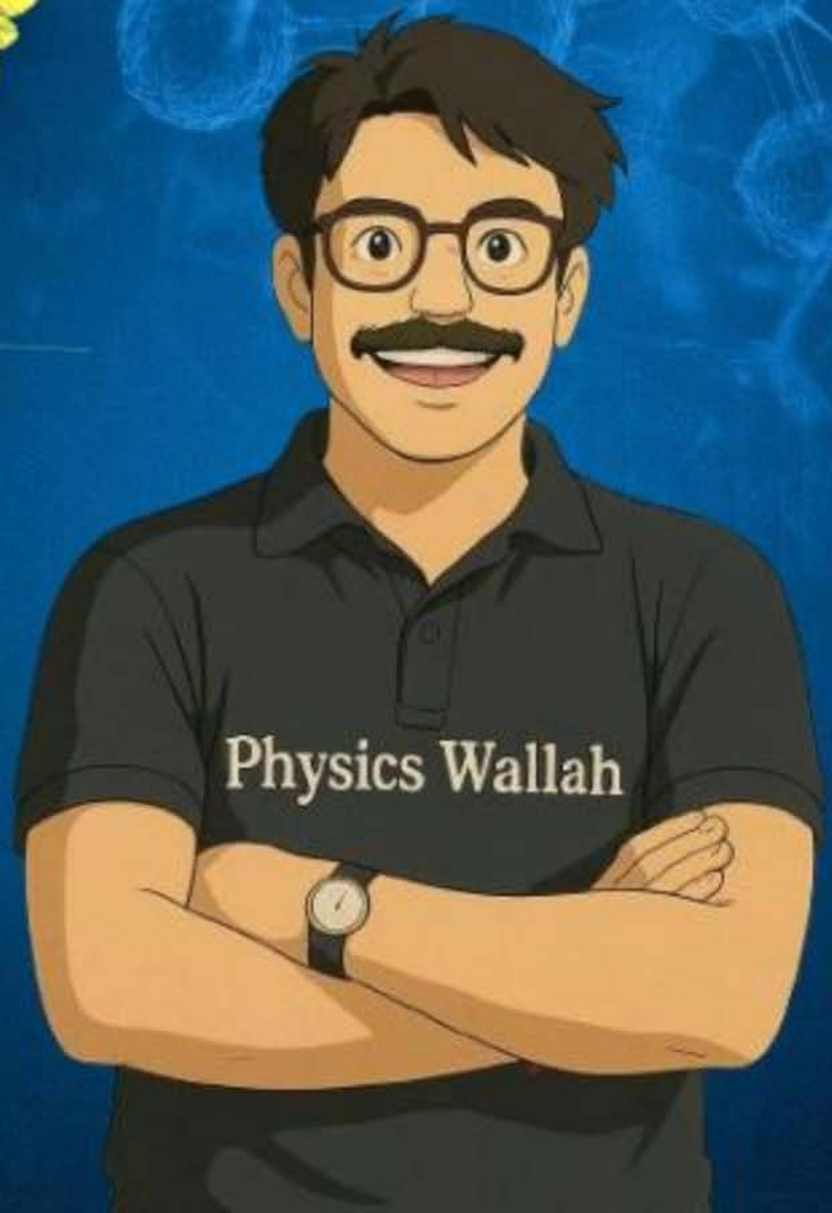
UDAAN

2026

Human Eye and The Colorful World

PHYSICS | Lecture - 2

BY - RAKSHAK SIR



Topics *to be covered*

6. HUMAN EYE AND ITS PARTS
7. POWER OF ACCOMMODATION
8. DEFECTS : MYOPIA (Near-sightedness)
9. DEFECTS : HYPERMETROPIA (FAR-SIGHTEDNESS)
10. DEFECTS : PRESBYOPIA (OLD AGE HYPERMETROPIA)

Topics *to be covered*

11 REFRACTION THROUGH PRISM ✓

12 ELECTROMAGNETIC SPECTRUM ✗

13 DISPERSION OF LIGHT THROUGH PRISM ✓

14 RECOMBINATION OF DISPERSED LIGHT ✓

15 RAINBOW ✓

Topics *to be covered*

16 ATMOSPHERIC REFRACTION

17 ADVANCED SUNRISE & DELAYED SUNSET

18 SCATTERING OF LIGHT

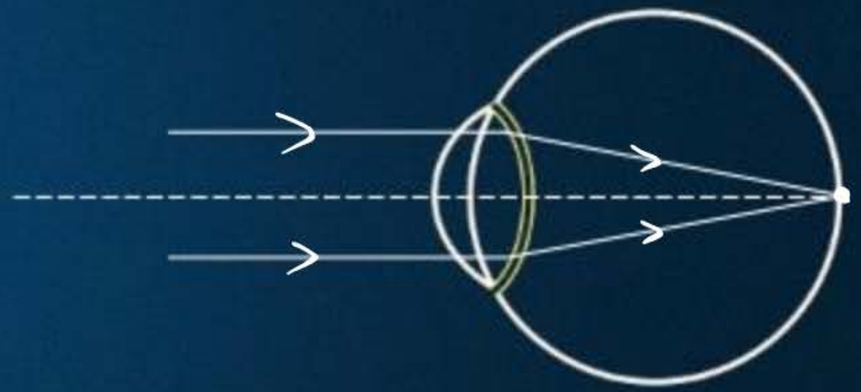
19 TYNDALL EFFECT

DEFECTS : MYOPIA (Near-sightedness)

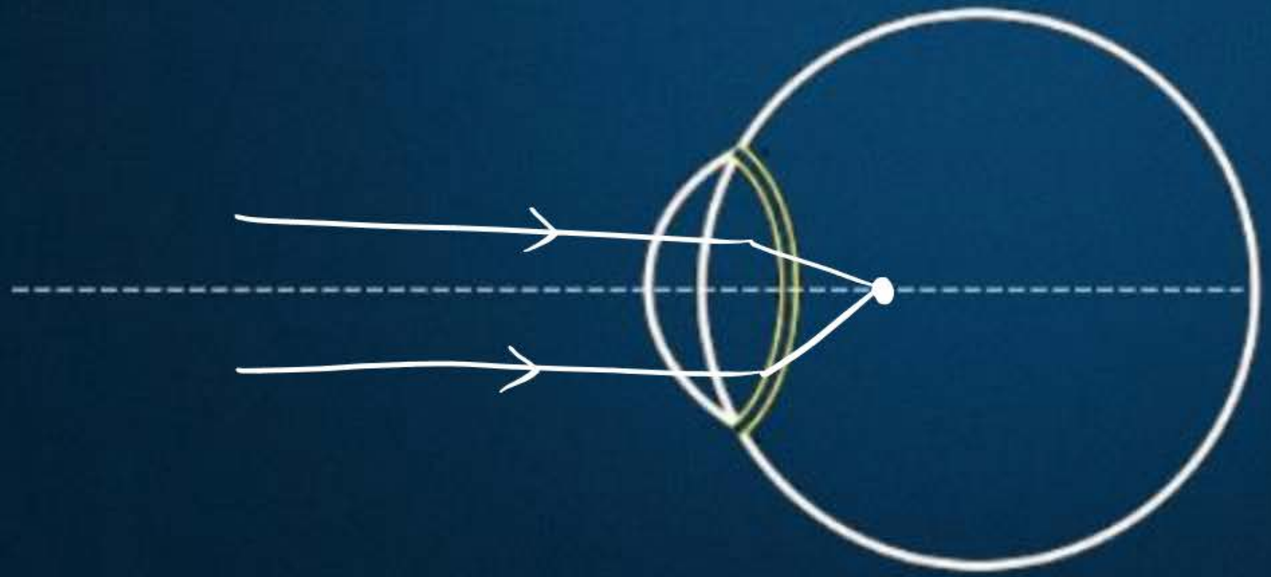
- It is kind of defect in the human eye Due to which a person can see near objects clearly but he cannot see the distant objects clearly. The image forms before the retina. Myopia is due to

(i) Excessive curvature of the eye lens.

(ii) Elongation of eyeball.

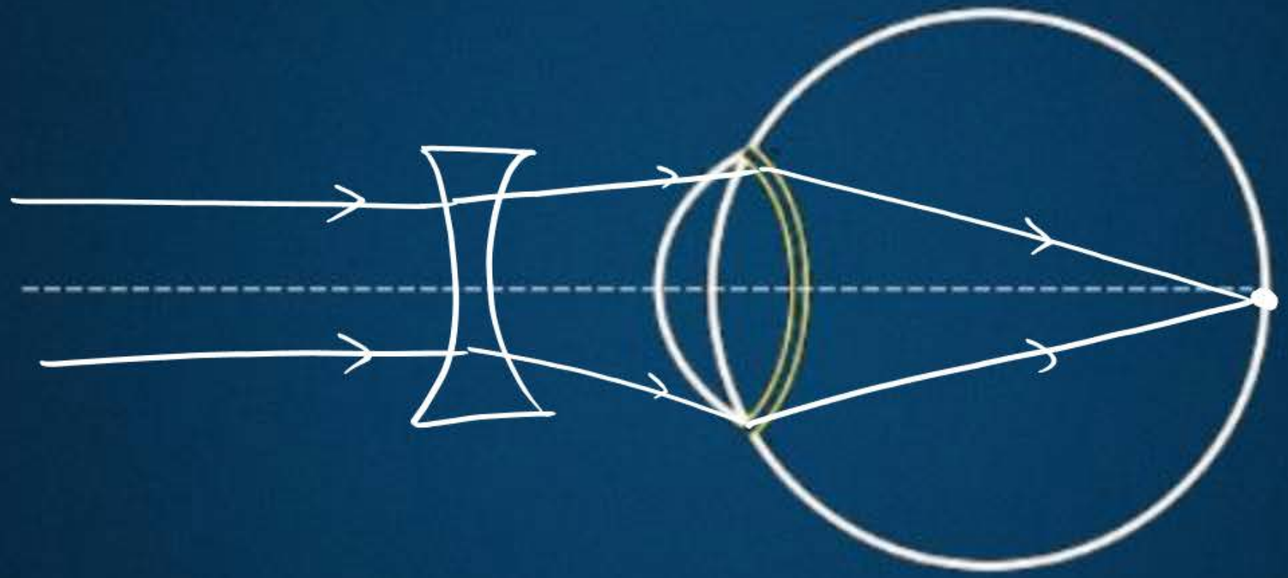


Healthy eye



Myopic Eye

CORRECTION : MYOPIA (NEAR-SIGHTEDNESS)



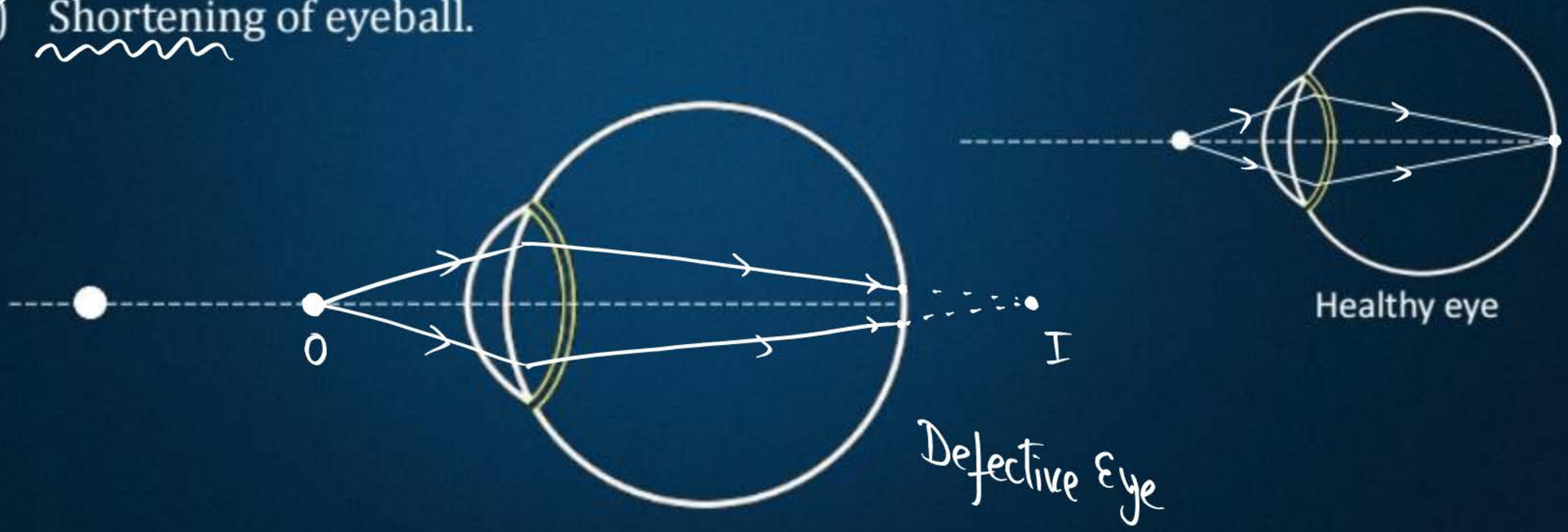
Corrective Eye

DEFECTS : HYPERMETROPIA (FAR-SIGHTEDNESS)

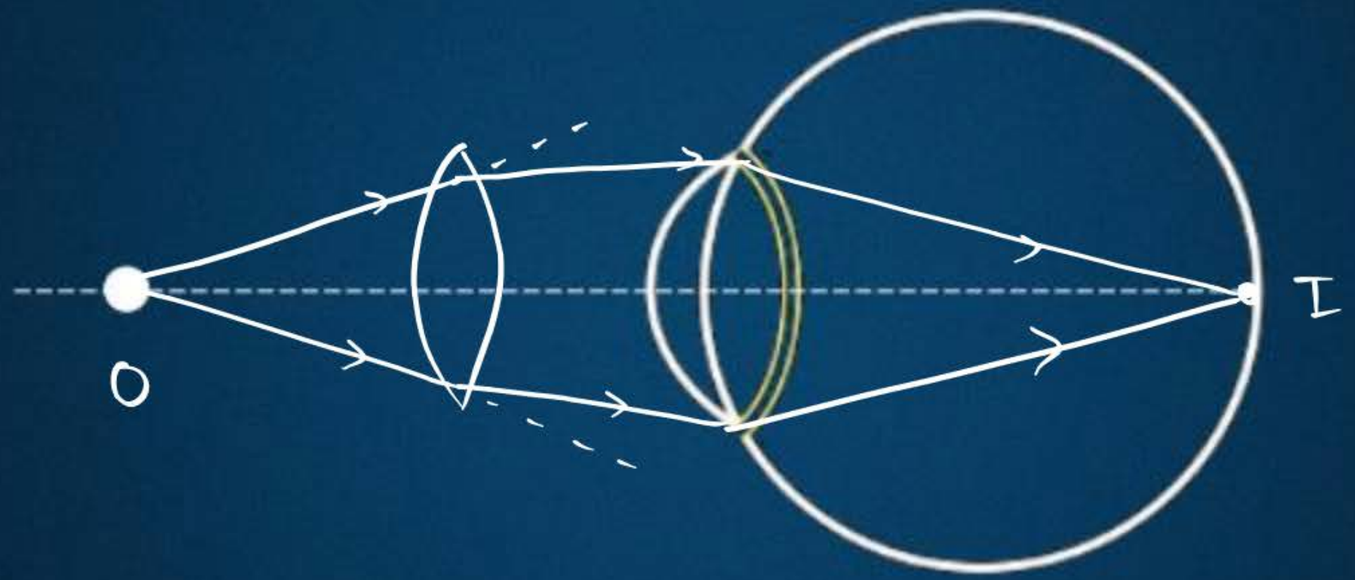
- It is a kind of defect in the human eye due to which, a person can see distant objects properly but cannot see the nearby objects clearly. It happens due to

(i) Decrease in the power of eye lens i.e. increase in focal length of eye lens.

(ii) Shortening of eyeball.



CORRECTION : HYPERMETROPIA (FAR-SIGHTEDNESS)



Corrective Eye

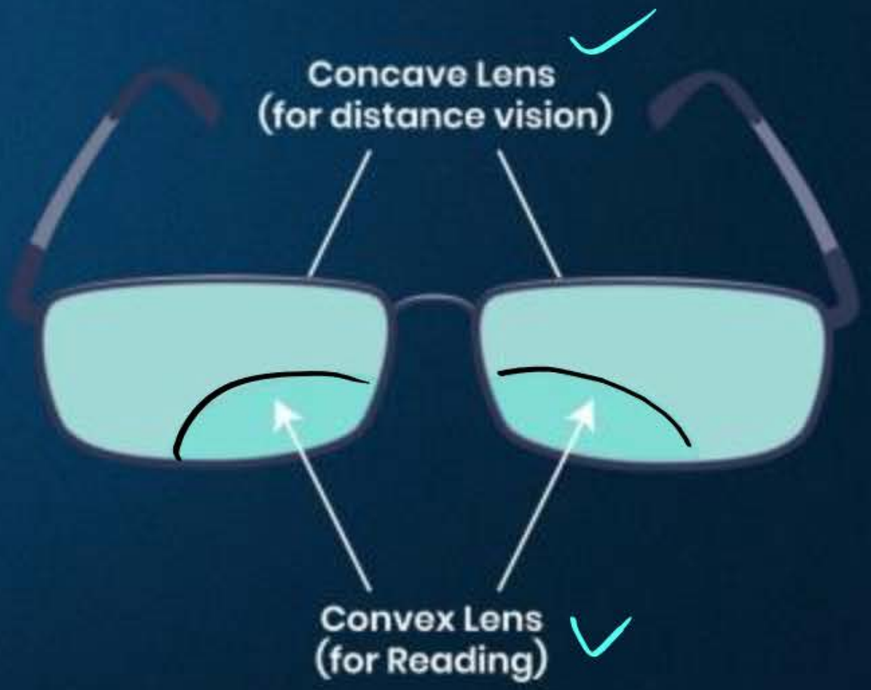
DEFECTS : PRESBYOPIA (OLD AGE HYPERMETROPIA)

- It is a kind of defect in human eye which occurs due to ageing. It happens due to the following reasons

(i) Decrease in flexibility of eye lens.

(ii) Gradual weakening of ciliary muscles. In this, a person may suffer from both myopia and hypermetropia.

Bi-focal lenses



DEFECTS : ASTIGMATISM

- In this defect a person cannot focus on both horizontal as well as vertical lines at the same time so the person can see objects clearly only in one plane.

Causes:- Astigmatism is caused by an irregularly shaped cornea or distorted lens.

Correction:- This defect can be corrected using cylindrical lens.

DEFECTS : CATARACT

Surgery → Artificial lens
→ LASIK

Totally opaque
↓
Loss of
Vision

NIAUKRI WALLAH

Myopia

$u = -\infty$ (Far point)

v = -Given No.

$f = ?$

$P = ?$

Hypermetropia

$u = -25\,cm$ (Near point)

v = -Given No.

$f = ?$

$P = ?$

Question

Myopia

A person can not clearly see objects at a distance more than 40 cm. He is advised to use lens of power.

$u = -\infty$

$v = -40\,cm$

$f =$

$P = ?$

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

$$\frac{1}{f} = \frac{1}{-40} - \left(\frac{1}{-\infty}\right)$$

$$\frac{1}{f} = -\frac{1}{40} + \frac{1}{\infty}$$

$$\frac{1}{f} = -\frac{1}{40}$$

$$\boxed{f = -40\,cm}$$

$$P = \frac{100}{f\,(cm)}$$

$$= \frac{100}{-40}$$

$$= -2.5\,D$$ Ans

Question

hypermetropia : Convex lens (Converging Nature)

An old aged person can read the newspaper by keeping it at 80 cm in front of his eye. What is the nature and power of the lens required to correct the problem?

$u = -25\,cm$

$v = -80\,cm$

$\rightarrow f =$

$\rightarrow P =$

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

$$\frac{1}{f} = \frac{1}{-80} - \left(\frac{1}{-25}\right)$$

$$= -\frac{1}{80} + \frac{1}{25}$$

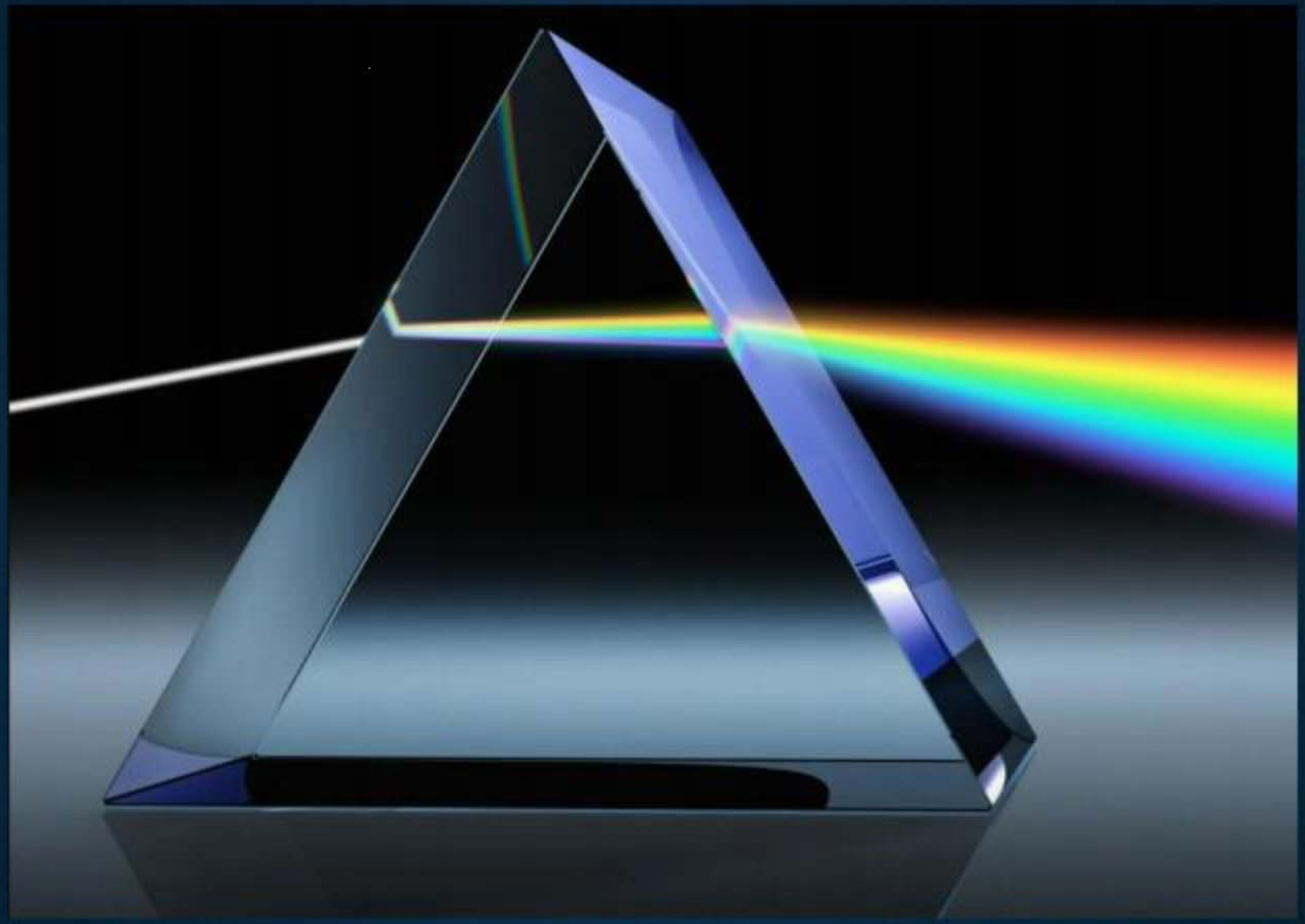
$$\frac{1}{f} = \frac{-5+16}{400} = \frac{11}{400}$$

$$f = \frac{400}{11}\,cm$$

$$P = \frac{100}{f(cm)}$$

$$= \frac{100}{\frac{400}{11}} = \frac{1100}{400} = \frac{11}{4}\,D$$

GLASS PRISM – 3 faces ▭ + 2 faces △

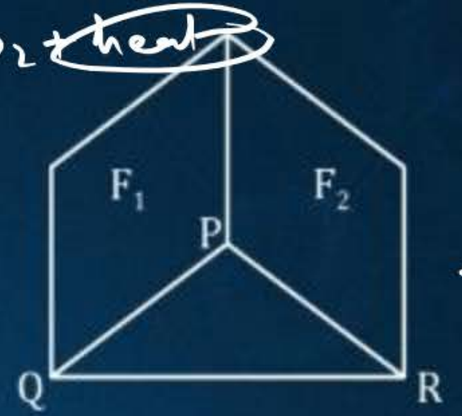


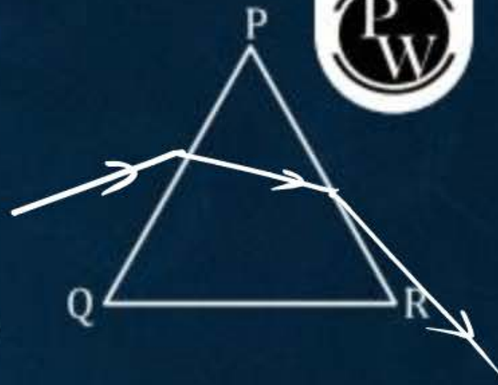
$C + O_2 \rightarrow CO_2 + heat$

REFRACTION THROUGH PRISM

one colour (Wavelength)

Using monochromatic Light :





I_R

R_R

E_R

$\angle i$

$\angle r$

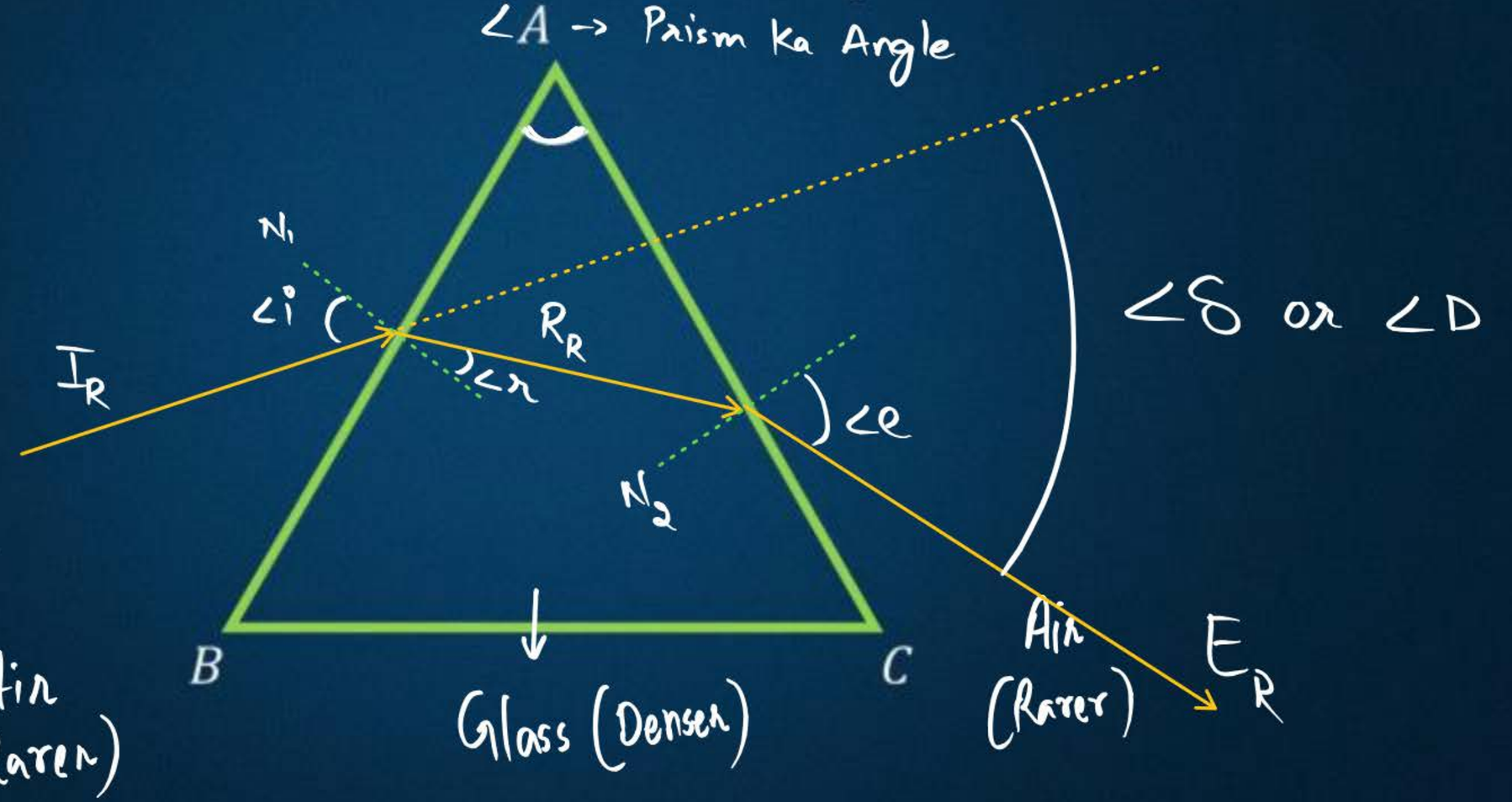
$\angle e$

$\angle A \rightarrow$ Angle of Prism

$\angle \delta \rightarrow$ Angle of Deviation

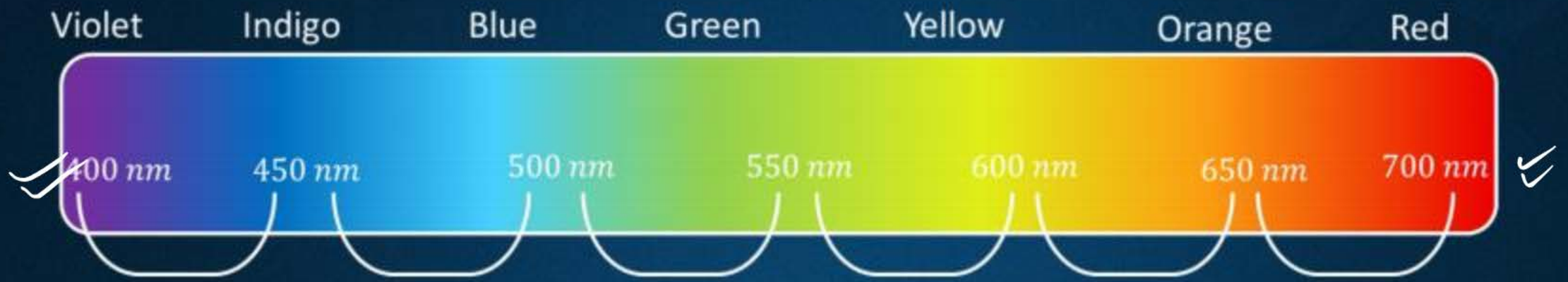
N_1

N_2



Newton's Disc Experiment

VISIBLE REGION :



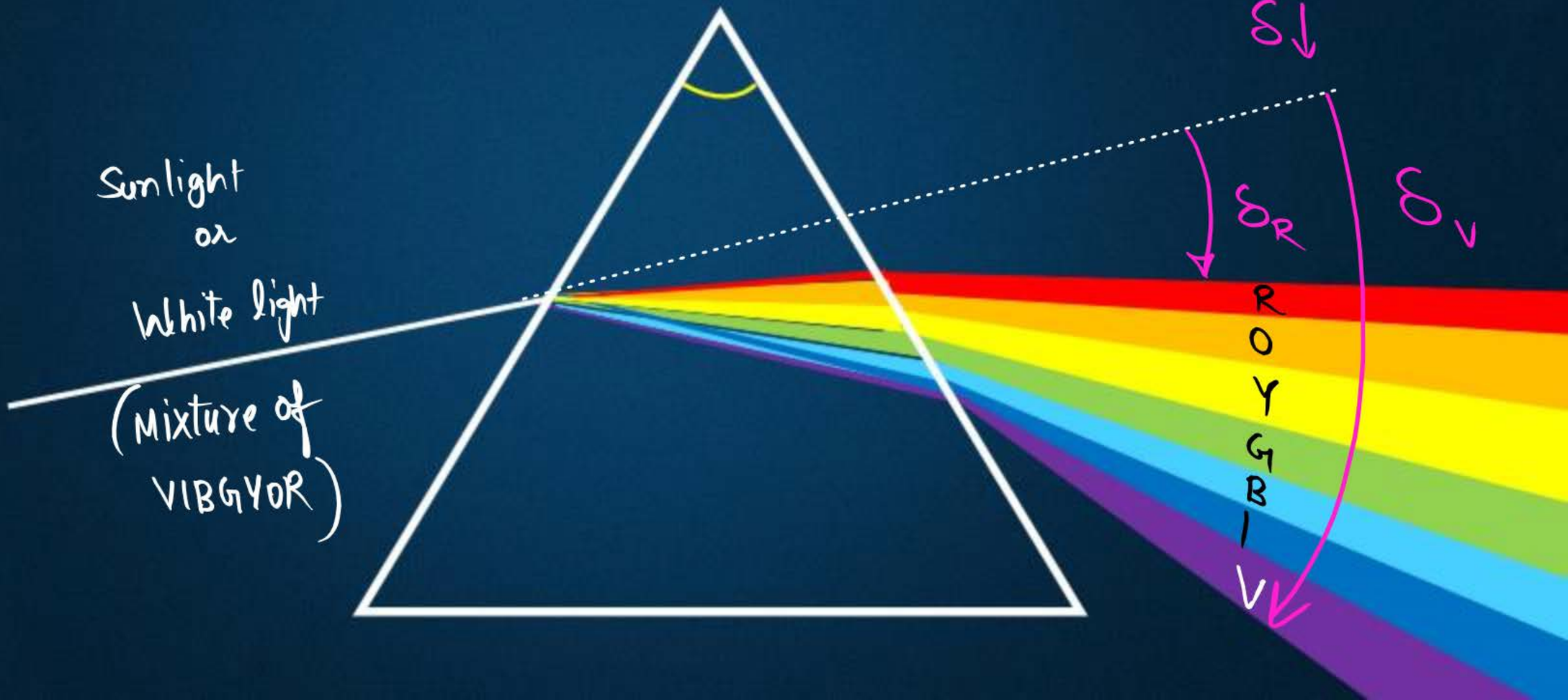
DISPERSION OF LIGHT THROUGH PRISM

$\delta_V > \delta_R$

$\lambda_V < \lambda_R$

The phenomenon of splitting of white light into its seven constituent colours when it passes through a glass prism is called dispersion of white light.

$\lambda \uparrow \alpha \frac{1}{\delta \downarrow}$



SPECTRUM

- The band of seven colors is called the spectrum.
- The sequence of colors remembers as VIBGYOR.

V - Violet

I - Indigo

B - Blue

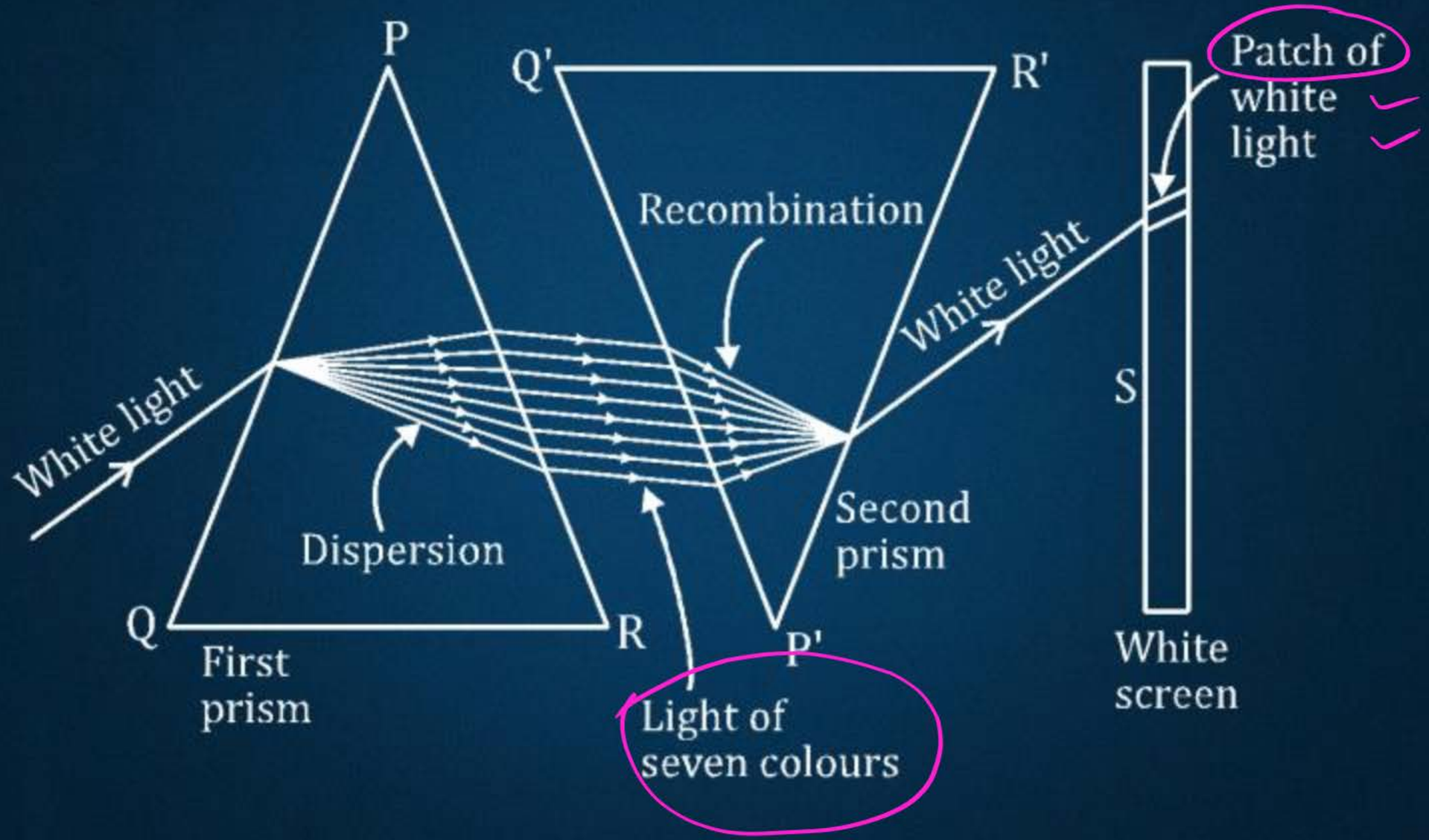
G - Green

Y - Yellow

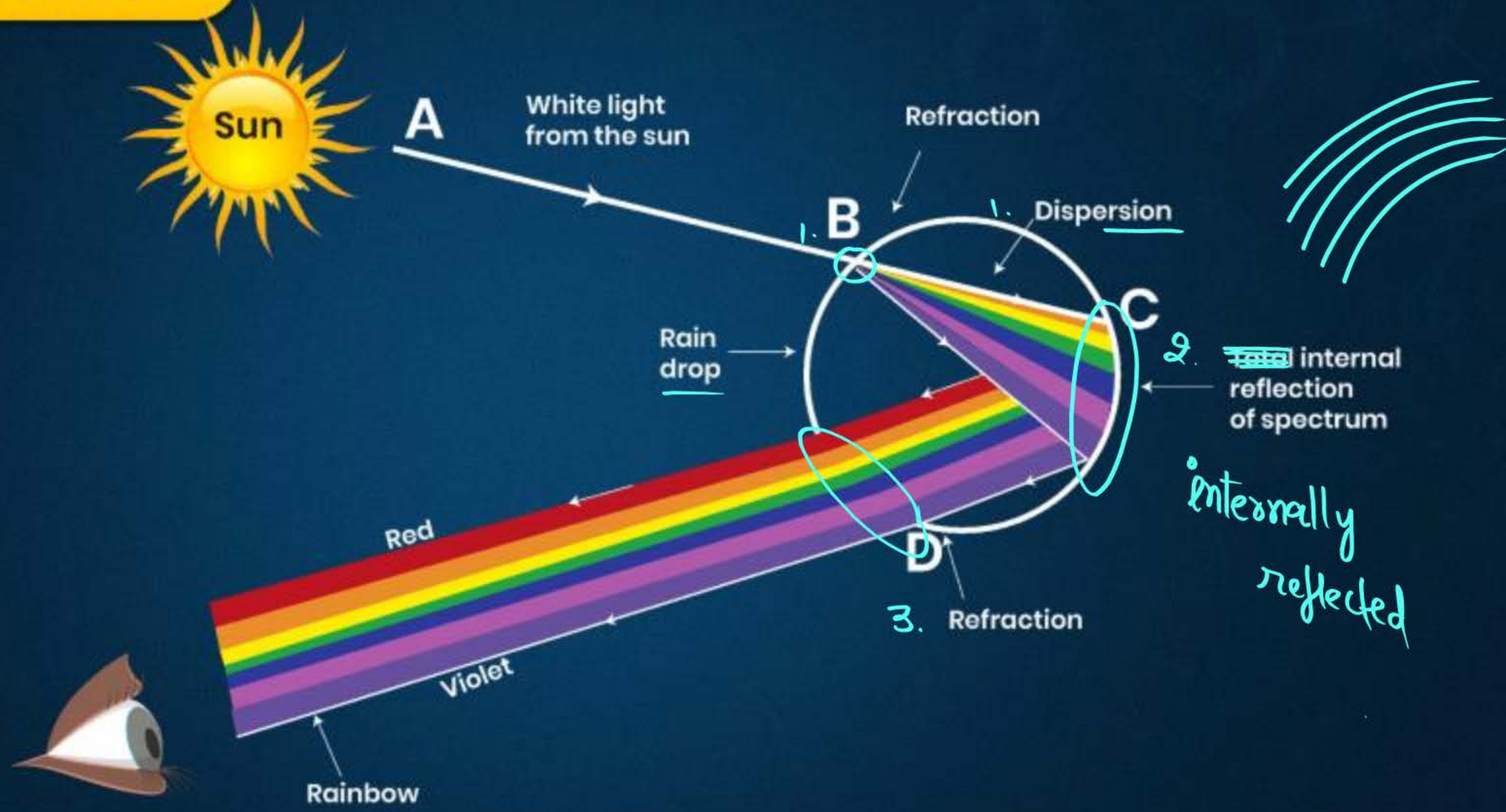
O - Orange

R - Red

RECOMBINATION OF DISPERSED LIGHT



RAINBOW



internally reflected

RAINBOW

- The water droplets act like small prism.
- They refract and disperse the incident sunlight, then reflect it internally and refract it again when it comes out of the raindrop.
- Due to the dispersion of light and internal reflection, different colors reach the observer's eye.
- Red color appears on top and violet at the bottom of rainbow.
- A rainbow is always formed in a direction opposite to that of Sun.

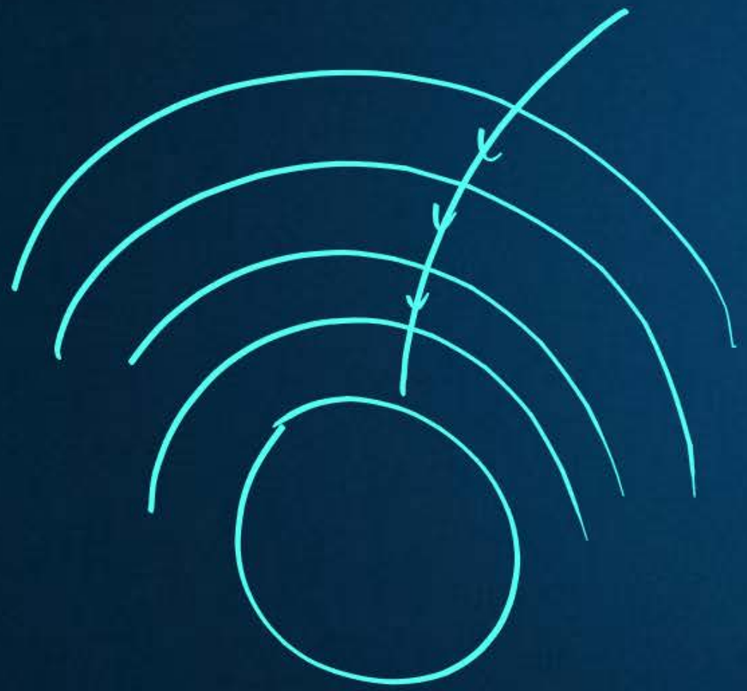
ATMOSPHERIC REFRACTION

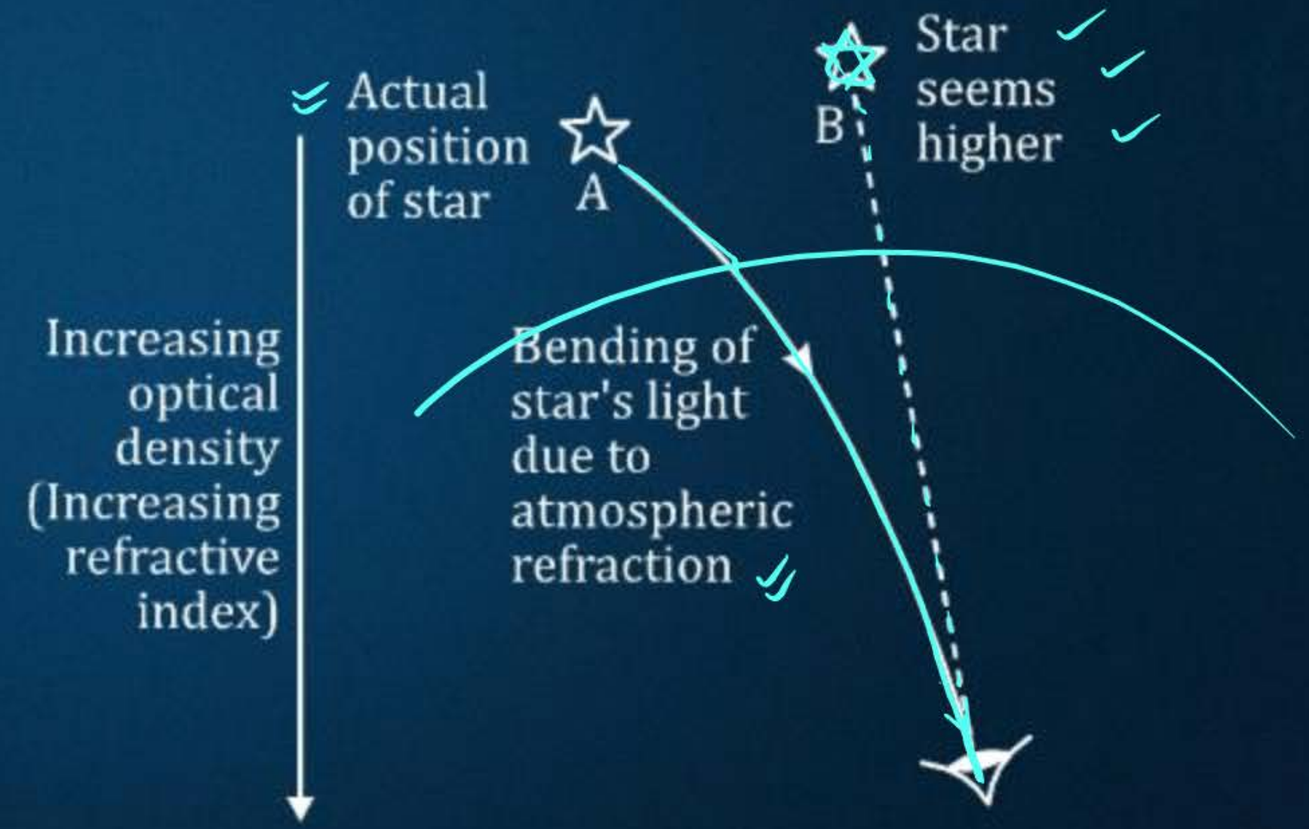
(AR)

$n_{air} = 1.003$ (D)

$n_{vacuum} = 1$ (R)

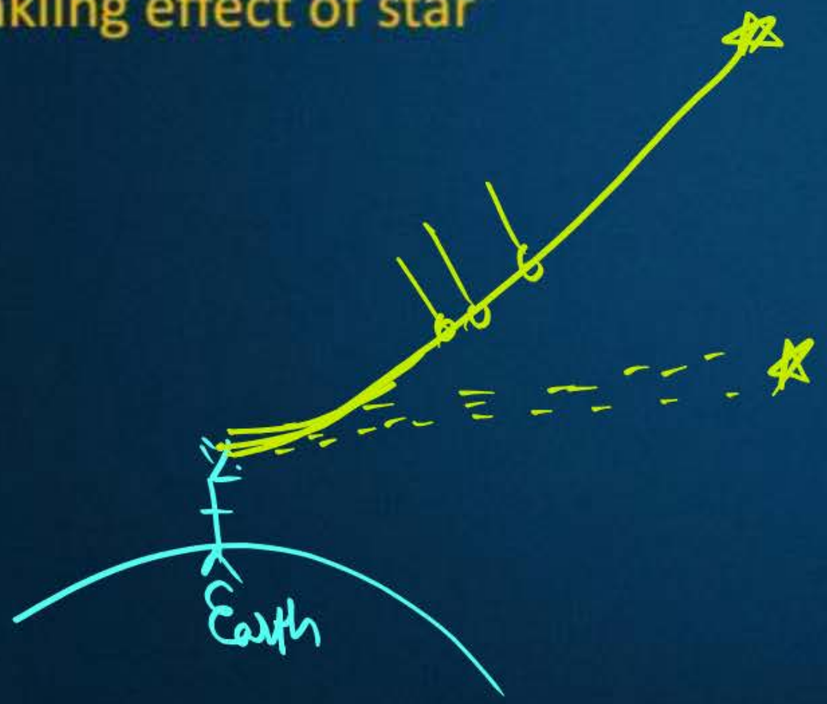
The refraction of light caused by the Earth's atmosphere (having air layers of varying optical densities) is called **Atmospheric Refraction**.

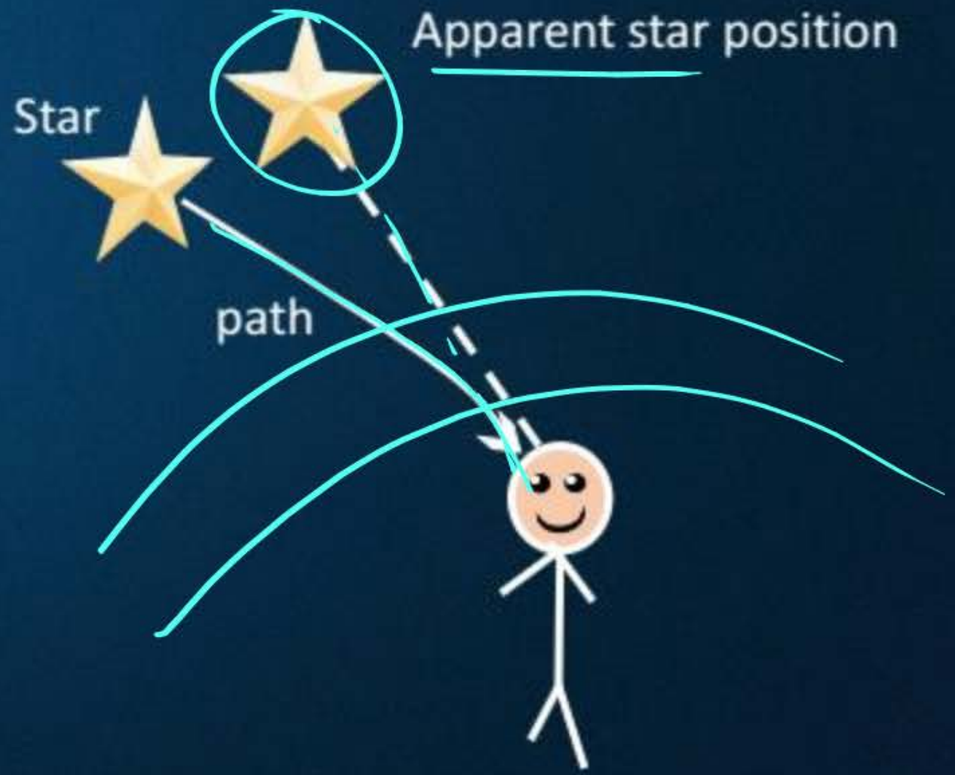




Why do stars twinkle?

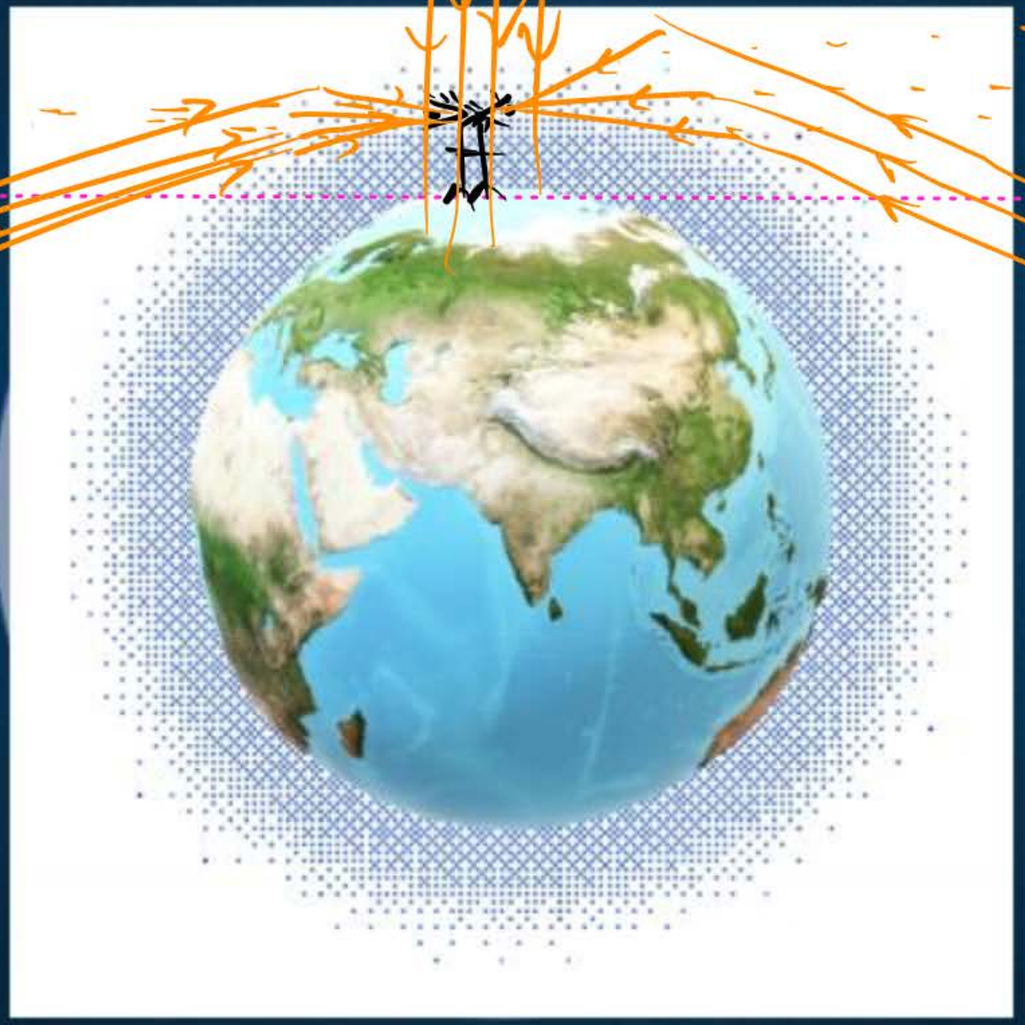
It is due to atmospheric refraction. Distant star act like a point source of light. As the beam of starlight keeps deviating from its path, the apparent position of star keeps on changing because physical condition of earth's atmosphere is not stationary. Hence, the amount of light enters our eyes fluctuate sometimes bright and sometime dim. This is the "Twinkling effect of star"





ADVANCED SUNRISE & DELAYED SUNSET

(A.R.) → (A.S.D.S.)



Apparent Sun

2min

Actual Sun

Apparent Sun

2min

HORIZON (क्षितिज)

SUN (Real position)

HOMEWORK

- Backlog X
- Sunday ≤
- NCERT ≤

Thank You