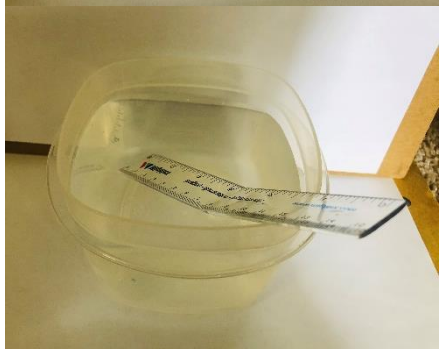
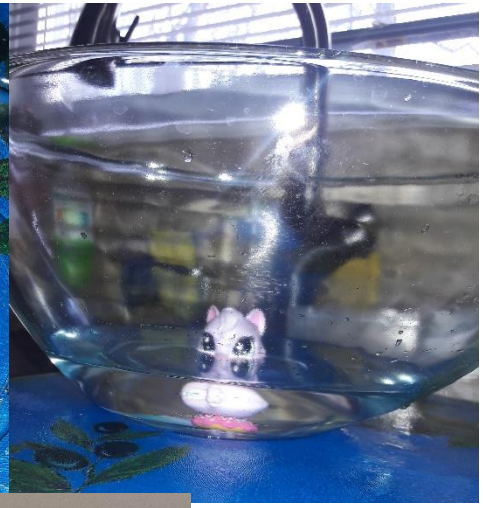
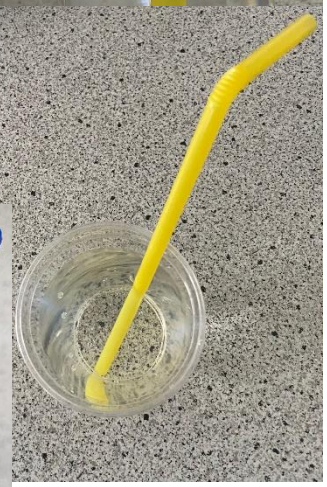
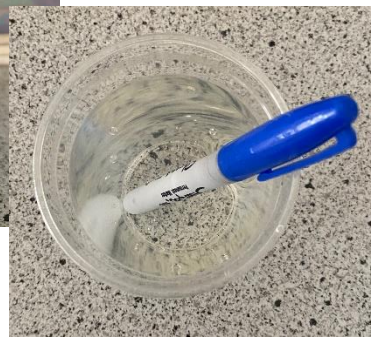





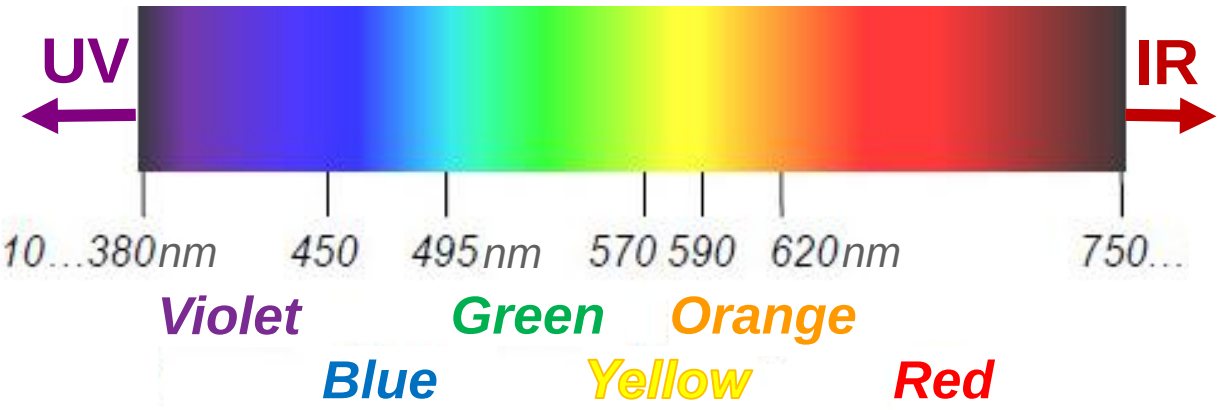






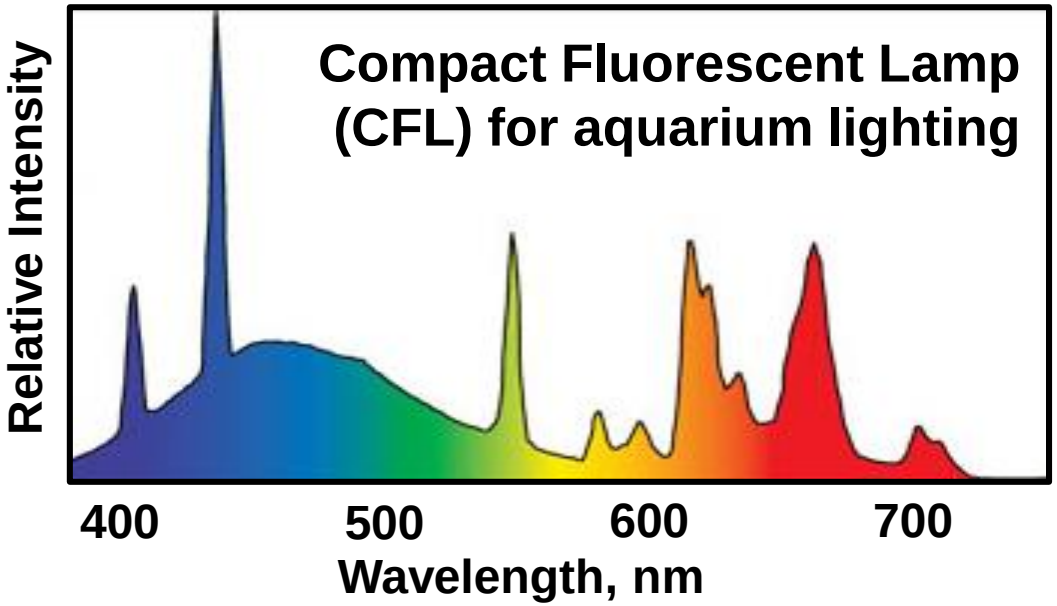
Describing Light

1. Wavelength:
type of photon

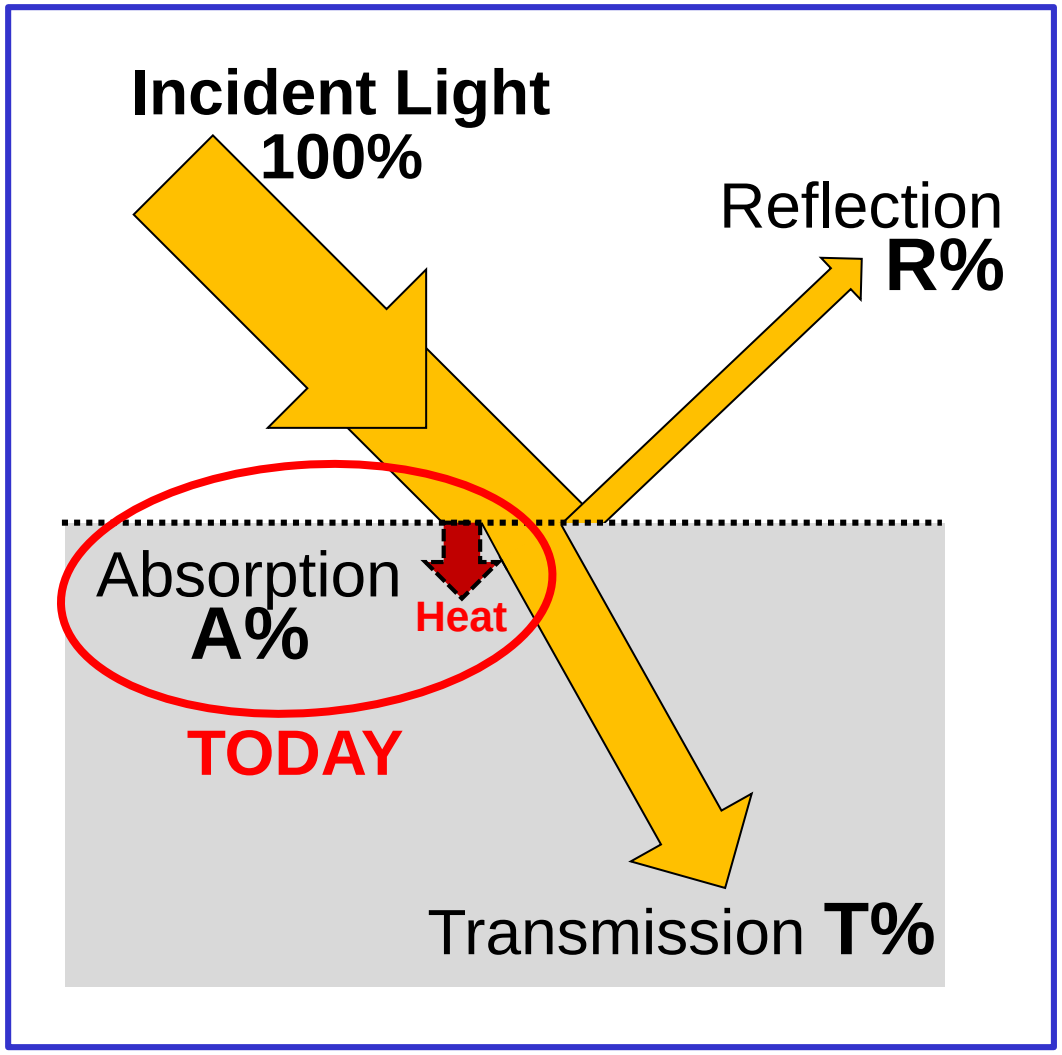


2. Intensity:
amount of photons

3. Spectrum:
composition of light; types of photons and their relative abundance



Light Interaction with Non-Luminescent Matter

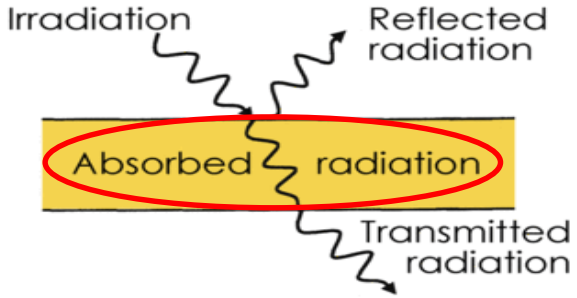


- **<u>Combination</u> of transmission, reflection, and absorption:**

T%+R%+A%=100%

Absorption

disappearance of a photon

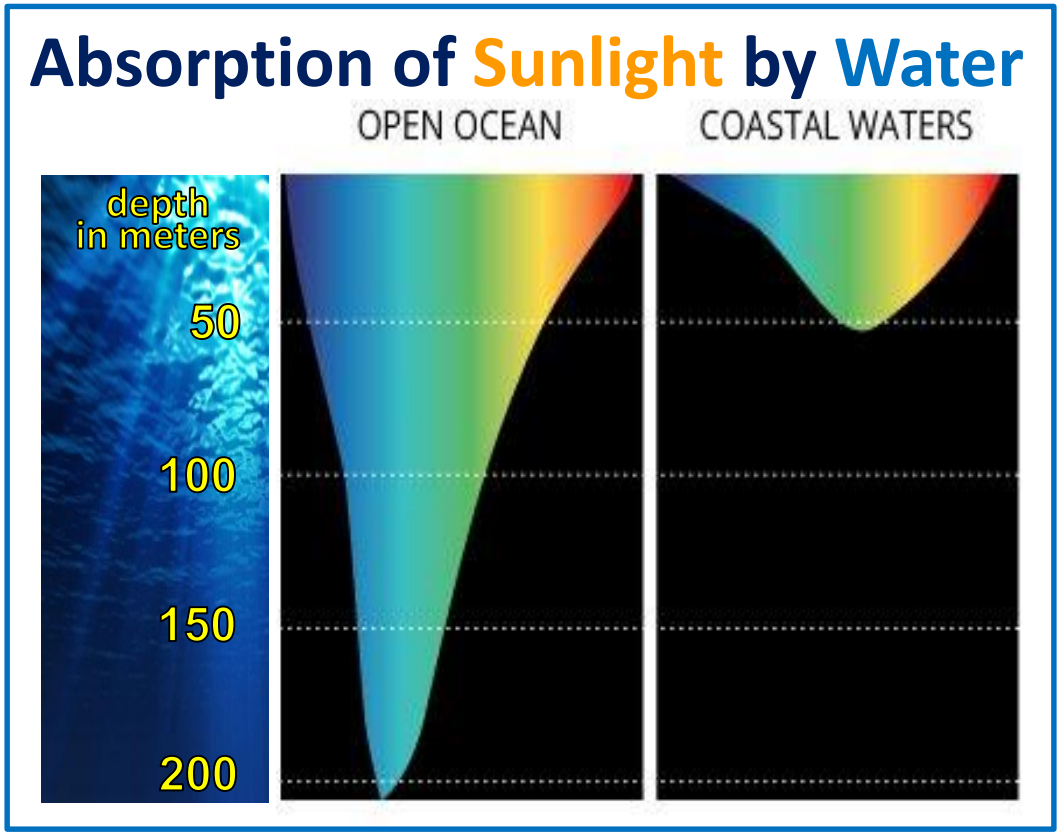


- **Absorption of electromagnetic radiation is the process in which the energy of a photon is taken up by matter, typically the electrons of an atom.**

- **Transparent and translucent objects absorb some part of the incident light.**

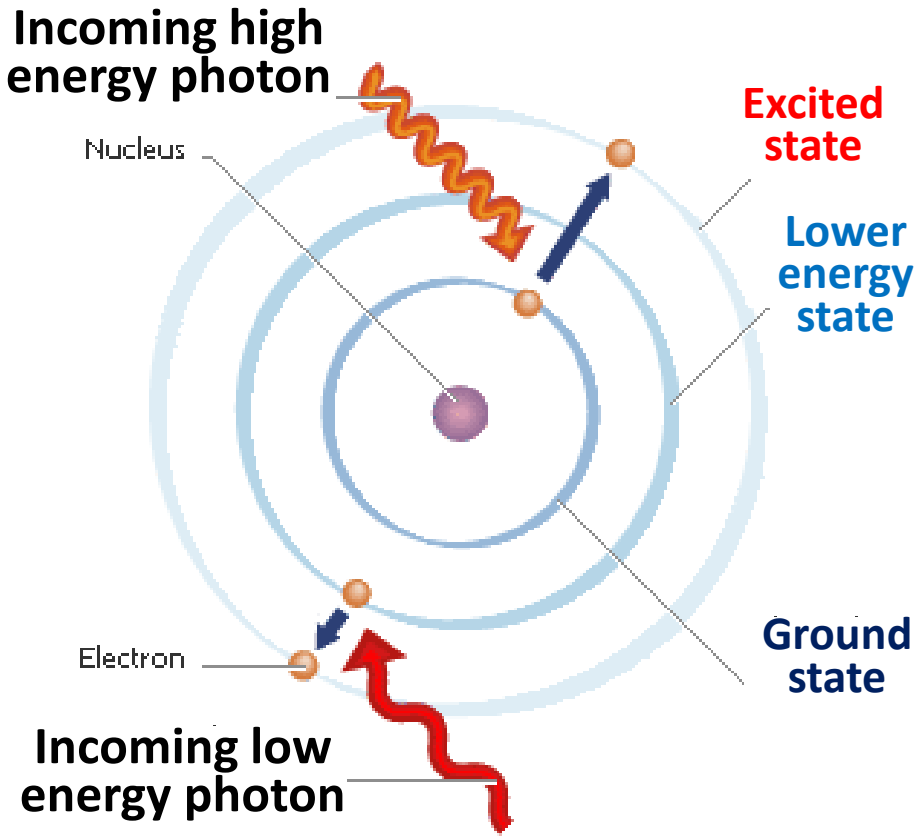
- **Dark opaque objects absorb most of the incident light.**

- **In most cases, energy of the absorbed photon is converted to *heat*.**

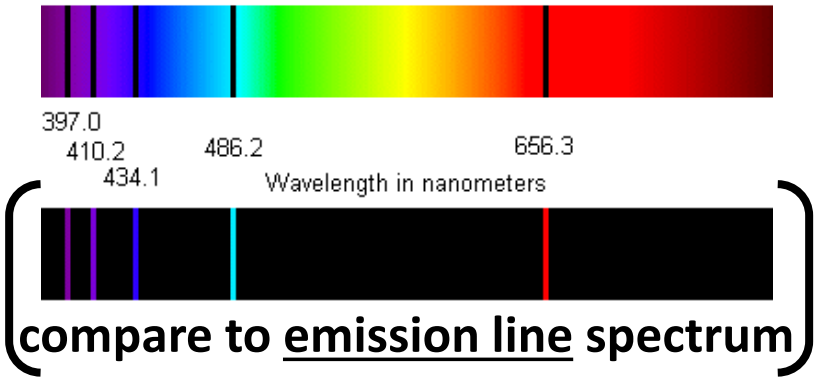


Absorption Spectrum

Absorption of light can happen when the photon energy (i.e. *frequency*) matches one of the allowed transitions between energy levels of that particular atom.



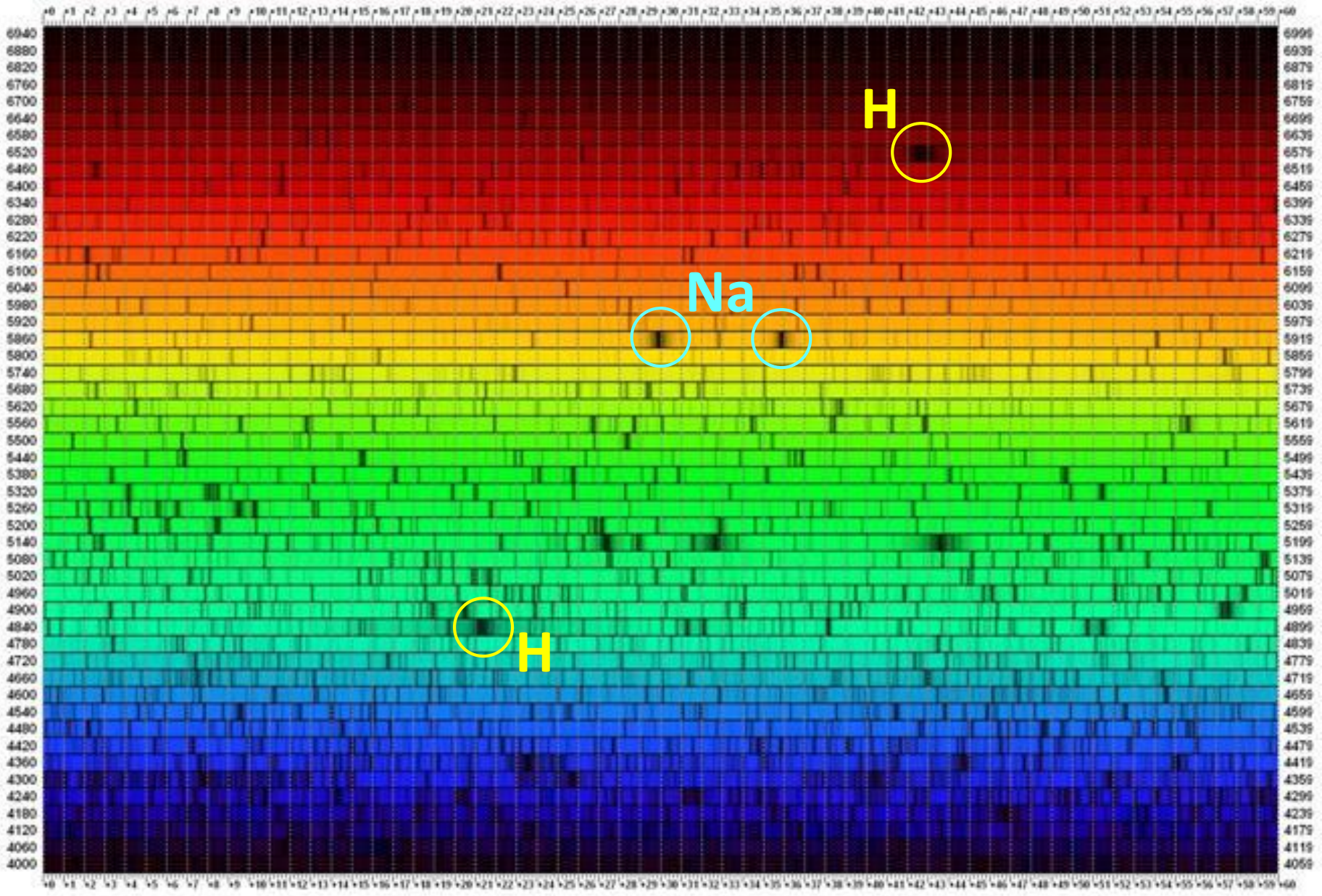
Example: Hydrogen



compare to emission line spectrum

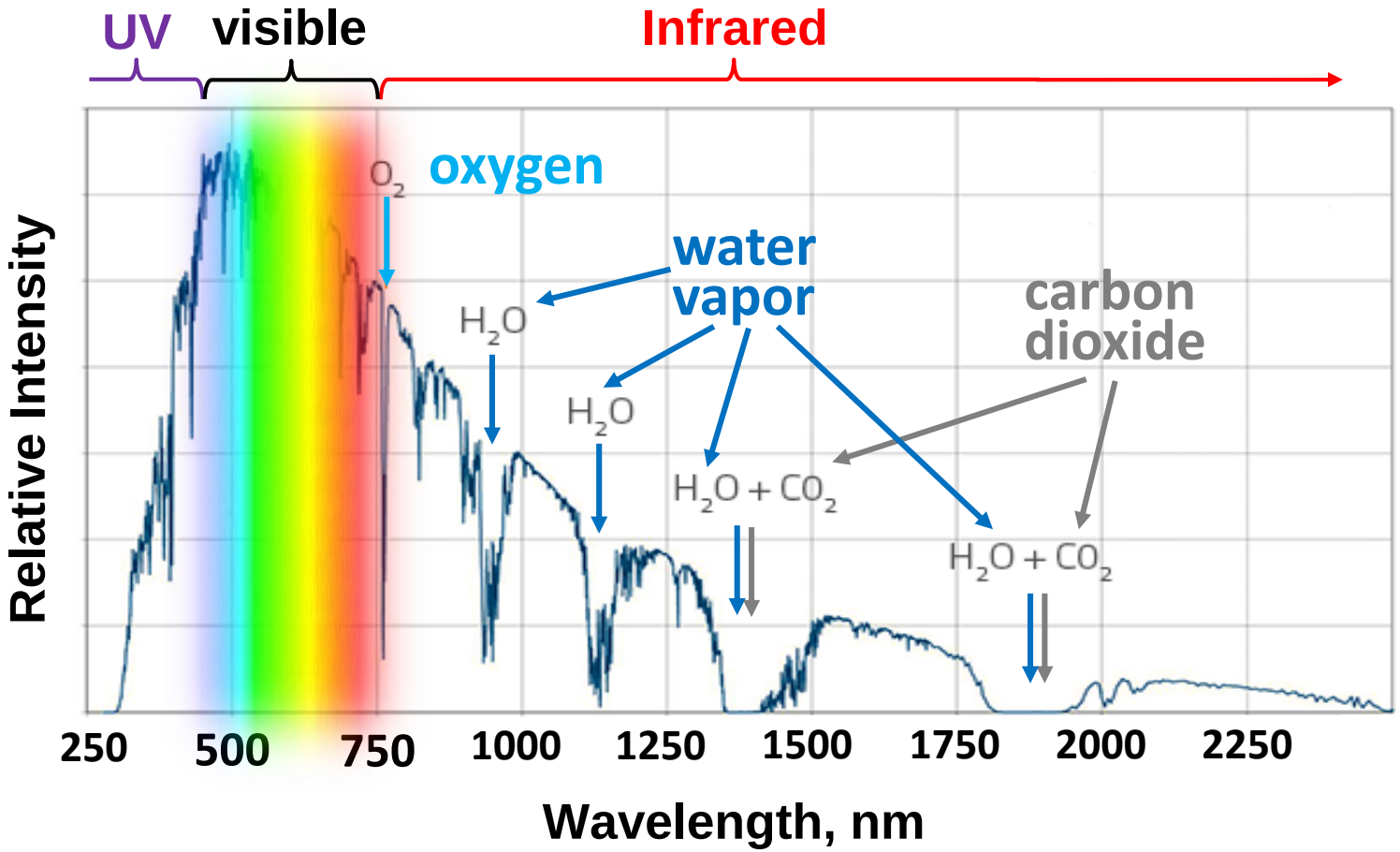
A star will create an absorption line spectrum because the continuous spectrum emitted by the dense, opaque gas that makes up most of the star passes through the cooler, transparent atmosphere of the star.

Absorption Spectrum of the Sun

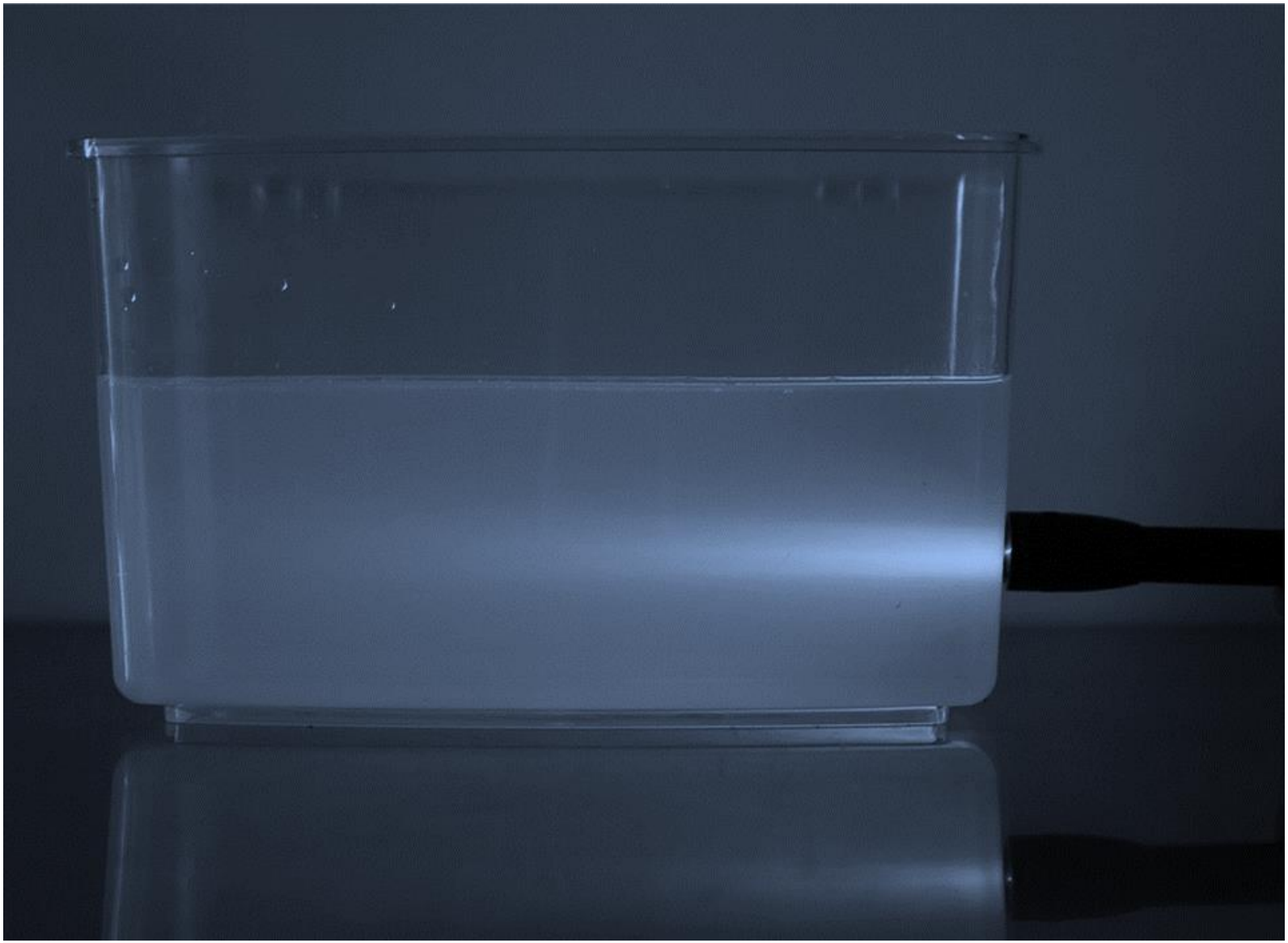


Sunlight Filtered through Atmosphere

Absorption of sunlight by various gas molecules that are present in the Earth's atmosphere is seen as absorption bands in the Sun spectrum.

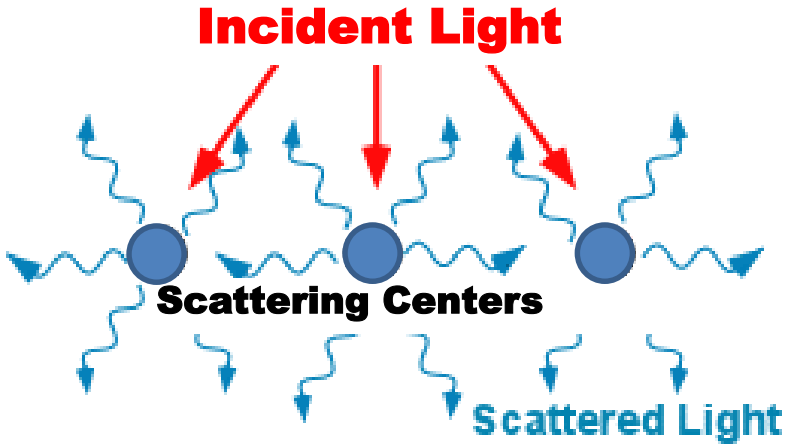


What Happens to Light in Murky Water?



Scattering

light ray moves over to the side in all directions rather than forward, backward or being absorbed



- Scattering is due to **localized non-uniformities *(scattering centers)*** in the medium through which light passes.
- The **most critical factor** is the <u>scattering centers size relative to the wavelength of the light</u> being scattered.
- Amount of the **scattered light can strongly depend on the wavelength** of light.

I See Skies of Blue…

Sunlight contains all the colors.

Atmospheric molecules scatter light (Rayleigh).

Longer path through atmosphere means more scattering.

At sunset, violet, blue and green are completely scattered away, red and orange are still there!

Violet and blue are scattered most…

…we see blue because our sensitivity to violet is very low!

…and Red Sunsets too!