Why the Sky is Blue and Sunsets are Red

Physics · CBSE Class 10 · The Human Eye and the Colourful World · PrayogX short notes

▸ **Video explanation:** Watch the PrayogX reel on Instagram

In one line: air molecules **scatter** short-wavelength blue light far more than red. Blue fills the sky by day; at sunset the blue is scattered away and red and orange reach us.

Key definitions

Term	Meaning
White light	A mixture of all colours, from red to violet (VIBGYOR).
Wavelength	Distance between two wave crests. Red is long (about 700 nm); blue is short (about 450 nm); violet is shortest (about 400 nm).
Scattering	Light hitting tiny particles is sent off in many directions.
Rayleigh scattering	Scattering by particles much smaller than the wavelength, such as air molecules. Its strength $\propto 1/\lambda^4$.

Rule to remember

Scattering $\propto 1/\lambda^4$: the shorter the wavelength, the more it scatters. Blue (≈450 nm) scatters about 5-6 times more than red (≈700 nm).

Step by step

1. Sunlight is white: it contains every colour.
2. In the atmosphere, air molecules scatter the short-wavelength blue light much more than red.
3. Scattered blue light reaches our eyes from every direction, so the whole sky looks blue.
4. **Why not violet?** Violet scatters even more, but sunlight has less violet, some is absorbed high in the atmosphere, and our eyes are less sensitive to violet than to blue.

5. **Sunset:** near the horizon, sunlight travels through a much thicker layer of atmosphere. Most of the blue is scattered out on the way, so mainly red and orange reach us.

Related facts

- The sky looks black from the Moon or from space: no atmosphere, no scattering.
- Clouds look white because water droplets are much bigger than the wavelength and scatter all colours almost equally.
- Danger signals are red because red is scattered least by fog and smoke, so it travels farthest.

Common mistakes

- "The sky is blue because it reflects the ocean." The sky is blue over deserts too; the cause is scattering.
- "At sunset the Sun changes colour." The Sun emits the same light; the longer path through the air removes the blue.

Quick check

1. Which colour of visible light is scattered least? *Red.*
2. Why would an astronaut see a black sky? *There is no atmosphere to scatter sunlight.*
3. Why are sunrises also red? *The Sun is again near the horizon, so the light's path through the air is long.*

Takeaway

Blue sky and red sunset: one cause, scattering.

▸ **Video explanation:** Watch the PrayogX reel on Instagram