NDA-CDS 2 2024

GS

LIVE

PHYSICS

CLASS 4

NAVJYOTI SIR

SSBCrack EXAMS

04 July 2024 Live Classes Schedule

8:00AM	04 JULY 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	04 JULY 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:00AM	OVERVIEW OF PPDT & PRACTICE	ANURADHA MA'AM

NDA 2 2024 LIVE CLASSES

1:00PM	GS - PHYSICS - CLASS 4	NAVJYOTI SIR
2:30PM	GS - CHEMISTRY MCQS - CLASS 9	SHIVANGI MA'AM
4:00PM	MATHS - DIFFERENTIAL EQUATIONS - CLASS 2	NAVJYOTI SIR
5:30PM	ENGLISH - PARTS OF SPEECH - CLASS 2	ANURADHA MA'AM

CDS 2 2024 LIVE CLASSES

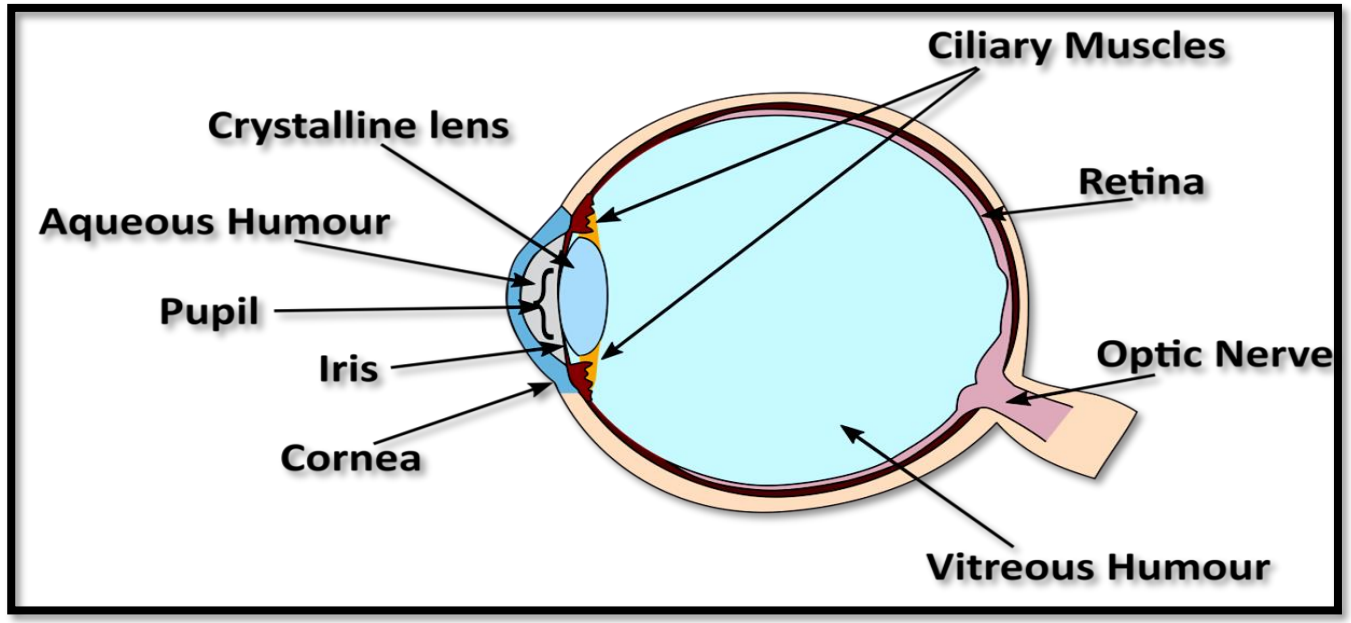
1:00PM	GS - PHYSICS - CLASS 4	NAVJYOTI SIR
2:30PM	GS - CHEMISTRY MCQS - CLASS 9	SHIVANGI MA'AM
5:30PM	ENGLISH - PARTS OF SPEECH - CLASS 2	ANURADHA MA'AM

HUMAN EYE AND COLOURFUL WORLD

WHAT WILL WE STUDY ?

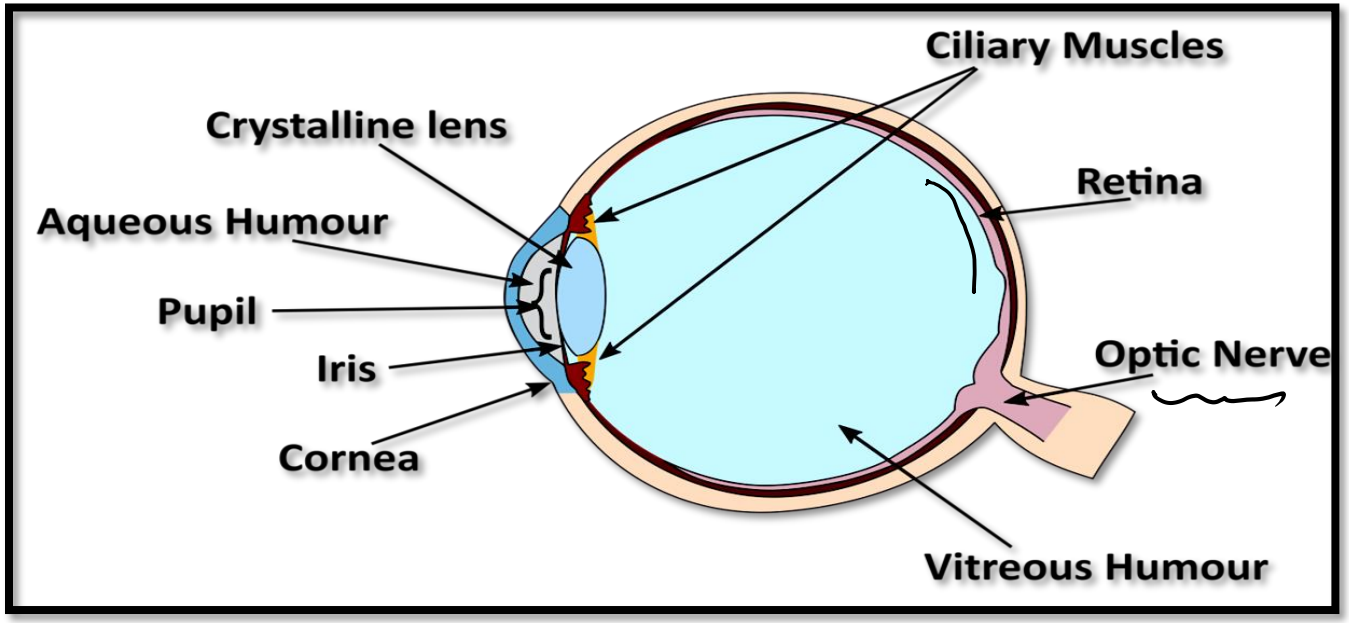
- Human Eye and its Parts ✓
- Defects of Vision and Correction
- Prism – Refraction and Dispersion
- Scattering of Light
- Microscopes and Telescopes

Human Eye and its Parts



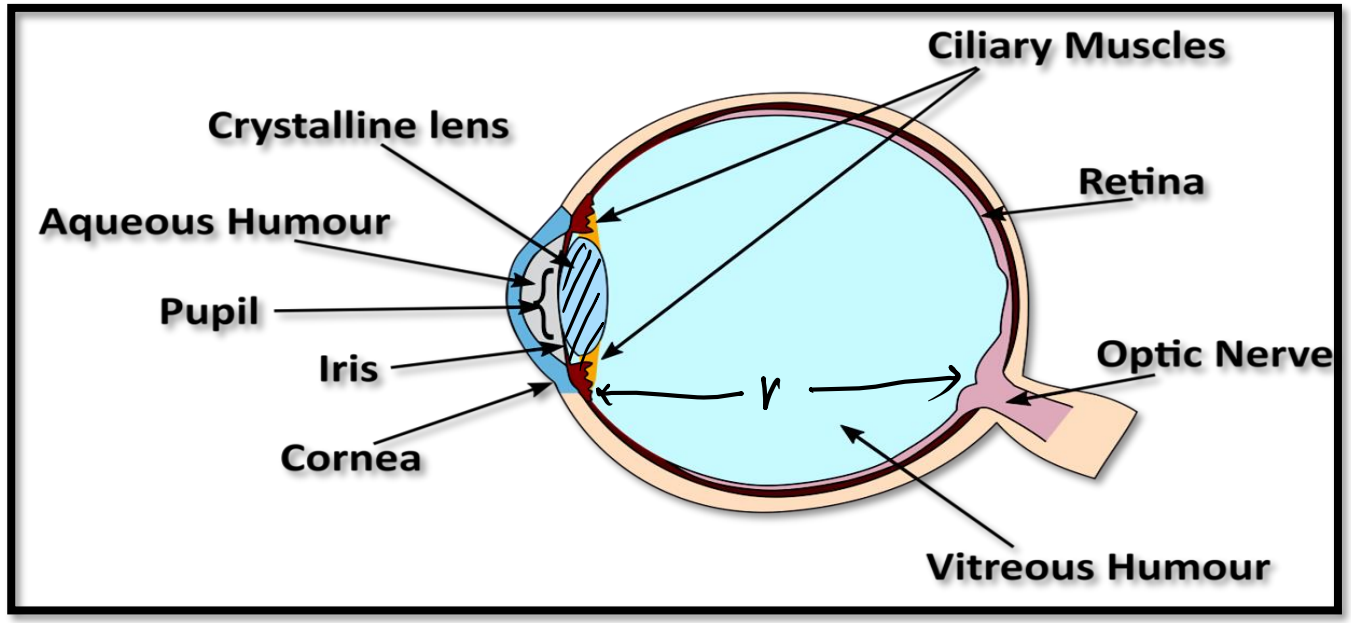
- Cornea : Light enters the eye through this thin membrane. Most of the refraction for the light rays entering the eye occurs at the outer surface of the cornea.
- Pupil : It regulates and controls the amount of light.
- Iris : A dark muscular diaphragm controls the size of pupil.

Human Eye and its Parts



- **Retina** : It is the light sensitive surface of eye on which the image is formed. It contains light sensitive cells rods and cones.
- **Optic Nerve** : It transmits visual information from the retina to the brain.

Human Eye and its Parts



u – changing

v – fixed

f – changing.

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

- Crystalline Lens : A convex lens forming a real and inverted image ; provides the finer adjustment of focal length required to focus objects at different distances on the retina.
- Ciliary Muscles : They hold the lens in position and help in modifying the curvature of the lens.

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

TERMS RELATED TO HUMAN EYE

- **Power of Accomodation : It is the ability of eye lens, to change its focal length to form sharp images of objects at different positions from the eye on the retina of the eye.**

- **Near Point : It is the nearest position of an object from human eye, so that its sharp images is formed on the retina.**

- **Range of vision : It is the distance between near point and the far point of an eye. For normal eye, the range of vision is 25 cm to infinity.**

EYE DEFECTS

- Eye losing its power of accomodation and so causes refractive defects.

1. Myopia
2. Hypermetropia
3. Presbyopia

- Others :

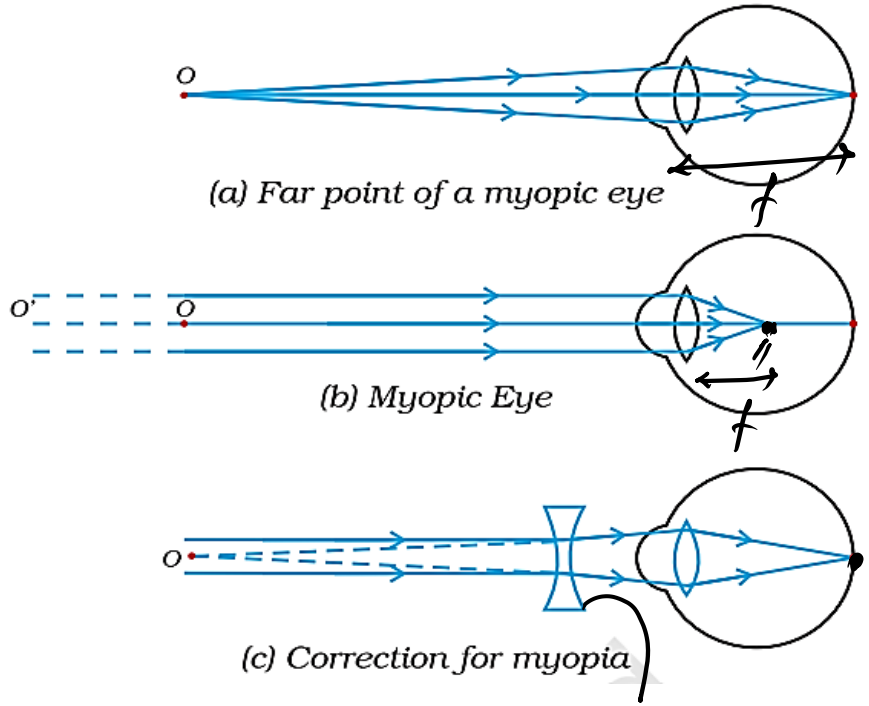
Astigmatism

Colour Blindness

Cataract

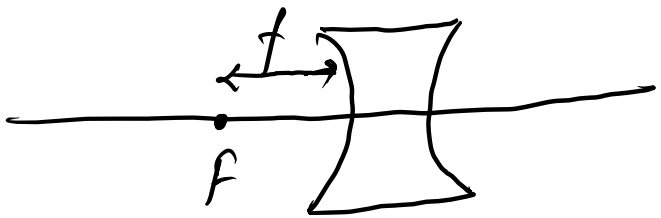
MYOPIA OR NEAR - SIGHTEDNESS

- A person may see clearly upto a distance of a few metres , as the far point has become nearer to infinity.
- In a myopic eye, the image of a distant object is formed in front of the retina.
- This defect may arise due to
  (i) excessive curvature of the eye lens.
  (ii) elongation of the eyeball.
- This defect can be removed by using a concave lens of appropriate power.

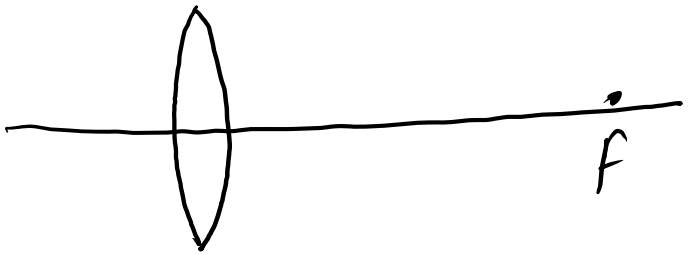


concave lens

f = -ve



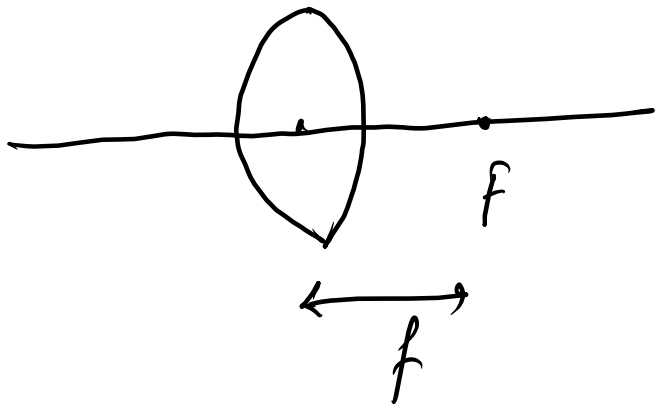
Power = (-ve)



→ More straight

→ higher focal length

→ Less curvature

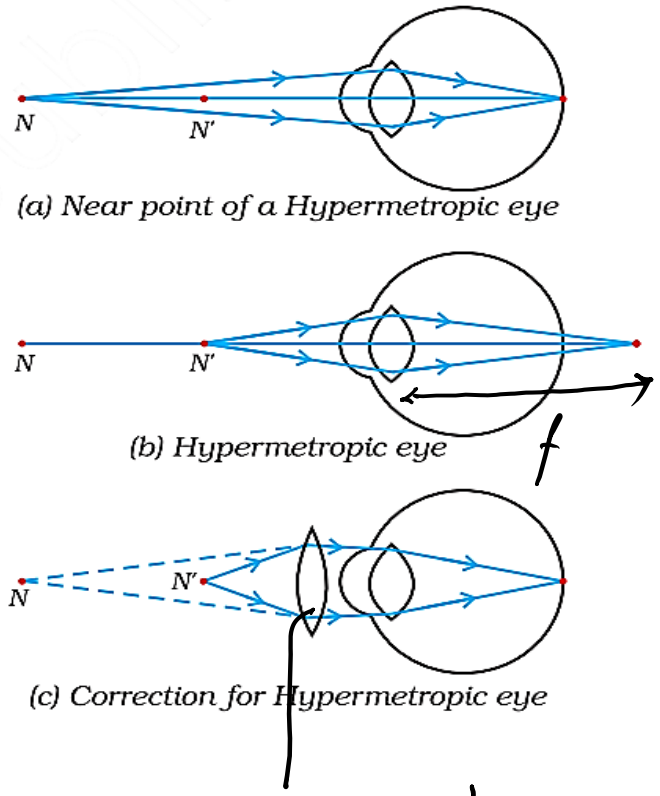


→ Less straight, more curvature

→ Less focal length

HYPERMETROPIA OR FAR - SIGHTEDNESS

- A person can see far away objects but cannot see near by objects clearly.
- In this defect, the near point of eye shifts away from the eye.
- This defect arises either because
  (i) the focal length of the eye lens is too long, or
  (ii) the eyeball has become too small.
- This defect can be removed by using a convex lens of appropriate power.



PRESBYOPIA

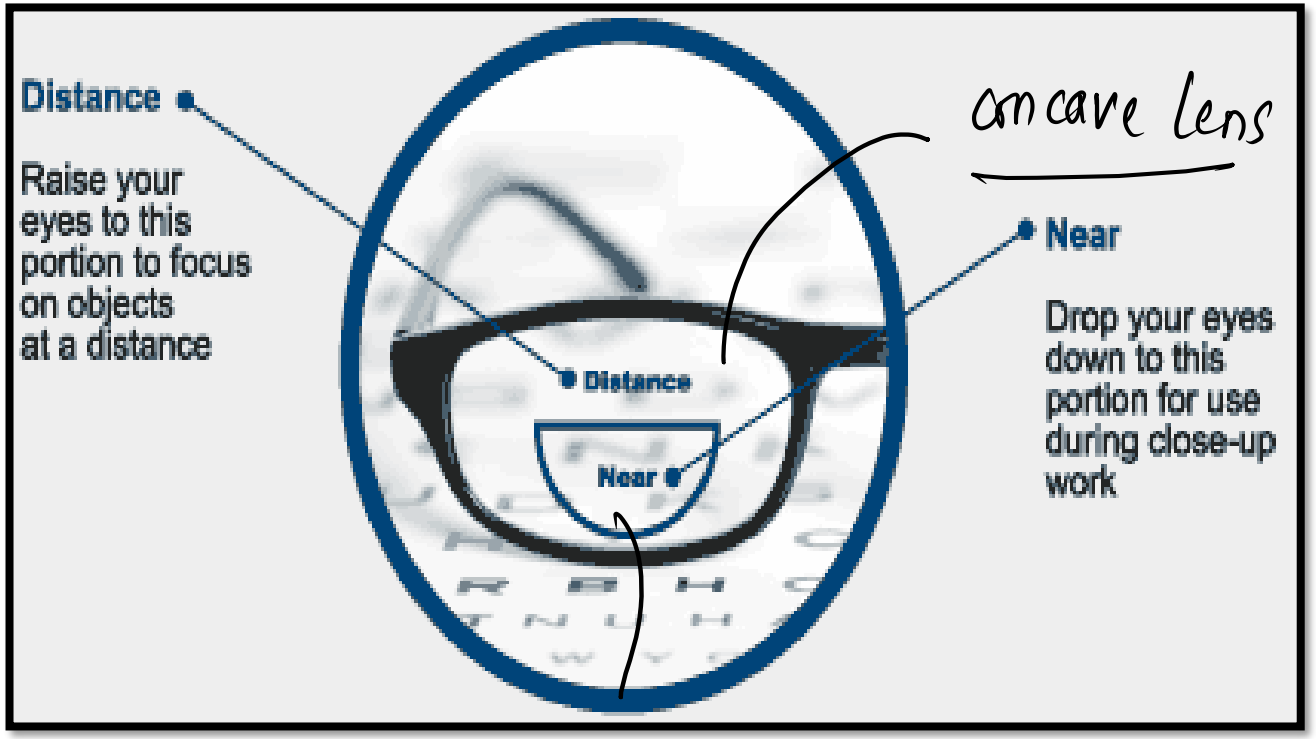
- The power of accommodation of the eye usually decreases with ageing. For most people, the near point gradually recedes away. They find it difficult to see nearby objects comfortably.

- It arises due to the gradual weakening of the ciliary muscles and diminishing flexibility of the eye lens.

- Sometimes, a person may suffer from both myopia and hypermetropia. Such people often require bi-focal lenses.

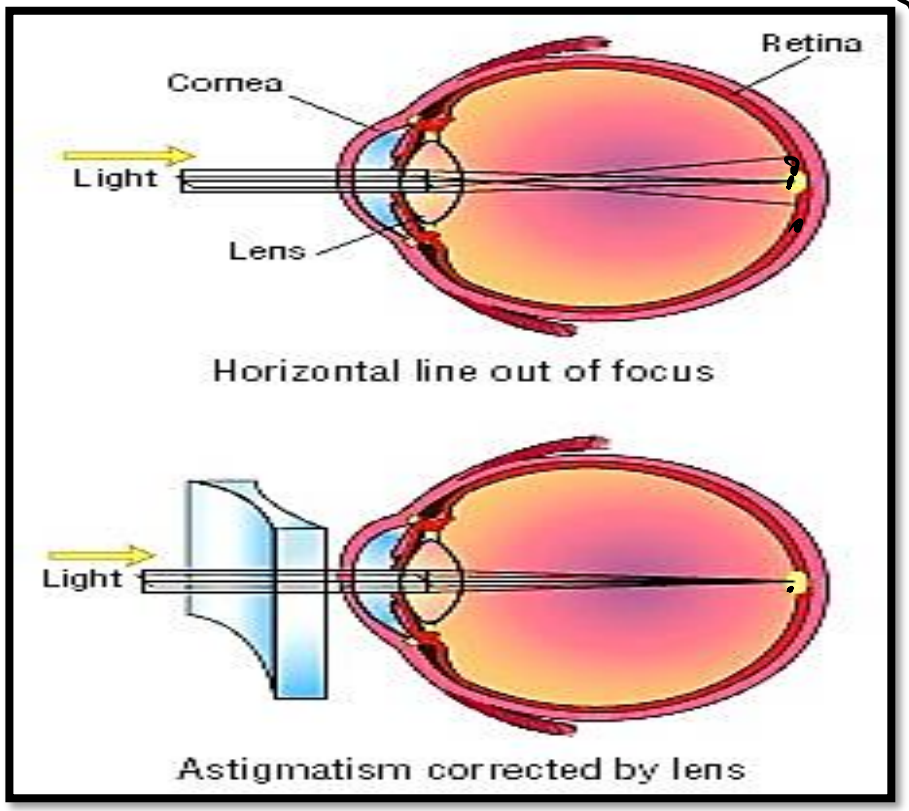
(convex + concave lens)

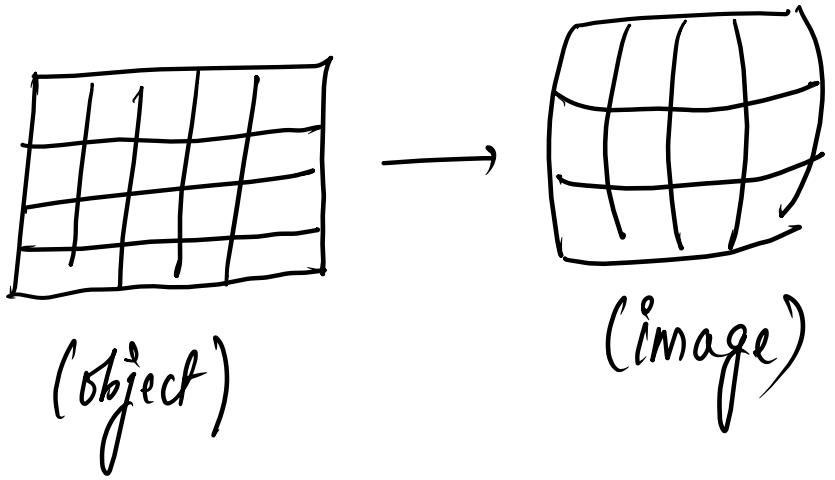
BIFOCAL LENS



OTHER EYE DEFECTS

- **Astigmatism : The defect in the eye or in a lens caused by a deviation from spherical curvature, which results in distorted images, as light rays are prevented from meeting at a common focus.**
  - This defect can be removed by using suitable cylindrical lenses.

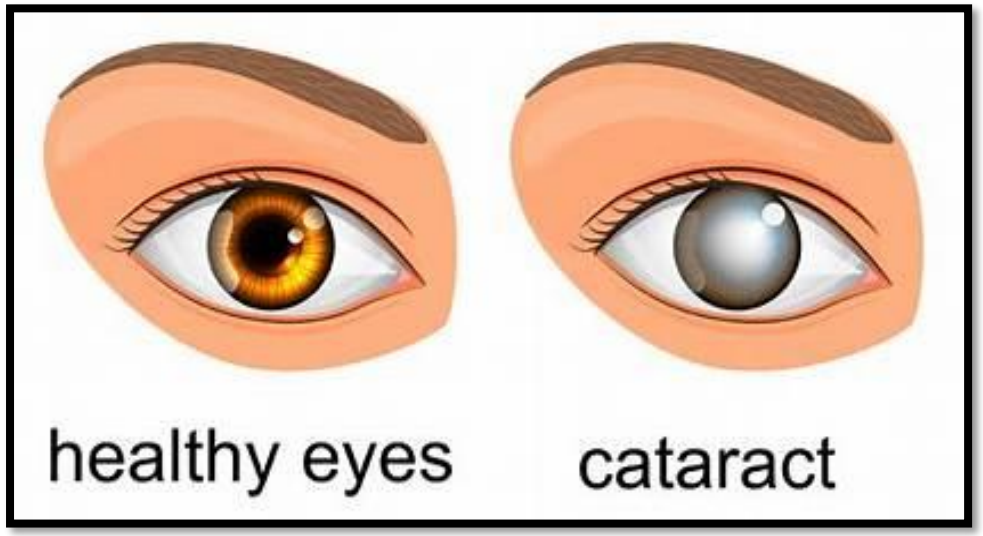




OTHER EYE DEFECTS

- **Cataract : An opaque white membrane is developed on cornea due to which person loses power of vision partially or completely.**

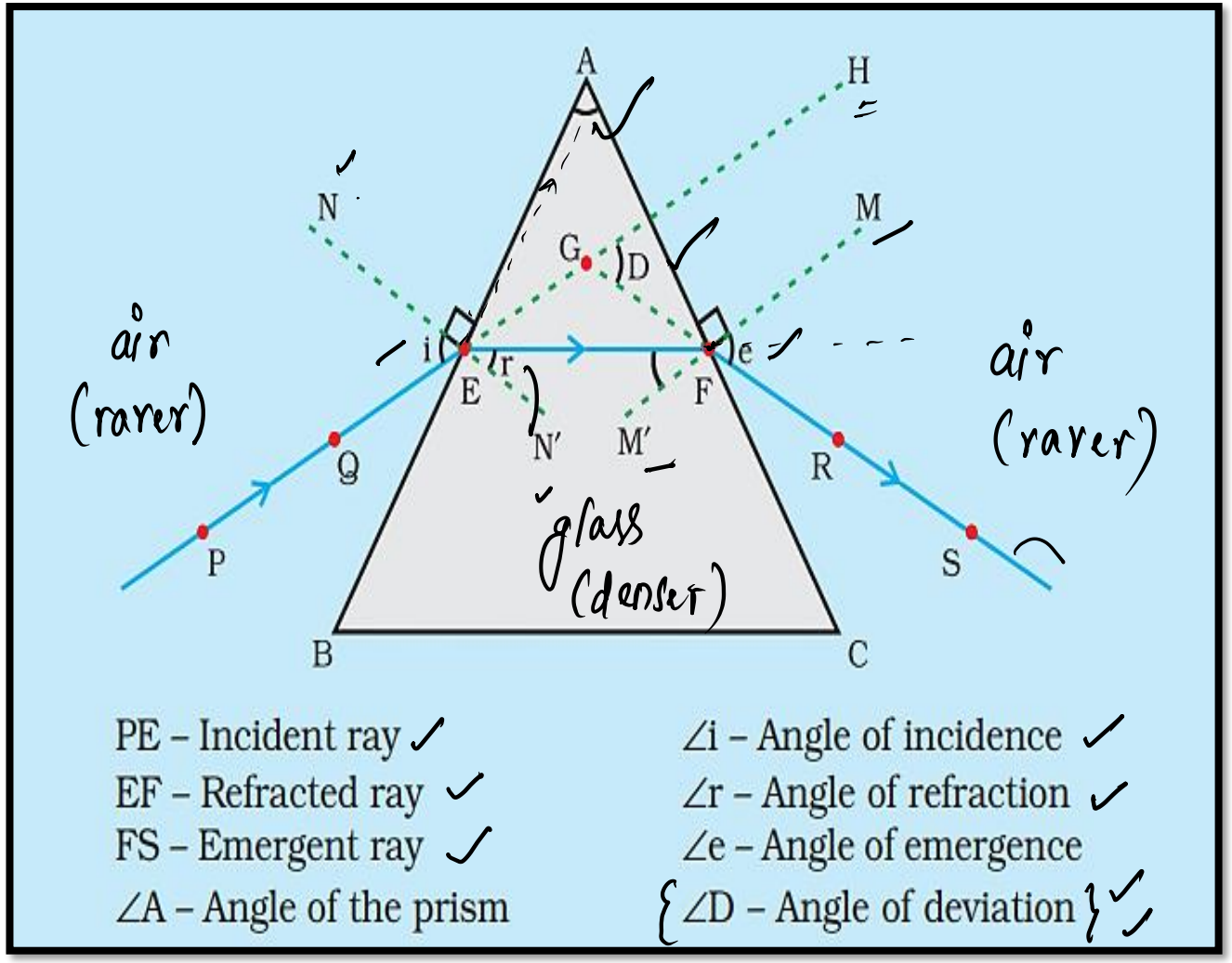
  - This defect can be removed by removing this membrane through surgery.



OTHER EYE DEFECTS

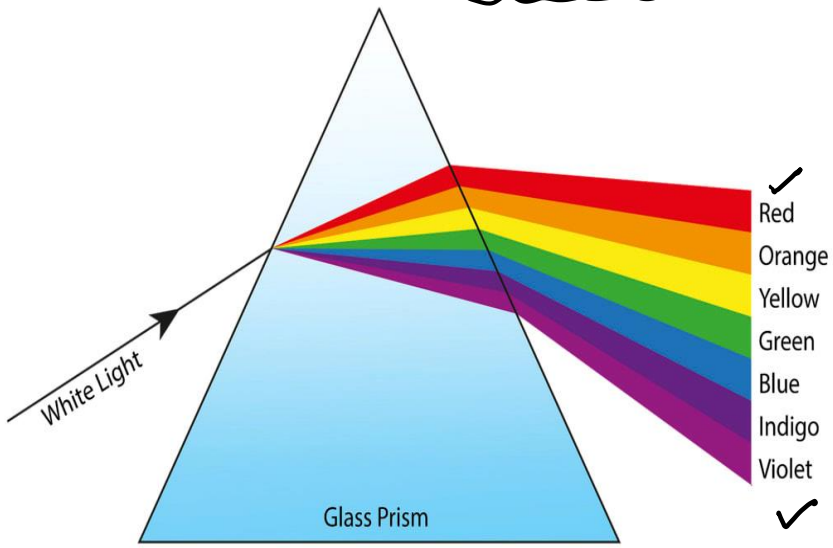
- **Colour Blindness : In this defect, a person is unable to distinguish between few colours.**
- **The reason of this defect is the absence of cone cells sensitive to those colours.**

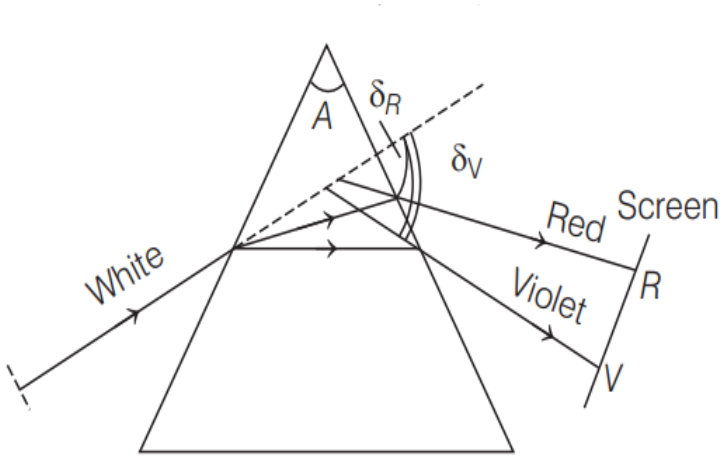
REFRACTION BY GLASS PRISM



DISPERSION

- **The splitting of white light into its constituent colours in the sequence of VIBGYOR, on passing through a prism.**





different angle of deviation for each colour.

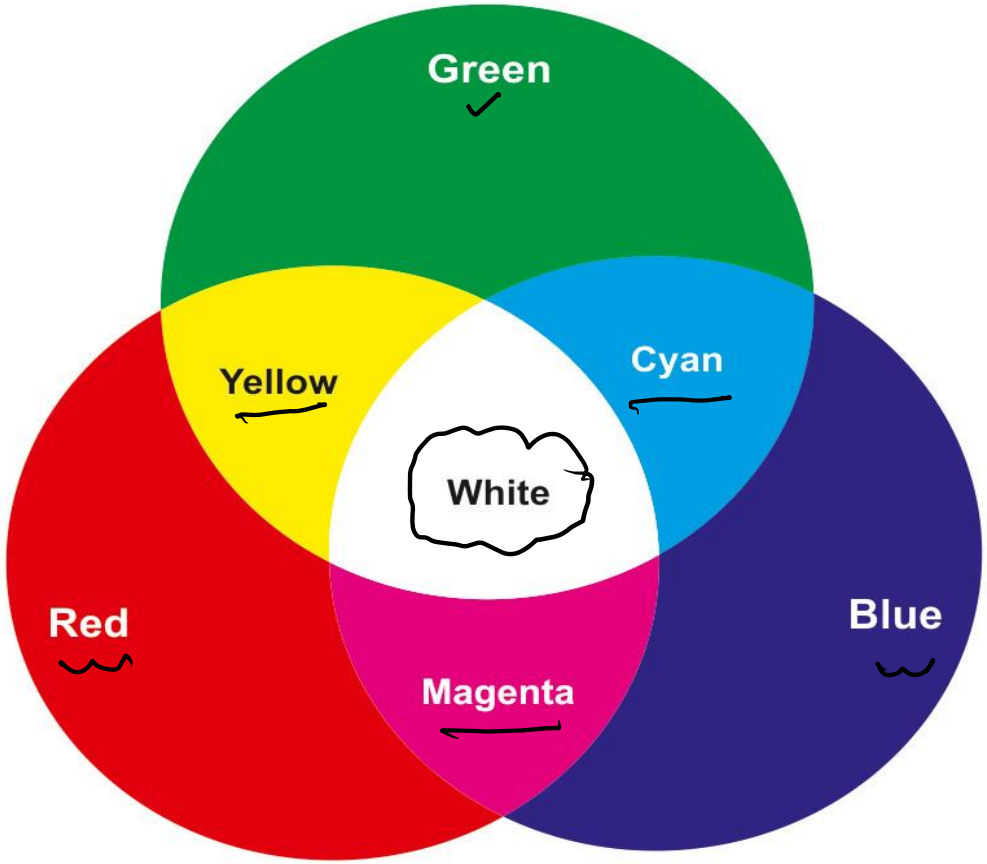
$\mu \propto \frac{1}{\lambda}$

μ_r — lowest (red light)

μ_v — highest (violet light)

V I B G Y O R → increasing wavelength

PRIMARY AND SECONDARY COLOURS



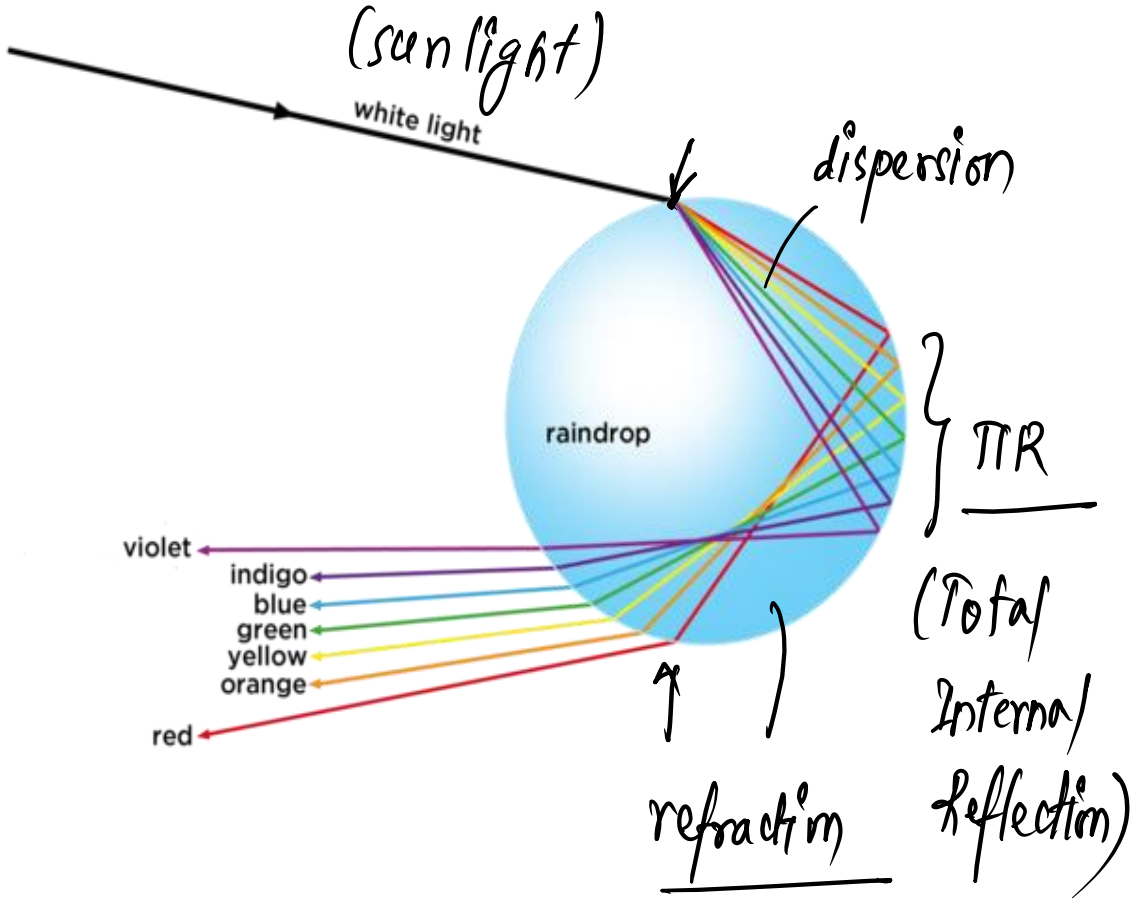
Red + Green = Yellow

Green + Blue = Cyan

Blue + Red = Magenta

RAINBOW FORMATION

- 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.
- A rainbow can also be seen on a sunny day at the sky through a waterfall or through a water fountain, when the Sun is behind.



SCATTERING OF LIGHT

- When light passes through a medium in which particles are suspended whose size is of the order of wavelength of light, then , light on striking these particles gets deviated in different directions.

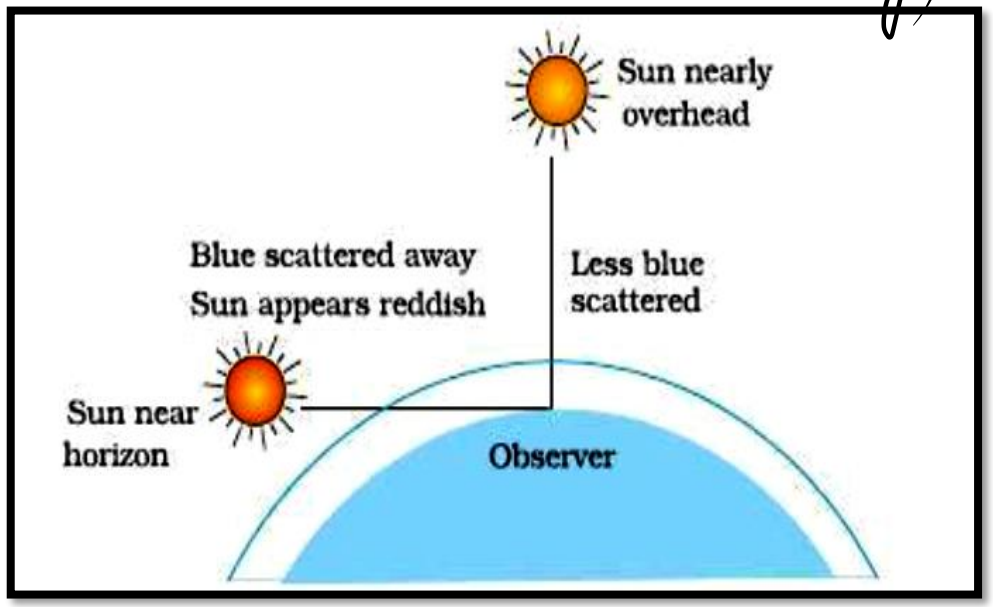
DAILY LIFE EXAMPLES OF SCATTERING OF LIGHT

1. **Blue colour of sky.**
2. **Red colour of sky at the time of sun rise and sun set.**
3. **Red colour of signals of danger.**
4. **White Colour of the clouds.**

(RAYLEIGH SCATTERING)

amount of scattering $\propto \frac{1}{\lambda^2}$ { scattering ↑ when λ ↓

(equal scattering)



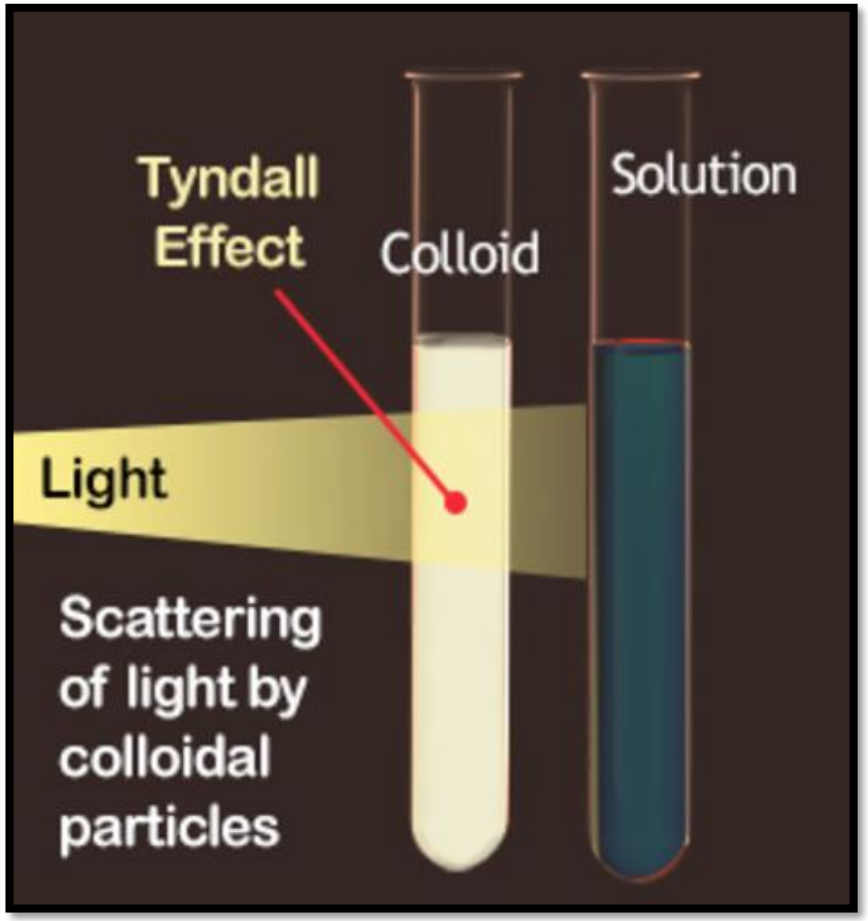
V I B G Y O R

(Least scattering)

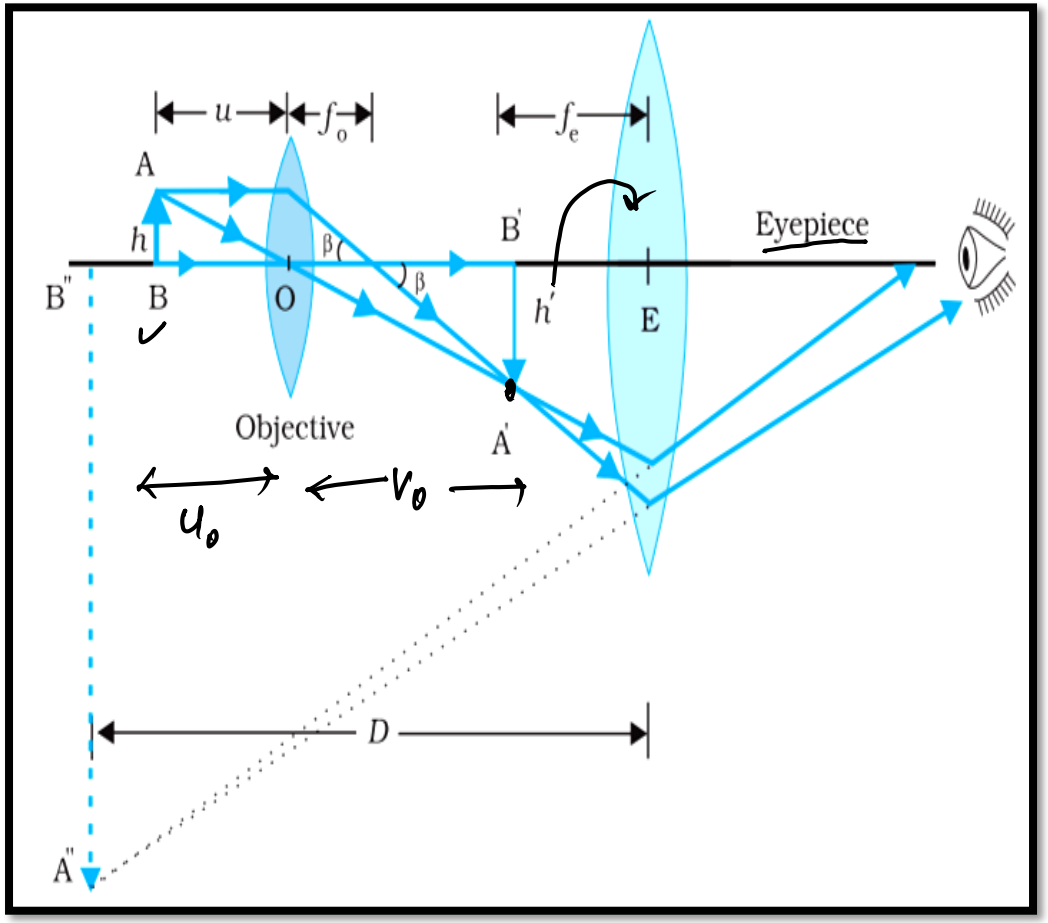
Blue

(Most scattering)

TYNDALL EFFECT



MICROSCOPE



Magnifying Power

(i) When final image is formed at least distance of distinct vision (D), then

$$M = \frac{v_0}{u_0}\left(1 + \frac{D}{f_e}\right)$$

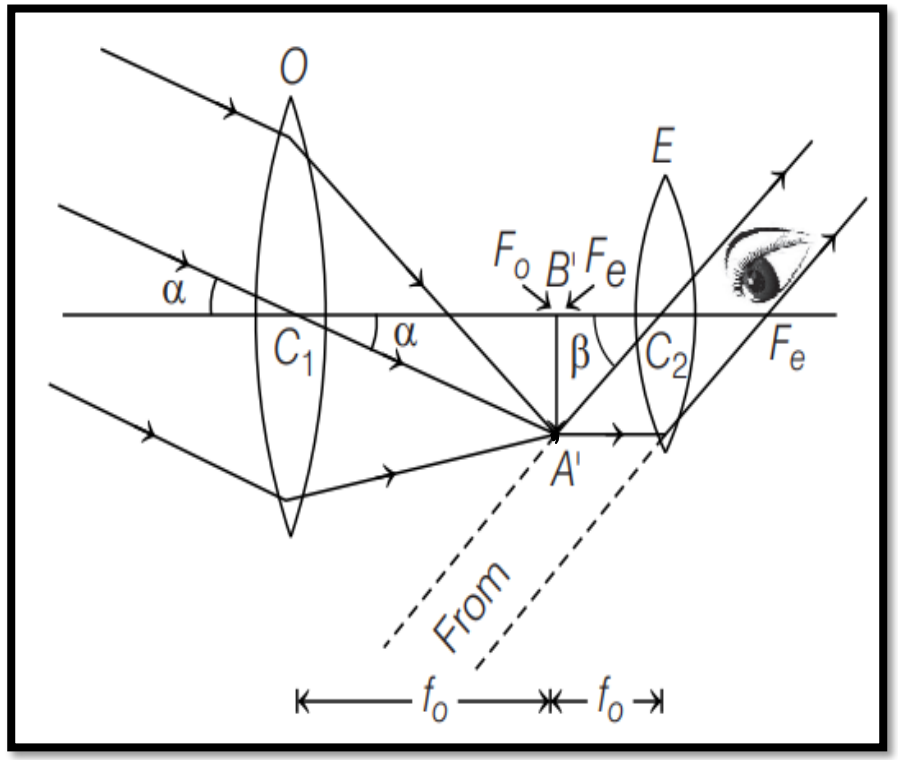
where, v_0 = distance of image formed by objective lens

and u_0 = distance of object from the objective.

(ii) When final image is formed at infinity, then, $M = \frac{v_0}{u_0} \cdot \frac{D}{f_e}$

TELESCOPE

1. Astronomical Telescope :



Magnifying Power

(i) When final image is formed at least distance of distinct vision (D), then $M = \frac{f_o}{f_e}\left(1 + \frac{D}{f_e}\right)$, where f_o and f_e are focal lengths of objective and eyepiece respectively.

Length of the telescope $(L) = (f_o + u_e)$

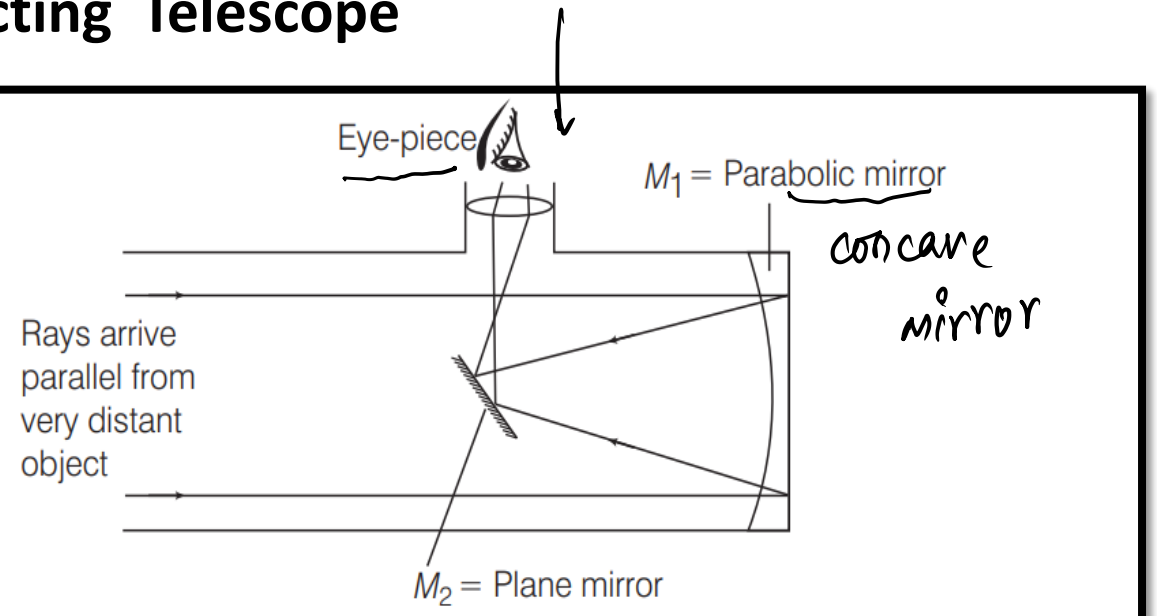
where, u_e = distance of object from the eyepiece.

(ii) When final image is formed at infinity, then $M = \frac{f_o}{f_e}$.

Length of the telescope, $(L) = f_o + f_e$

TELESCOPE

2. Reflecting Telescope



If f_0 is focal length of the concave spherical mirror and f_e the focal length of the eye-piece, the magnifying power of the reflecting telescope is given by

$$m = \frac{f_o}{f_e}$$

SUMMARY

- Human Eye and Parts
- Eye Defects and Correction
- Deviation and Dispersion by Glass Prism
- Scattering of Light and Examples in Nature
- Microscopes and Telescopes

NDA & CDS 2 2024 LIVE - PHYSICS - CLASS 4

1. Presbyopia can be corrected by _____ lens.

A. Convex

B. Concave

C. Bi-focal

D. Cylindrical

NDA & CDS 2 2024 LIVE - PHYSICS - CLASS 4

1. Presbyopia can be corrected by _____ lens.

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2. The part of the human eye on which the image is formed is

(a) pupil

(b) cornea

(c) retina

(d) iris

SSBCrack EXAMS

2. The part of the human eye on which the image is formed is

(a) pupil

(b) cornea

(c) retina

(d) iris

Answer: (C)

3. A prism causes

A. Only Dispersion

B. Only Deviation

C. Both Dispersion and Deviation

D. Neither Dispersion nor Deviation

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A. Only Dispersion

B. Only Deviation

C. Both Dispersion and Deviation

D. Neither Dispersion nor Deviation

4. Identify the correct statement(s) ,

1) Iris controls the size of the pupil. ✓

2) Pupil controls the size of the Iris. ✗

3) The Eye-lens forms an inverted real image of the object. ✓

4) Pupil controls the amount of light entering the eye. ✓

A. 1 , 2 and 4

B. 1, 3 and 4

C. 1 and 4

D. 2 , 3 and 4

4. Identify the correct statement(s) ,

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3) The Eye-lens forms an inverted real image of the object.

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A. 1 , 2 and 4

B. 1, 3 and 4

C. 1 and 4

D. 2 , 3 and 4

5. How many times does a ray of light bend on passing through a prism ?

A. Once

B. Twice

C. Thrice

D. Four Times

5. How many times does a ray of light bend on passing through a prism ?

A. Once

B. Twice

C. Thrice

D. Four Times

NDA & CDS 2 2024 LIVE - PHYSICS - CLASS 4

6. Light enters the eye through a thin membrane called

(a) retina

(b) cornea

(c) pupil

(d) iris

6. Light enters the eye through a thin membrane called

(a) retina

(b) cornea

(c) pupil

(d) iris

Answer: (B)

NDA & CDS 2 2024 LIVE - PHYSICS - CLASS 4

7. Which of the following are the primary colours of light ?

(a) Yellow, Red and Green

(b) Blue, Red and Green

(c) Violet, Red and Yellow

(d) Indigo, Violet and Green

NDA & CDS 2 2024 LIVE - PHYSICS - CLASS 4

7. Which of the following are the primary colours of light ?

(a) Yellow, Red and Green

(b) Blue, Red and Green

(c) Violet, Red and Yellow

(d) Indigo, Violet and Green

Answer: (B)

8. During the formation of rainbow , dispersion of sunlight is done by

A. Tiny Air molecules

B. Dust Particles of Atmosphere

C. Tiny Droplets of Rain Water Suspended in Air

D. Air and Water.

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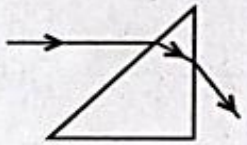
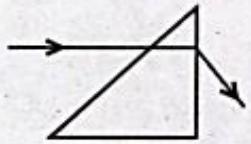
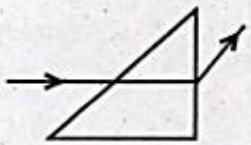
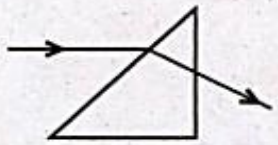
NDA & CDS 2 2024 LIVE - PHYSICS - CLASS 4

9. Which one of the following figures correctly shows the path of a ray of light through a glass prism ?

(a) 

(b) 

(c) 

(d) 

SSBCrack EXAMS

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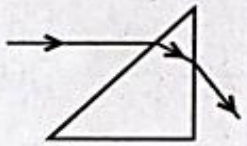
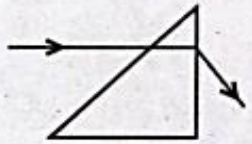
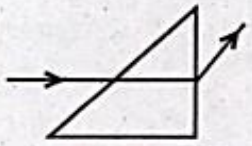
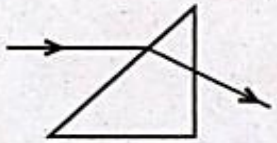
(a) 

(b) 

(c) 

(d) 

Answer: (A)

10. A glass prism splits white light into different colours. This phenomenon is called dispersion of light by prism. Which one of the following statements is correct ?

(a) Red light will deviate the most and it is because of the reflection of light.

(b) Violet light will deviate the most and it is because of the refraction of light.

(c) Red light will deviate the most and it is because of the refraction of light.

(d) Violet light will deviate the most and it is because of the reflection of light.

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(c) Red light will deviate the most and it is because of the refraction of light.

(d) Violet light will deviate the most and it is because of the reflection of light.

Answer: (B)

11. A certain person has minimum distance of distinct vision of 150 cm. He wants to read at a distance of 25 cm. What is the nature of the eye defect ?

A. Myopia

B. Hypermetropia

C. Presbyopia

D. Cataract

11. A certain person has minimum distance of distinct vision of 150 cm. He wants to read at a distance of 25 cm. What is the nature of the eye defect ?

A. Myopia

B. Hypermetropia

C. Presbyopia

D. Cataract

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12. Human eye can see objects at different distances with contrasting illuminations. This is due to

(a) far-sightedness

(b) near-sightedness

(c) far-sightedness and near-sightedness

(d) accommodation of eye

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12. Human eye can see objects at different distances with contrasting illuminations. This is due to

(a) far-sightedness

(b) near-sightedness

(c) far-sightedness and near-sightedness

(d) accommodation of eye

Answer: (D)

13. Which colour of sky will appear to the pessengers flying at high altitudes,

A. Green

B. Orange

C. Blue

D. Black

13. Which colour of sky will appear to the pessengers flying at high altitudes,

A. Green

B. Orange

C. Blue

D. Black

NDA & CDS 2 2024 LIVE - PHYSICS - CLASS 4

14. Tyndall effect is a phenomenon of

(a) scattering of light by the colloidal particles.

(b) refraction of light by the colloidal particles.

(c) dispersion of light by dust particles.

(d) refraction of light by dust particles.

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14. Tyndall effect is a phenomenon of

(a) scattering of light by the colloidal particles.

(b) refraction of light by the colloidal particles.

(c) dispersion of light by dust particles.

(d) refraction of light by dust particles.

Answer: (A)

15. The dispersion of light into its components by prism is due to

A. Each component gets deviated by the same angle of Refraction.

B. Each component gets deviated by a different angle of Refraction.

C. Reflection of each component light by different angle.

D. Reflection of each component light by same angle.

15. The dispersion of light into its components by prism is due to

A. Each component gets deviated by the same angle of Refraction.

B. Each component gets deviated by a different angle of Refraction.

C. Reflection of each component light by different angle.

D. Reflection of each component light by same angle.

NDA & CDS 2 2024 LIVE - PHYSICS - CLASS 4

16. The streaming of light beams coming from the Sun through trees is said to have suggested that light travels in straight line. The particles on the path of light beams are visible to us because

(a) dust particles in the air reflect light into our eyes

(b) dust particles in the air scatter light into our eyes

(c) dust particles in the air refract light into our eyes

(d) dust particles in the air polarize light into our eyes

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Answer: (B)

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C. Spectrum

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18. Consider the following statements about a microscope and a telescope :

1. Both the eyepiece and the objective of a microscope are convex lenses.
2. The focal length of the objective of a telescope is larger than the focal length of its eyepiece.
3. The magnification of a telescope increases with the increase in focal length of its objective.
4. The magnification of a microscope increases with the increase in focal length of its objective.

Which of the statements given above are correct?

(a) 1 and 3 only

(b) 1 and 4

(c) 2, 3 and 4

(d) 1, 2 and 3

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Answer: (D)

19. The Eyeball Of A Person Has Become Slightly Larger. What Kind Of Lens Should The Person Wear To Correct The Defect In The Vision Caused By This Change In The Size Of The Eyeball ?

A. Concave Lens

B. Convex Lens

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20. A Student Is Not Able To See The Blackboard Question When Seated At A Distance Of 5 m From The Board. The Defect He Is Suffering From Is

A. Myopia

B. Presbyopia

C. Hypermetropia

D. Astigmatism

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