phenomenon of bending of light on passing through earth's atmosphere. As we move above the surface of earth, density of air goes on decreasing. Local conditions like temperature etc. also affect the optical density of earth's atmosphere. On account of atmospheric refraction, stars seen appear higher than they actual are; advanced sunrise; delayed sunset, oval appearance of the sun at sunrise and sunset; stars twinkle, planets do not.



19. Due to atmospheric refraction, apparent length of the day
 - (a) increases
 - (b) decreases
 - (c) remains the same
 - (d) all of these
20. The colour of sky appears blue, it is due to the
 - (a) refraction of light through the atmosphere
 - (b) dispersion of light by air molecules
 - (c) scattering of light by air molecules
 - (d) all of these.
21. The danger signs made red in colour, because
 - (a) the red light can be seen from farthest distance
 - (b) both (a) and (b)
 - (c) the scattering of red light is least
 - (d) none of these

SHORT ANSWER QUESTIONS (3 M)

22. Is the position of a star as seen by us its true position? Justify your answer.
23. Why do we see a rainbow in the sky only after rainfall?
24. Explain the phenomenon of dispersion of white light through a glass prism, using suitable ray diagram.
25. A student is not able to see clearly the questions written on the blackboard placed at a

distance of 5 m from him. Name the defect of vision he is suffering from. With the help of the labelled diagram explain in brief how this defect can be corrected? (CBSE 2017)

26. What is Presbyopia? State the cause of presbyopia. How is presbyopia of a person corrected? (CBSE 2011,2016)

27. State the cause of dispersion of white light by glass prism. How did Newton, using two identical glass prisms show that white light is made of seven colours? Draw a ray diagram to show the path of a narrow beam of white light, through combination of two identical prisms (where one of the prisms is in an inverted position with respect to the other), when it is allowed to fall obliquely on one of the faces of the first prism of the combination (CBSE 2016).

LONG ANSWER QUESTIONS (5 M)

28. (a) A student is unable to see clearly the words written on the black board placed at a distance of approximately 3m from him. Name the defect of vision the boy is suffering from. State the possible causes of this defect and explain the method of correcting it.

(b) Why do stars twinkle? Explain. (CBSE 2017-18)

29. A 52-year-old near-sighted person wears eye glass of power of $-5.5D$ for distance viewing. His doctor prescribes a correction of $+1.5D$ in the near-vision section of his bi-focals this measured relative to the main parts of the lens

(i) what is the focal length of his distance viewing part of the lens.

(ii) What is the focal length of the near vision section of the lens.

30. (a) A person is suffering from both myopia and hypermetropia.

(i) What kind of lenses can correct this defect?

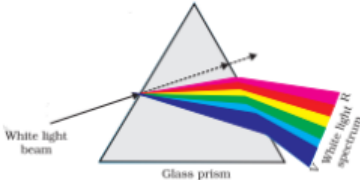
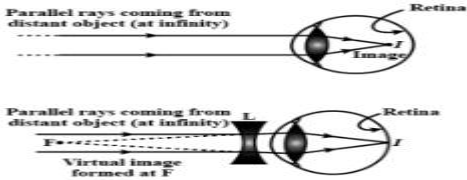
(ii) How are these lenses prepared?

(b) A person needs a lens of power $+3 D$ for correcting his near vision and $-3 D$ for correcting his distant vision. Calculate the focal lengths of the lenses required to correct these defects. (2020)

Answer key

Q.No.	Answers
1.	(a) A and D
2.	(a) Ciliary muscles
3.	(b) is scattered the least by smoke or fog
4.	(a) myopia
5.	(a) The size of pupil will decrease, and less light will enter the eye

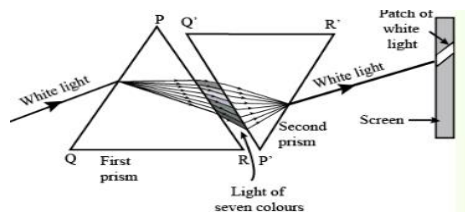
6.	(b) is scattered the least by smoke or fog
7.	(c) Dispersion
8.	(b) X: violet; Y: green; Z: red
9.	(a) The size of the pupil will decrease, and less light will enter the eye
10.	(b) all the colours of the white light are scattered away
11.	There is a limit for the eye lens to decrease its focal length by contracting the ciliary muscles
12	rainbow
13.	The ability of the eye lens to adjust its focal length is called power of accommodation. The ciliary muscles modifies the curvature to some extent. The change in the curvature of the eye lens can thus change its focal length.
14	It transmits the visual information in the form of electrical signals generated at retina to the brain
15	(a) Both A and R are true and R is the correct explanation of A.
16	(a) Both A and R are true and R is the correct explanation of A.
17	(b) Both A and R are true but R is not the correct explanation of A.
18	(c) A is true but R is false.
19	(a) increases
20	(c) scattering of light by air molecules
21	(b) both (a) and (b)
22	Star light undergo continuous refraction on entering earth's atmosphere. Refraction occurs in a medium of gradually changing refractive index. Since the atmosphere bends starlight towards the normal, the apparent position of the star is slightly different from its actual position. The star appears slightly higher (above) than its actual position.
23	Rainbow is caused by dispersion of sunlight by tiny water droplets, present in the atmosphere. A rainbow is always formed in a direction opposite to that of the Sun. The water droplets act like small prisms. They refract and disperse the incident sunlight, then reflect it internally, and finally refract it again when it comes out of the raindrop.

24	 <p>When ray of light enters a prism, it bends because of refraction of light. When the ray of light finally emerges out of the prism. it deviates drastically from its original path. This happens because of unique shape of prism. Different colours in the visible spectrum have different speeds. Due to this, different colours bend at different angles of deviation. As a result, the emergent light appears as a band of seven colours: the colours which are the components of white light. These colours are Violet. Indigo, Blue, Green, Yellow, Orange and Red. Segregation of white light into its different components is called dispersion of light.</p>
25	<p>(a) The defect of vision he is suffering from is called short -sightedness (Myopia).</p>  <p>(b) This defect can be corrected using a diverging lens.</p> <p>(c) The type of lens used to correct this defect is concave Lens.</p>
26.	<p>The near point of the eye of a person gradually recedes away. They find it difficult to see nearby objects comfortably and distinctly without corrective eye-glasses.</p> <p>This defect is called presbyopia.</p> <p>As a person gets older, the ciliary muscles holding the eye lens weaken and the lens lose some of its elasticity. Therefore, the power of accommodation of the eye decreases with ageing.</p> <p>To correct this defect, the elderly people need to use spectacles with a convex lens. They need to wear these spectacles for reading or similar kind of close work.</p>

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When a beam of white light enters the prism, it gets refracted at that point and splits into seven constituent colours. This splitting of the light occurs because different colours of light bend through different angles with respect to the incident ray, as they pass through the prism.

Firstly, Newton made white light to fall on a prism. This caused dispersion of white light into seven colours. Newton then placed an inverted prism in the path of the colour band of seven colours. Only a beam of white light came out from the second prism. So, Newton concluded that white light comprises of seven component colours.



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a) Myopia is that defect of human eye by virtue of which it can see clearly the objects lying at short distance from it. But the far off objects cannot be seen clearly by the myopic eye.

Causes of Myopia : The two possible causes of this defect are :

Increase in the length of the eyeball, as if distance of retina from the eye lens has increased.

Decrease in focal length of the eye lens when the eye is fully relaxed. This is as if the ciliary muscles holding the eye lens do not relax fully and have some tension.

This defect can be corrected by using a concave lens of suitable focal length.
diagram

b) Stars emit their own light and they twinkle due to the atmospheric refraction of light. Stars are very far away from the earth. Hence, they are considered as point sources of light. When the light coming from stars enters the earth's atmosphere, it gets refracted at different levels because of the variation in the air density at different levels of the atmosphere. When the star light refracted by the atmosphere comes more towards us, it appears brighter than when it comes less towards us. Therefore, it appears as if the stars are twinkling at night.

29	<p>(i) Focal length of lens for distance</p> <p>viewing $F_1 = \frac{1}{P_1} = \frac{1}{-5.5}$</p> <p>$= -0.182 \text{ m}$</p> <p>$= -18.2 \text{ cm}$</p> <p>(ii) Focal length for near vision</p> <p>$F_2 = \frac{1}{P_2} = \frac{1}{1.5}$</p> <p>$= 0.667 \text{ m} = 66.7 \text{ cm}$</p>
30	<p>(a) (i) The lens which can correct the vision of such a person suffering from both myopia and hypermetropia is a bifocal lens.</p> <p>(b) (ii) A common type of bifocal lens contains both concave and convex lens. It is prepared with the upper portion consisting of a concave lens facilitating distant vision and the lower portion consisting of convex lens facilitating near vision, (b) The power for correcting his near vision,</p> <p>$P = +3 \text{ D}$.</p> <p>As $P = 1f(\text{m})$</p> <p>\therefore Focal length of convex lens needed,</p> <p>$f = 0.33 \text{ m} = +33.33 \text{ cm}$</p> <p>$\therefore$ Focal length of concave lens,</p> <p>$f_D = -0.33 \text{ m} = -33.33 \text{ cm}$.</p>

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