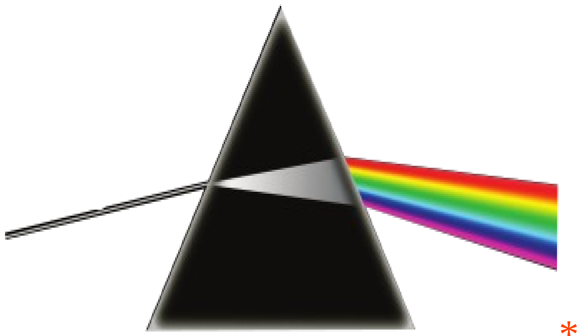
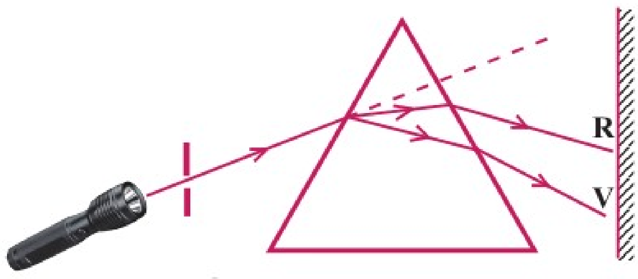
6.VISION AND THE WORLD OF COLOURS

FOCUS AREA

1. Dispersion of light
2. Recombination of colours
3. Formation of Rainbow
4. Persistence of vision
5. Scattering of light
6. Relation between wavelength of colours and Scattering

1. Dispersion of light





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What are the colours seen on the screen?
VIBGYOR

Red (R)
Orange (O)
Yellow (Y)
Green (G)
Blue (B)
Indigo (I)
Violet (V)

* Which colour deviates the most?
Violet

* Which colour deviates least?
Red

* What may be the reason behind this difference in deviation?
Difference in wavelengths.
* What is this phenomenon? Explain.
Dispersion of light

- Dispersion is the phenomenon of splitting up of a composite light into its constituent colours. The regular array of colours formed by dispersion is the visible spectrum.
* What is composite light
Any light that is composed of more than one colour is a composite light
Ex: Sunlight

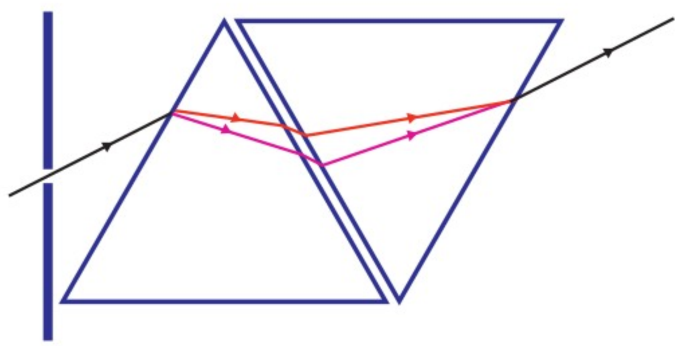
* Which colour has the shortest wavelength?
Violet

* Which one has the longest?
Red

* When light passes through the prism, as the wavelength increases, how does the deviation change?
- When the wavelength of the colour decrease, the deviation increases
- When the wavelength of the colour increases, the deviation decrease

2. Recombination of colours

Pass white light through a prism and obtain the constituent colours on a screen. A prism similar to the first is placed in inverted position, adjacent to the first (Fig.6.11).



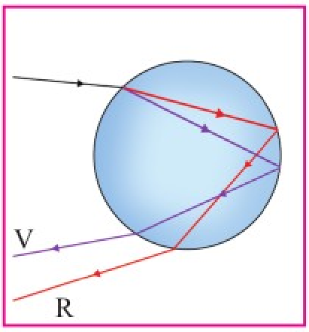
1. What happened to the light when it passed through the first prism?
* The white light separates in to its component colours

2. What happened when it passed through the second one?
* The colour formed in the first prism recombine to form white light.

3.Formation of Rainbow

1. When is the rainbow formed?
* In the morning and in the evening
2. Where will be the Sun when the rainbow is seen in the East?
* West
3. Where will be the Sun when the rainbow is seen in the West?
*East
4. What is the phenomenon that causes rainbow?
*Dispersion of light caused by the water droplets in the atmosphere causes rainbow.

The figure shows a ray of sunlight falls obliquely on a water drop.



1. How many times does a ray of light undergo refraction when it passes through a water droplet?
* The light undergoes two times refraction in the water droplet

2. What about the internal reflection?
* One time

3. What is the colour seen at the upper edge of the rainbow?
* Red

4. What is the colour seen at the lower edge?
* Violet

5. How the rainbow is formed?

* Sunlight, when it passes through water droplets, undergoes refraction and internal reflection. The light ray emerging from the water droplets which make the same angle with the line of vision have the same colour. These droplets appear in the form of an arc of a particular colour. Thus there is red colour at the upper edge and violet colour at the lower edge. All the other colours are seen in between, depending on their wavelengths.

* When the position of the sun is near the horizon, the rainbow appears to be bigger.

* When seen from an aeroplane, the rainbow is seen as a circle.

* When the sun is much above the horizon, the rainbow disappears.

4. Persistence of vision

When an object is viewed by a person, its image remains in the retina of the eye for a time interval of 0.0625s (1/16s) after seeing it. This phenomenon is called persistence of vision. If more than one scene is viewed within 0.0625s, the effect of all these scenes will be felt by the eye simultaneously.

Newton's colour disc

1.In which colour does the disc appear when rotated fast?
* white
2. Give reason.
* The disc appears white since all the rays of light from the seven colours reach the retina of the eye within 0.0625 second (1/16s). The disc appeared white due to persistence of vision.

Examples of persistence of vision
1. A torch rotated rapidly appears as an illuminated circle.

2. Raindrops look like glass rods during rain.

5. Scattering of light

Scattering is the change in direction brought out by the irregular and partial reflection of light when it hits the particles of the medium.

6. Relation between wavelength of colours and Scattering

* Colours like violet, indigo and blue have the smallest wavelengths in sunlight. They undergo maximum scattering.

* Red has comparatively greater wavelength and it can overcome small obstacles and hence scattering is low. As a result they travel greater distance.

* Rate of scattering and the size of the particles are interrelated. As the size of the particle increases, the rate of scattering also increases. If the size of the particles is greater than the wavelength of light, then the scattering is same for all colours.