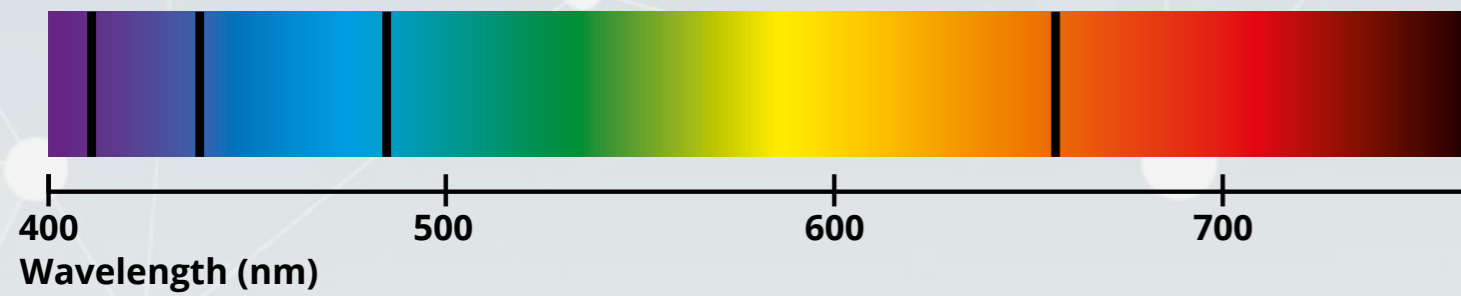


Absorption spectra

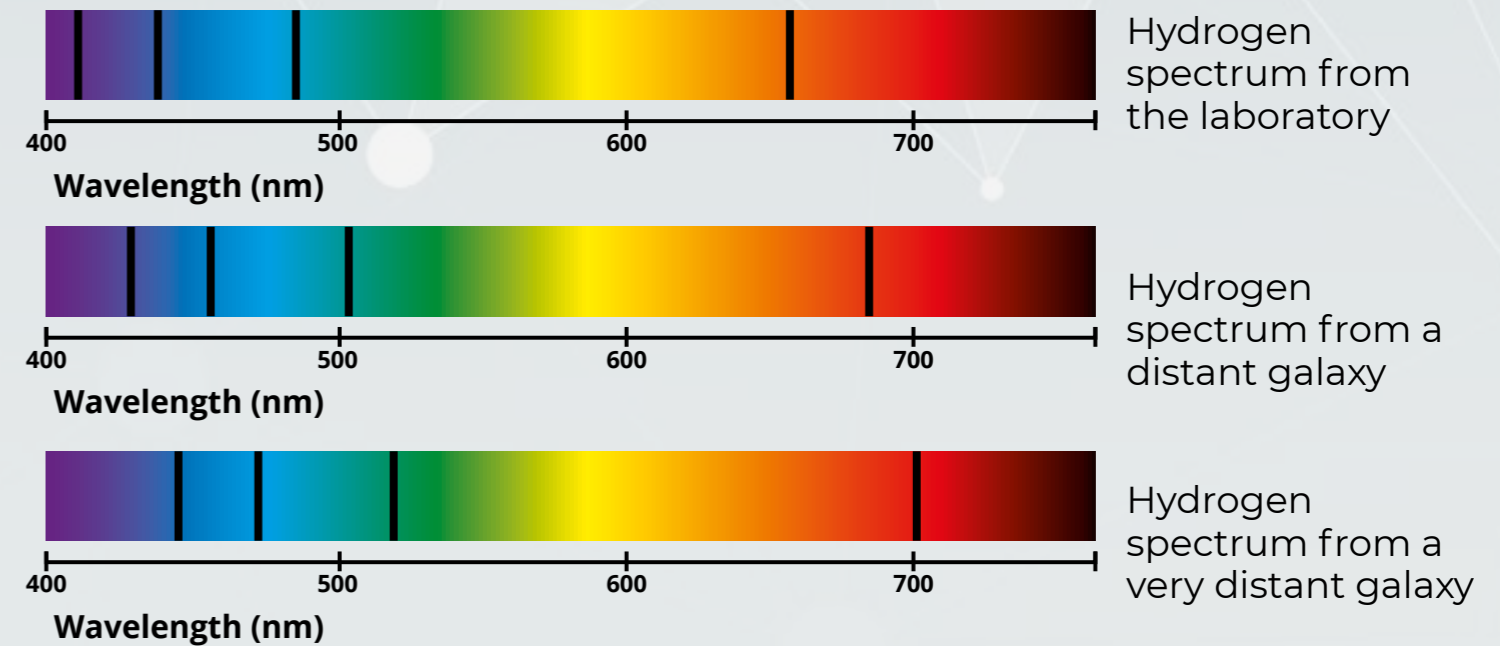


When observing light from distant stars and galaxies through a spectrometer you see a **pattern of black lines** on the spectrum. These lines represent **wavelengths** of light that have been **absorbed** by **elements** in the gases in the star's **atmosphere**. As every element will absorb different wavelengths, each **element has a unique pattern** of lines.

This pattern can be used to identify which elements are present. The example above is a hydrogen spectrum, only hydrogen will absorb light in that specific pattern of lines.

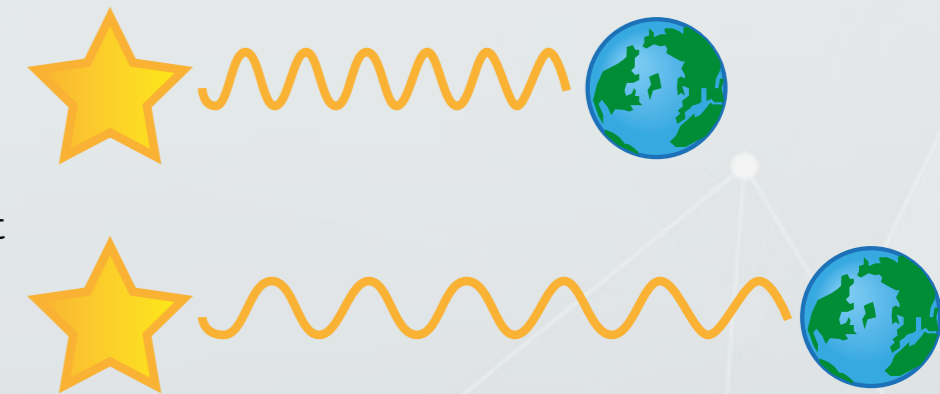
Cosmological red shift

When comparing light from distant galaxies to spectra created in the laboratory scientists noticed the pattern of lines had been shifted towards the red side of the spectrum, with the **longer wavelength**.



The wavelength has increased because the light was **stretched** as it travelled through space that was **expanding**.

As light is stretched as it travels through expanding space, light from galaxies that are **further away is stretched more** as the light travels through space for longer.



Using this information, it can be theorised that **all galaxies started at the same point** and the universe has expanded from that point.

CMBR Cosmic microwave background radiation

High energy **Gamma** radiation released at the Big Bang has travelled through the universe since then, because the universe is **expanding** the wavelength of these waves has been stretched to become **microwave** radiation.

As microwave radiation can be measured throughout the universe it is evidence that the universe started from a **hot Big Bang** which released a lot of energy.

The Big Bang

Both these pieces of evidence support the Big Bang Theory which states that the universe started from **one point** where all the energy and matter was released.