ODM Teachers' Note

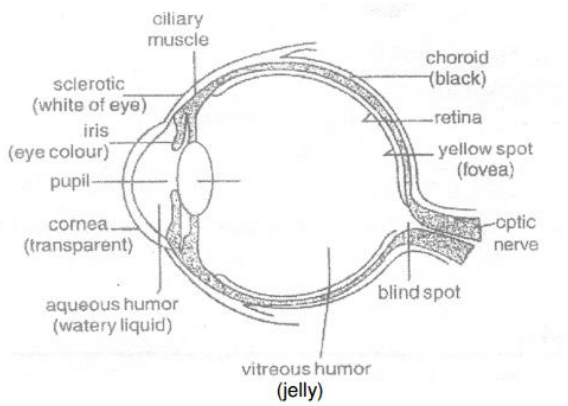
Class	X	Subject	Physics	Plan For	Normal class

Period	45	Chapter 13	Human Eye and the colorful world

T

Sub-Concepts	Human eye Parts and functions of different parts of human eye.
Teaching Aid To be used	Smart board

Sl. No	Step Wise (What to be done)
1	Introducing the topic by asking the following questions: How are we able to see? What are the different parts of human eye? The human eye is one of the most sensitive sense organs of sight which enables us to see the wonderful world of light and color around us. It is like a camera having la lens system and forming an inverted, real image on a light sensitive screen inside the eye
2	The different parts of human eye and their functions are discussed.

. 3	 **Eye ball is nearly spherical in shape with a diameter of 2.3 cm.**
4	Explain about the function of different parts of human eye:
5	1) **Cornea:** It is the transparent spherical membrane covering the front of the eye. Light enters the eye through this membrane. Most of the refraction occurs at the outer surface of the cornea. 2) **Iris:**It is a dark muscular diaphragm between the cornea and the lens. It controls the size of the pupil. 3) **Pupil:** It is a small hole between the iris through which light enters the eye. In dim light it expands and in bright light it contracts. 4) **Crystalline Lens:** The eye lens is a convex lens made of a transparent, soft and flexible material like a jelly made of proteins **5) Ciliary Muscles: They** hold the lens in position and help in modifying the curvature of the lens. **6) Retina:** It is the light sensitive surface of the eye on which the image is formed. It contains Rods and Cones. Rod cells respond to intensity of light and cone cells respond to colors. These cells generate signals which are transmitted to the brain through the optic nerve. **7) Optic Nerve:** It transmits visual information from the retina to the brain. **8) Sclera:** It is an opaque, fibrous, protective outer layer of an eye containing collagen and elastic of the fiber. It is also called as the white of the eye. **9) Blind Spot: It** is the point at which the optic nerve leaves the eye. It contains no rods and cones. So an image formed at this point is not sent to the brain. **10) Aqueous humour:** Between the cornea and the eye lens, we have a space filled with a transparent liquid called the aqueous humour. It maintains the intraocular pressure. **11) Vitreous humour:** The space between the eyelens and retina is filled with another liquid called vitreous humour.

ODM Teachers' Note

Class	X	Subject	Physics	Plan For	Normal class

Period	46	Chapter 13	Human Eye and the colorful world

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Sub-Concepts	Power of accommodation Defects of vision and its correction
Teaching Aid To be used	Smart board

Sl. No	Step Wise (What to be done)
1	Recap different parts of human eye:
2	Explain the concept of accommodation and power of accommodation:
. 3	**Accommodation:** It is the ability of the eye lens to focus both near and distant objects by adjusting its focal length.
4	Give the concept of near point and far point of the eye: **Near point:** The minimum distance at which an object can be seen most distinctly without any strain is called the least distance of distinct vision. It is 25 cm for normal eye of an adult. It is also called near point of the eye.
5	**Far point:** it is the farthest point upto which the eye can see clearly. It is infinity for normal eye.
6	**Persistence of vision:** The time for which sensation of an object continues in the eye is called persistence of vision. It is about $1/16^{th}$ of a second.
7	**Define power of accommodation:** It is the maximum variation in power of eye lens for focusing nearby or far objects. For young adults, with normal vision, the power of accommodation is about 4D.

ODM Teachers' Note

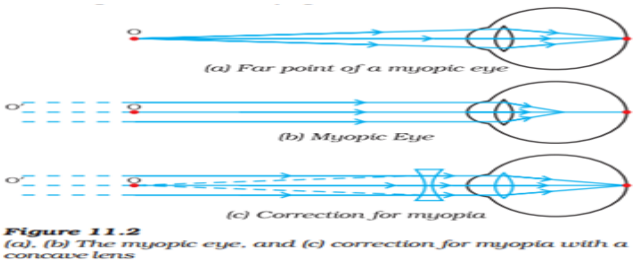
Class	X	Subject	Physics	Plan For	Normal class

Period	47	Chapter 13	Human Eye and the colorful world

T

Sub-Concepts	Power of accommodation Defects of vision and its correction
Teaching Aid To be used	Smart board

Sl. No	Step Wise (What to be done)
1	Recap power of accommodation.
2	Explain the concept of defects of vision and their correction.
. 3	The defects due to which a person cannot see the objects distinctly and comfortably are called defects of vision.
4	The three main defects are: 1) Myopia or short sightedness 2) Hypermetropia or long sightedness 3) Presbyopia
5	**Myopia**: 1. The defect in which a person can see nearby objects distinctly but cannot see distant objects clearly is called myopia. 2.In this case, the image is formed before retina. 3. **causes**: i. Excessive curvature of eye lens. ii. Elongation of eye ball. 1. **Remedy:** This defect can be corrected by using concave lens of appropriate power.

	 **Figure 11.2** (a), (b) The myopic eye, and (c) correction for myopia with a concave lens
6	**Hypermetropia:** : 1. The defect in which a person can see distant objects distinctly but cannot see nearby objects clearly is called hypermetropia. 2.In this case, the image is formed after retina. 3. **causes**: i. Focal length of eye lens become large. ii. Eye ball becomes too short. **Remedy:** This defect can be corrected by using convex lens of appropriate power.
7	**Presbyopia:** It is found in old people. For most people the near point recedes away with age. Sometimes people may suffer from both myopia and hypermetropia. **Causes:** Weakness of ciliary muscles. Hardening or loss of elasticity of eye lens. **Remedy**: The defect can be corrected by using bifocal lenses which contains both concave lens and convex lens.

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ODM Teachers' Note

Class	X	Subject	Physics	Plan For	Normal class

Period	48	Chapter 13	Human Eye and the colorful world

T

Sub-Concepts	Refraction through glass prism , dispersion.
Teaching Aid To be used	Prism, pins, wooden board, paper.

Sl. No	Step Wise (What to be done)
1	Show a prism and tell the parts of a prism. Prism is a transparent refracting medium bounded by at least two lateral surfaces , inclined to each other at a certain angle. It has two triangular bases and three rectangular lateral surfaces. The angle between two lateral surfaces is called angle of prism.
2	Show the different parts like incident ray, refracted ray, emergent ray, angle of incidence, angle of refraction, angle of emergence, angle of deviation etc.
3	Explain the activity to verify the formula: A + D = e + i.

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ODM Teachers' Note

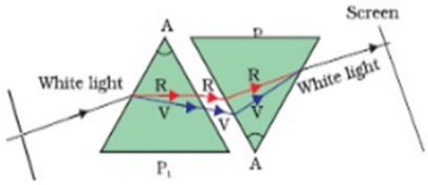
Class	X	Subject	Physics	Plan For	Normal class

Period	49	Chapter 13	Human Eye and the colorful world

T

Sub-Concepts	dispersion
Teaching Aid To be used	Prism, pins, wooden board, paper.

Sl. No	Step Wise (What to be done)
1	The teacher will recapitulate the topic by asking the following questions: 1) What happens when sun light is passed through a glass prism? 2) Define dispersion The phenomenon of splitting of white light into its constituent colors when passes through a prism is called dispersion.
2	The band of seven colors obtained are 1) Violet 2) Indigo 3) Blue 4) Green 5) Yellow 6) Orange 7) Red. This band of seven colors obtained by dispersion of light is called **spectrum.**
3	Explain the causes of dispersion: Light rays of different colours , travel with the same speed in vacuum and air but in any other medium they travel with different speeds and bend through different angles which leads to dispersion of light.
4	Red light has maximum wave length. so, it travels faster and deviates the least.
5	Wave length α velocity α 1/deviation.
6	Explain what will happen if two prisms identical in shape are kept close to each other: Activity: 1) Keep one prism and near to it keep another prism in inverted position. 2) The light is dispersed when passes through the first prism.

	3) The second prism receives all seven colours and recombines them into original white light.  ***Figure 11.6*** *Recombination of the spectrum of white light* 4)

Class	X	**Subject**	Physics	**Plan For**	Normal class

Period	50	**Chapter 13**	**Human Eye and the colorful world**

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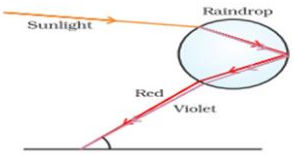
Sub-Concepts	Dispersion and rainbow formation
Teaching Aid To be used	Smart board

Sl. No	**Step Wise (What to be done)**
1	The teacher will recapitulate the topic by asking the following questions: 3) What happens when sun light is passed through a glass prism? 4) Define dispersion The phenomenon of splitting of white light into its constituent colors when passes through a prism is called dispersion.
2	The band of seven colors obtained are 8) Violet 9) Indigo 10) Blue 11) Green 12) Yellow 13) Orange 14) Red. This band of seven colors obtained by dispersion of light is called **spectrum.**
3	Explain the formation of rainbow. 
4	1) A rainbow is a natural spectrum appearing in the sky after a rain shower. 2) It is caused by dispersion of sunlight by tiny water droplets p[resent in the atmosphere. 3) A rainbow is always formed in opposite direction to that of the sun. 4) The water droplets act like small prisms. They refract, disperse the incident sunlight

	then reflect it internally and finally refract it again when it comes out of rain drop. 5) At last different colours reach the human eye and we can see the rainbow.

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ODM Teachers' Note

Class	X	**Subject**	Physics	**Plan For**	Normal class

Period	51	Chapter 13	Human Eye and the colorful world

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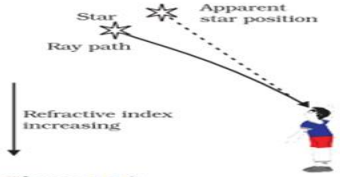
Sub-Concepts	Atmospheric refraction
Teaching Aid To be used	Smart board

Sl. No	Step Wise (What to be done)
1	The teacher will recapitulate the topic dispersion by asking the following questions. 1) Have you seen twinkling of stars? 2) What is the reason behind it?
2	The earth's atmosphere is not uniform throughout. Its density goes on changing if we go from up to down. So, when the light rays pass through earth's atmosphere, they undergo refraction.
. 3	**Explain the following topics based on refraction of light:** **1) Twinkling of stars:** The stars are very far away from us. So, they are considered as point sources. As the light from stars enter earths atmosphere, it undergoes refraction due to varying optical densities. The continuously changing atmosphere refracts the light by different amounts. The star light reaching our eye increases or decreases continuously and the star appears to be twinkling at night.
	2) The stars seem higher than they actually are: As the light from a star enters the earths atmosphere, it undergoes refraction and bends towards the normal each time due to refraction. Therefore the apparent position ofg the star is slightly different from its actual position.  ***Figure 11.9*** *Apparent star position due to atmospheric refraction*

	3) Planets do not twinkle: Planets are larger in size as they are much closer to us , so, they are considered as extended sources. The total variation in the amount of light entering our eyefrom all these individual points will average out to zero which nullify the twinkling effect of each other. Therefore planets do not twinkle.
	4) Advance sunrise and delayed sunset: **The sun** is visible to us about two minutes before the actual sun rise and about two minutes after the actual sun set because of atmospheric refraction. When the sun is slightly below the horizon, the sun light come from less dense to denser air. So it is refracted downwards, due to this sun appears to be raised above the horizon and we can see it before the sun rise.

ODM Teachers' Note

Class	X	Subject	Physics	Plan For	Normal class

Period	52	Chapter 13	Human Eye and the colorful world

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Sub-Concepts	Scattering of light
Teaching Aid To be used	Smart board

Sl. No	Step Wise (What to be done)
1	Recapitulate topic by giving the example of tyndalleffect
2	The reflection of light from an object in all directions is called scattering. Very fine particles scatter blue light. Particles of larger size scatter light of longer wavelength (red colour) Scattering α d^6 Scattering $\alpha\lambda^4$.
. 3	Explain the phenomenon related to scattering of light:
	1) Why the colour of the sky is blue? 2) Why the sky appears black to the astronauts? 3) Why the sun appears reddish at the time of sun rise and sun set? 4) Why the danger signals are red in colour?
	Answers: 1) During the day time sky appears blue. Because, The size of the particles in the atmosphere is smaller than the wavelength of visible light. So, they scatter the light of shorter wavelength. So, the sky appears blue.

ODM Teachers' Note

Class	X	Subject	Physics	Plan For	Normal class

Period	53	Chapter 13	Human Eye and the colorful world

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Sub-Concepts	Numericals based on defects of vision
Teaching Aid To be used	Smart board

Sl. No	Step Wise (What to be done)
1	The numericals are solved by using the lens formula: 1/f = 1/v – 1/u.
2	A person cannot see the object beyond 3m distinctly. State the nature and focal length of the lens required to correct this defect of vision. **Answer**: The person cannot see the object beyond 3m distinctly. i.e he is suffering from myopia. To correct this defect, concave lens will be used which can form the image of an object which is at infinite distance at 3m from eye. U = -∞, v = -3m = -300 cm. Lens formula: 1/f = 1/v – 1/u 1/f = 1/-300. F = -300 cm = -3 m.
. 3	A person needs a lens of power -5.5 D for correcting his distant vision. For correcting his near vision he needs a lens of power + 1.5 D. What is the focal length of the lens required for correcting i. distant vision ii. Near vision. F = 1/p.

	= - 1/ 5.5 = - 0.18m = - 18 cm. i. F = 1/p = 1/1.5 = 0.67 m = 67 cm.
4	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 correct the problem? Answer: The image of a distant object should be formed at 80 cm in front of the eye. U = - ∞, v = -80 cm. Lens formula: 1/f = 1/v – 1/u. F = - 1/80. P = 1/f in m = -100/80 =- 1.25D.
5	Make a diagram to show how hypermetropia is corrected? The near point of hypermetropic eye is 1m. What is the power of lens required to correct this defect? Assume that near point of the normal eye is 25 cm. Answer: v = -1 m = - 100 cm. U = -25 cm. By applying lens formula, f = 100/3 cm = 1/3 m P = 3D.

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Class	X	Subject	Physics	Plan For	Normal class

Period	54	Chapter 13	Human Eye and the colorful world

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Sub-Concepts	Exercise questions discussion
Teaching Aid To be used	Smart board

Sl. No	Step Wise (What to be done)
1	**Q.Define the principal focus of a concave mirror**. Answer- Light rays that are parallel to the principal axis of a concave mirror converge at a specific point on its principal axis after reflecting from the mirror. This point is called the principal focus of the concave mirror
2	Q.**The radius of curvature of a spherical mirror is 20 cm. What is its focal length?** Answer- Radius of curvature (R) = 20 cm Radius of curvature of the spherical mirror = 2 × Focal length (f) R = 2f f= R/2 = 20 / 2 = 10 Therefore, the focal length of the spherical mirror is 10 cm.
. 3	**Q.Name the mirror that can give an erect and enlarged image of an object.** Answer- The mirror that can give an erect and enlarged image of an object is Concave Mirror.
4	**Q.Why do we prefer a convex mirror as a rear-view mirror in vehicles?**

	Answer- Convex mirror is preferred as a rear-view mirror in cars and vehicles as it gives a wider field of view, which helps the driver to see most of the traffic behind him. Convex mirrors always form an erect, virtual, and diminished image of the objects placed in front of it.
5	**Q.Find the focal length of a convex mirror whose radius of curvature is 32 cm.** Answer- Radius of curvature (R) = 32 cm Radius of curvature = 2 × Focal length (f) R= 2f f = R/2 = 32/2 = 16 Therefore, the focal length of the given convex mirror is 16 cm.
6	**Q.A ray of light travelling in air enters obliquely into water. Does the light ray bends towards the normal or away from the normal? Why?** Answer- The light ray bends towards the normal. When a light ray enters from an optically rarer medium (which has low refractive index) to an optically denser medium (which has a high refractive index), its speed slows down and bends towards the normal. As water is optically denser than air, a ray of light entering from air into water will bend towards the normal.