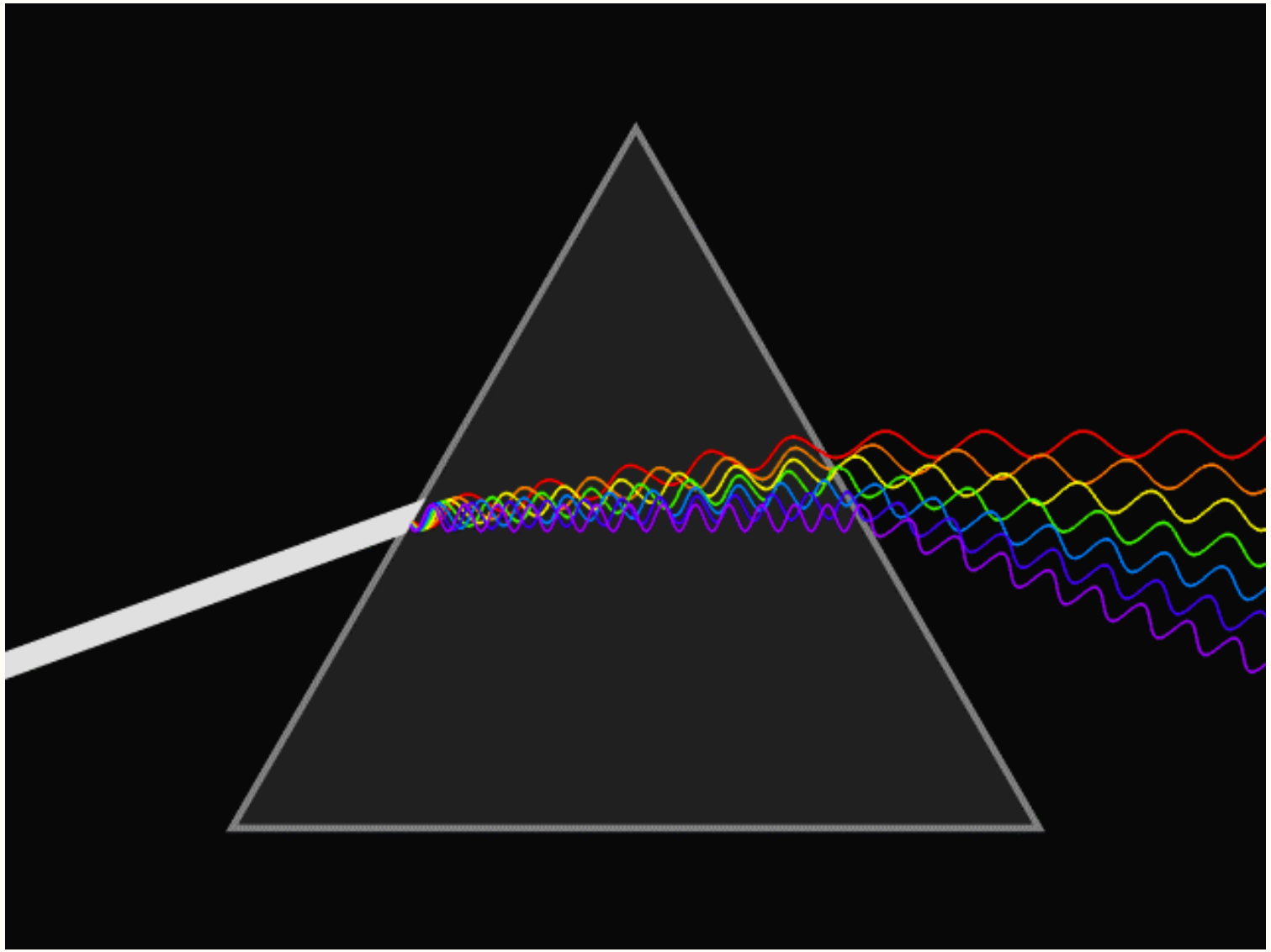
THE HUMAN EYE AND THE COLOURFUL WORLD

MODULE-3

DISPERSION OF WHITE LIGHT BY A GLASS PRISM

- The prism splits the incident white light into a band of colours.
- The various colours seen are Violet, Indigo, Blue, Green, Yellow, Orange and Red,
- The band of the coloured components of a light beam is called its spectrum.
- The splitting of light into its component colours is called dispersion

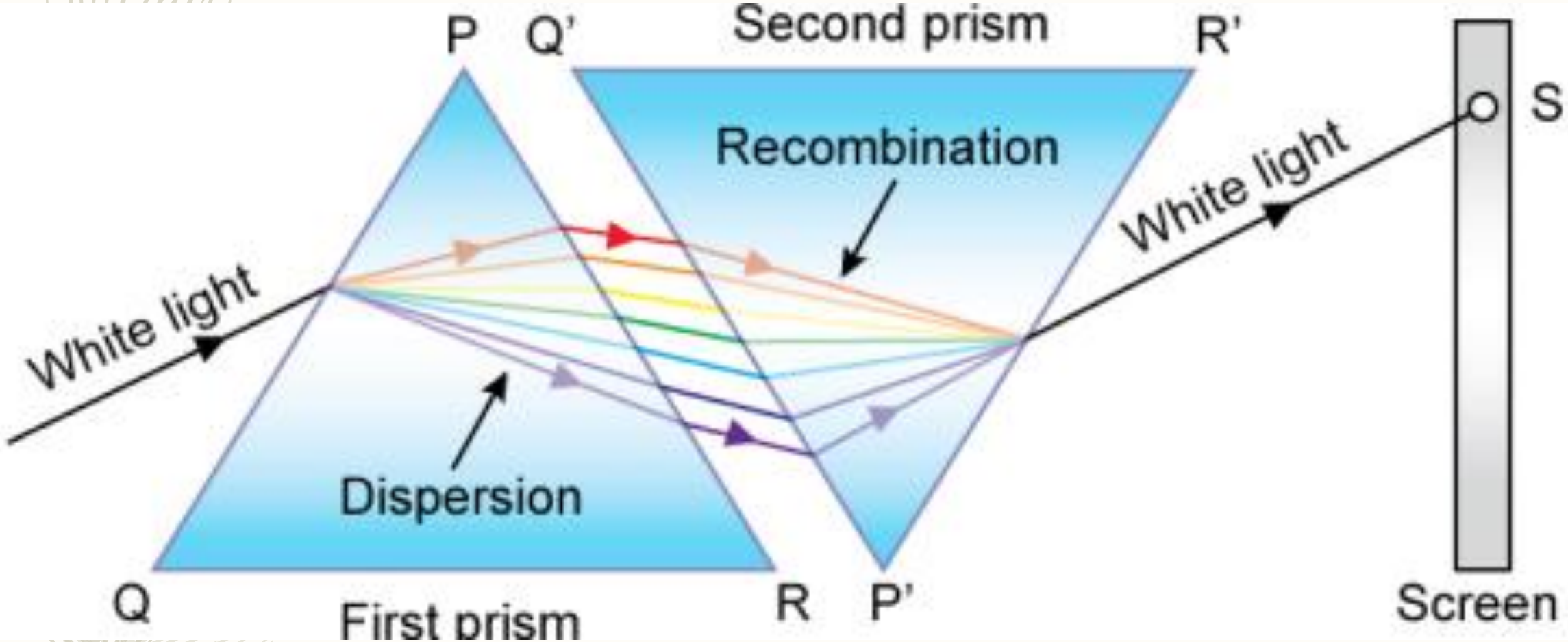


REASON OF DISPERSION

- White light is dispersed into its seven-colour components by a prism. This is because-
- Different colours of light bend through different angles with respect to the incident ray, as they pass through a prism. The red light bends the least while the violet the most. Thus, the rays of each colour emerge along different paths and thus become distinct. It is the band of distinct colours that we see in a spectrum.

RECOMBINATION OF SPECTRUM COLOURS

- Isaac Newton was the first to use a glass prism to obtain the spectrum of sunlight. He tried to split the colours of the spectrum of white light further by using another similar prism. However, he could not get any more colours. He then placed a second identical prism in an inverted position with respect to the first prism. This allowed all the colours of spectrum to pass second prism. He found a beam of white light emerging from the other side of the second prism.
- This observation gave Newton the idea that the sunlight is made up of seven colours. Any light that gives a spectrum similar to that of sunlight is often referred to as white light.

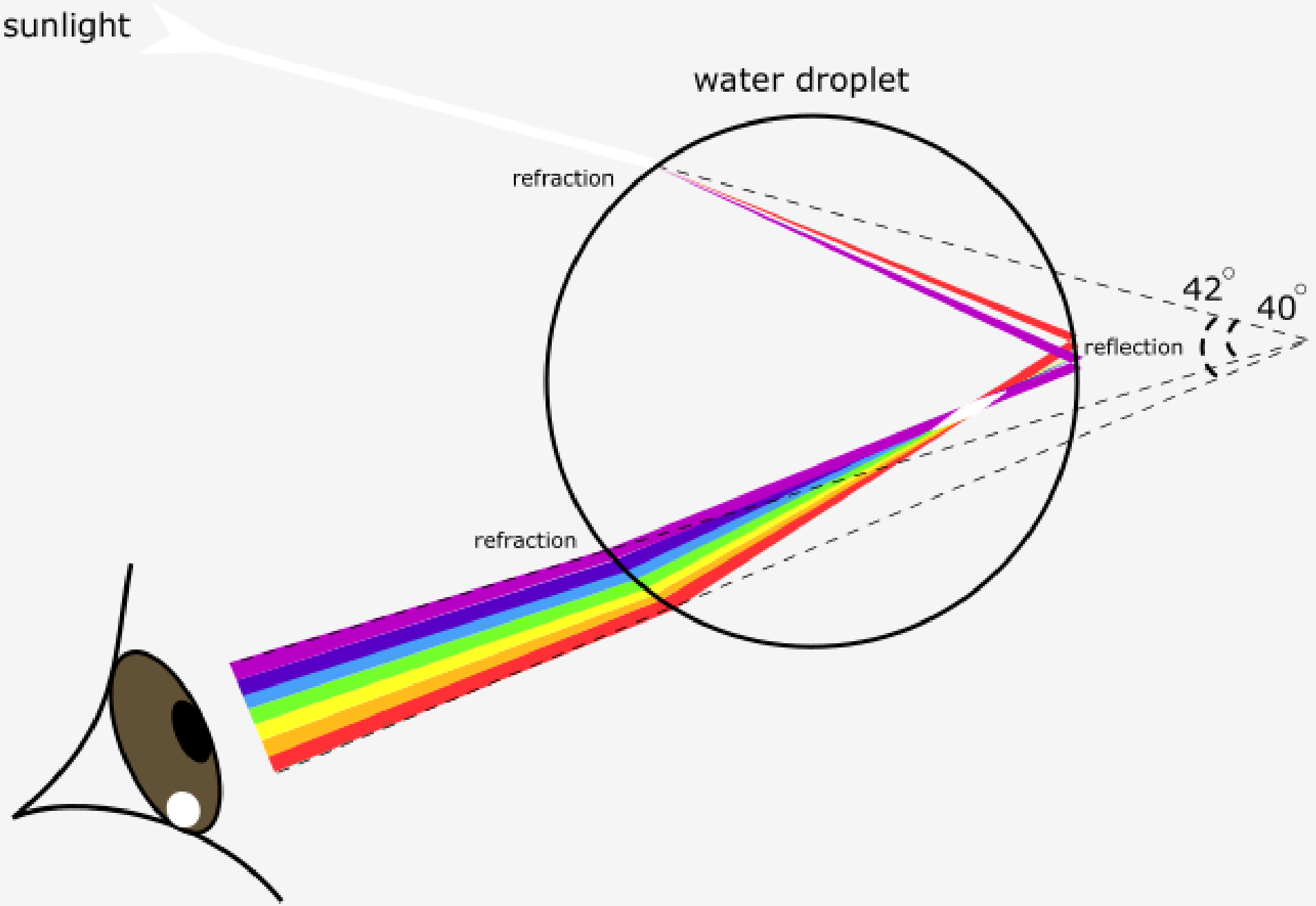

P
Q'
Second prism
R'
S
Recombination
White light
White light
Dispersion
Q
First prism
R
P'
Screen

RAINBOW

- A rainbow is a natural spectrum appearing in the sky after a rain shower.
- It is 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.

FORMATION OF RAINBOW

- The water droplets act like small prisms.
- They refract and disperse the incident sunlight, then reflect it internally, and finally refract it again when it comes out of the raindrop.
- Due to the dispersion of light and internal reflection, different colours reach the observer’s eye.
- You can also see a rainbow on a sunny day when you look at the sky through a waterfall or through a water fountain, with the Sun behind you.


sunlight
water droplet
refraction
42°
40°
reflection
refraction