

Dispersion of White Light:

- In the year, 1665, Newton discovered by his experiments with glass prisms that white light (like sunlight) consists of a mixture of seven colours. He found that if a beam of white light is passed through a triangular prism, the white light splits to form a band of seven colours on a white screen. This band of seven colours is called spectrum of white light.
- The seven colours of spectrum are: passed through a glass Red, Orange, Yellow, Green, Blue, Indigo and Violet.
- The splitting up of white light into seven colours on passing through a transparent medium like a glass prism is called dispersion of light.

Figure 10.5,
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- The dispersion of white light occurs because colours of white light travel at different speeds through the glass prism.
- Hence, when white light falls on a glass prism, each colour in it is refracted (or deviated) by a different angle, with the result that seven colours are spread out to form a spectrum. The red colour has maximum speed in the glass prism, so the red colour is deviated the least. Whereas, violet colour has minimum speed in glass prism, so the violet colour is deviated the maximum.

Recombination of spectrum colours to give white light :-

- We have just seen that white light can be dispersed into its seven constituents colours. Newton showed that the reverse of this is also true. i.e., the seven coloured lights of the spectrum can be recombined to give back white light.

Figure 10.6

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- The first glass prism (P_1) disperse (splits) the white light into seven coloured rays. The second prism (P_2) receives all the seven coloured rays from the first prism and recombines them into original white beam of light which falls on the screen. placed behind second prism (P_2)
- The recombination of seven colours, produced by first prism, is due to the fact that the second prism has been placed in reversed position, due to which the refraction produced by the second prism is equal and opposite to that produced by the first prism.

The Rainbow:-

- One of the most beautiful examples of spectrum formed by the dispersion of sunlight is provided by nature in the form of rainbow.
- The rainbow is an arch of seven colours visible in the sky which is produced by the dispersion of sun's light by raindrops in the atmosphere.
- The rainbow is actually a natural spectrum of sunlight in the sky.
- We can see the rainbow if we stand with our back towards the sun and rain in front of us. A rainbow is always formed in the direction opposite to that of the sun.
- A rainbow is produced by dispersion of white sunlight by raindrops (or waterdrops) in the atmosphere. Each raindrop acts as a tiny glass prism splitting the sunlight into spectrum.

• Diagram

Figure 10.8

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Atmospheric Refraction :-

- We know that when light goes from one medium to another medium having different optical densities, then the refraction of light rays takes place.
- In the atmosphere, the air is not at the same temperature. Some of the air layers of the atmosphere are cold whereas other air layers are comparatively warm.
- Now, the cooler air layers of the atmosphere behave as optically denser medium for light rays. Whereas the warmer air layers of the atmosphere behave as optically ^{rarer} denser medium for the light rays. So in the same atmosphere we have air layers having different optical densities.
- When light rays pass through the atmosphere having air layers of different optical densities, then refraction of light takes place.
- The refraction of light caused by the earth's atmosphere is called atmospheric refraction.
- Some of the optical phenomena in nature which occur due to the atmospheric refraction of light, are as follows
 1. Twinkling of stars.
 2. The stars seem higher than they actually are.
 3. Advance sunrise & delayed sunset.