ATMOSPHERIC REFRACTION

It is the phenomenon of bending of light on passing through earth's atmosphere

The twinkling of stars is a similar phenomenon on a much larger scale.

Twinkling of stars

The twinkling of a star is due to atmospheric refraction of starlight.

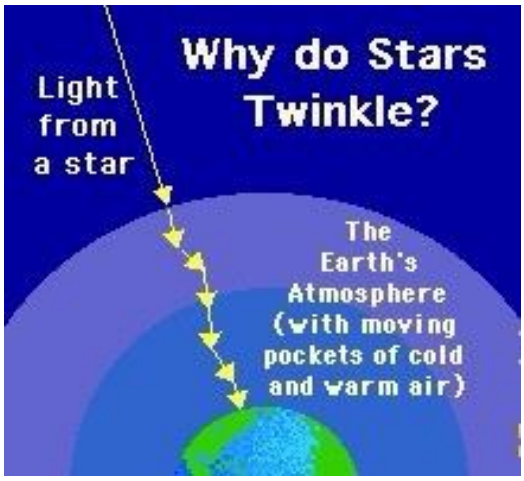
The starlight, on entering the earth's atmosphere, undergoes refraction continuously before it reaches the earth.

The atmospheric refraction occurs in a medium of gradually changing refractive index.

Since the atmosphere bends starlight towards the normal, the apparent position of the star is slightly different from its actual position.

The star appears slightly higher (above) than its actual position when viewed near the horizon

Since the stars are very distant, they approximate point-sized sources of light. As the path of rays of light coming from the star goes on varying slightly, the apparent position of the star fluctuates and the amount of starlight entering eye flickers -the star sometimes appear brighter and sometimes fainter ,which is twinkling effect.

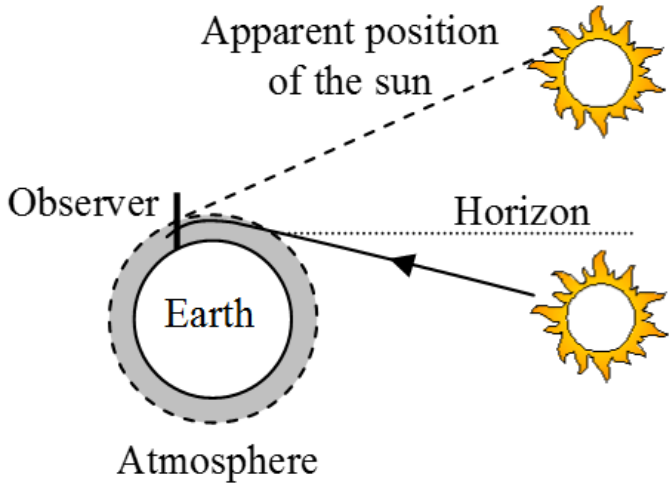


Why don’t the planets twinkle?

The planets are much closer to the earth, and are thus seen as extended sources. If we consider a planet as a collection of a large number of point-sized sources of light, the total variation in the amount of light entering our eye from all the individual point-sized sources will average out to zero, thereby nullifying the twinkling effect.

Advance sunrise and delayed sunset

The Sun is visible to us about 2 minutes before the actual sunrise, and about 2 minutes after the actual sunset because of atmospheric refraction. By actual sunrise, we mean the actual crossing of the horizon by the Sun. The time difference between actual sunset and the apparent sunset is about 2 minutes. The apparent flattening of the Sun’s disc at sunrise and sunset is also due to the same phenomenon.



SCATTERING OF LIGHT

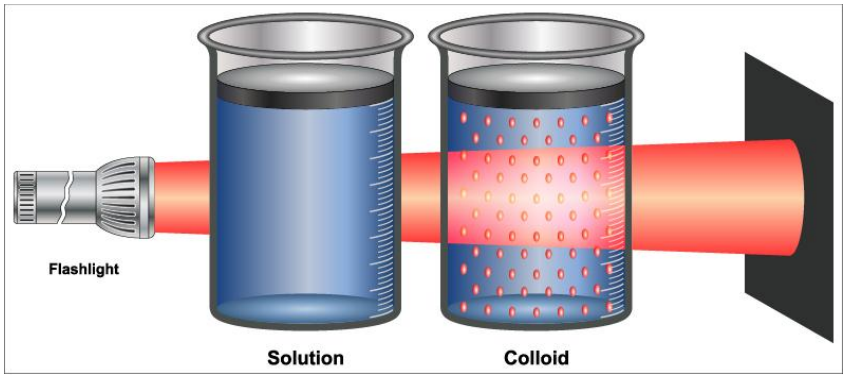
It is the phenomena of change in direction of light on striking an obstacle like an atom, a molecule a dust particle water droplet etc.

Tyndall Effect

When a beam of light strikes such fine particles, the path of the beam becomes visible. The light reaches us, after being reflected diffusely by these particles. The phenomenon of scattering of light by the colloidal particles gives rise to Tyndall effect.

This phenomenon is seen when a fine beam of sunlight enters a smoke-filled room through a small hole. Thus, scattering of light makes the particles visible.

Tyndall effect can also be observed when sunlight passes through a canopy of a dense forest.



On the basis of scattering, we account for-

(i) blue colour of clear sky
(ii) white colour of clouds
(iii) reddish colour of sun at sunrise and sunset
(iv) red colour for danger signals.