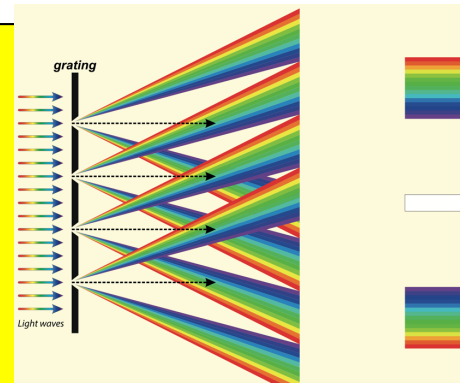
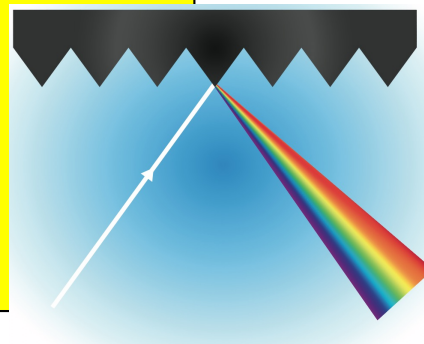
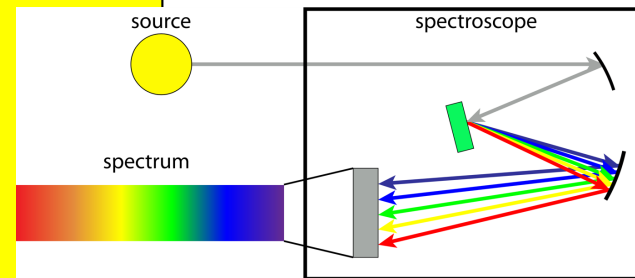
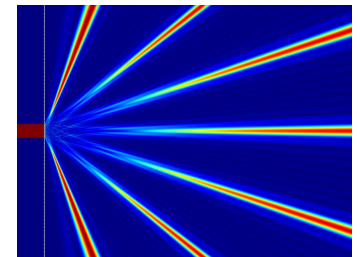


Diffraction Gratings

- Diffraction Grating vs. Double Slit
- The Grating Equation
- Types of Diffraction Grating
- DVDs and CDs
- Spectroscope and Spectral Analysis



$$\sin \theta_m = \frac{m\lambda}{d}$$



Preview File

Please enjoy this preview of your Student Version of the presentation. Please note within this sample file:

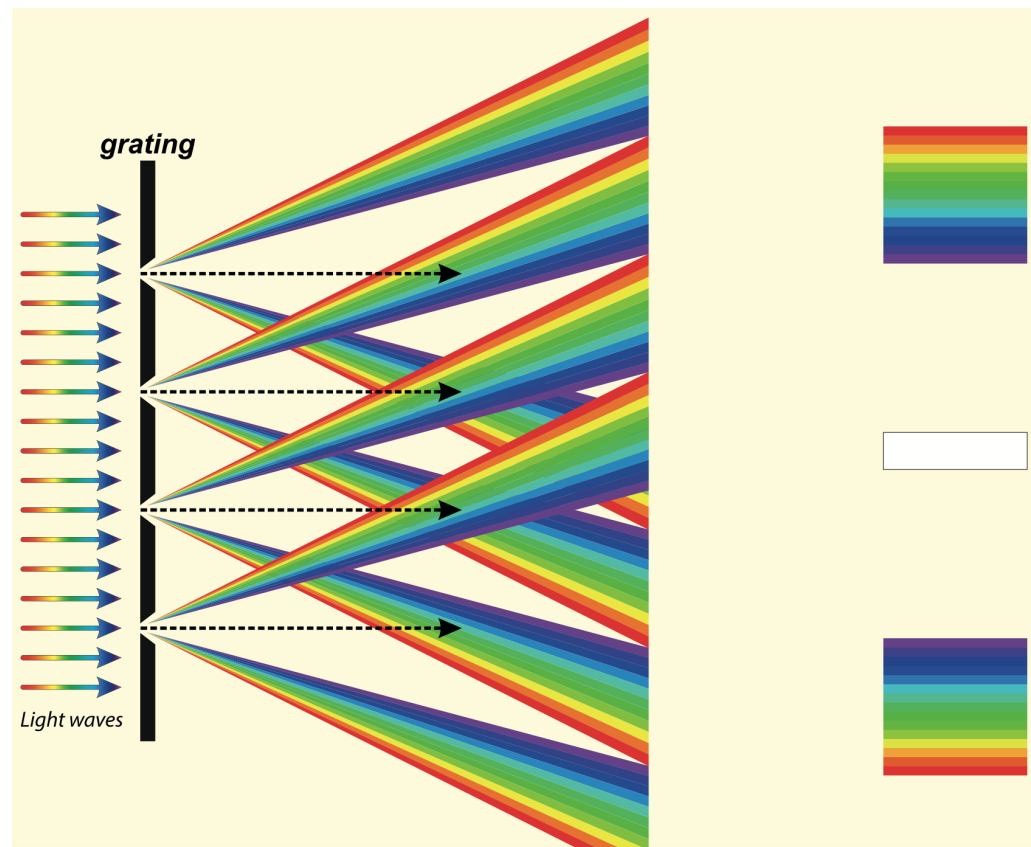
- Some slides appear blank because they have been removed
- Student versions have portions of the text removed which is given in the teacher version and appear as _____ which the students are to fill in
- Other slides may have on them, this represents writing that has been removed on this sample

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Google Classroom Ready**



Diffraction Grating

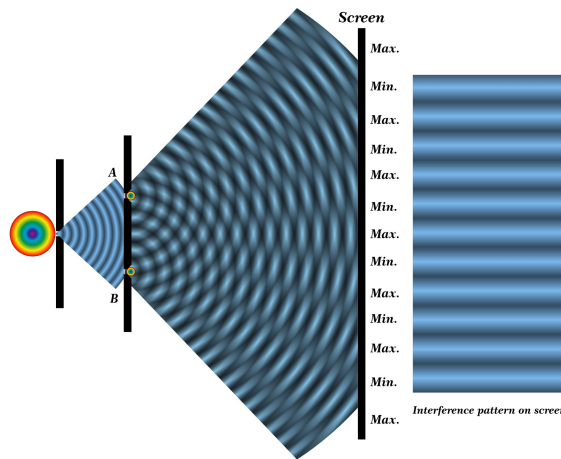
A diffraction grating is a device used for wave analysis, _____



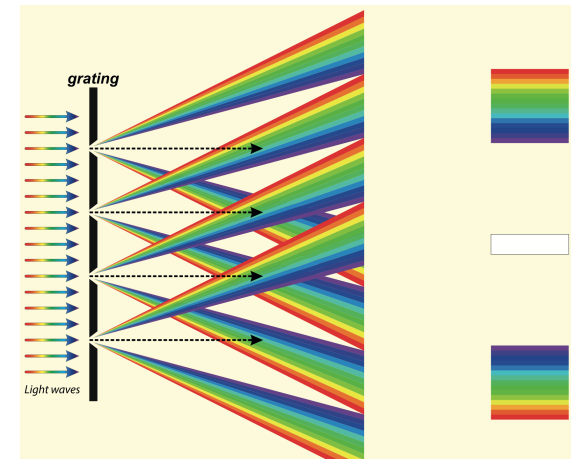
Diffraction Grating vs. Double Slit

Similar to the double slit except:

- 1) Grating has more slits → increased light passing through → brighter interference pattern
- 2) The maximas are sharper and narrower in grating
- 3) _____



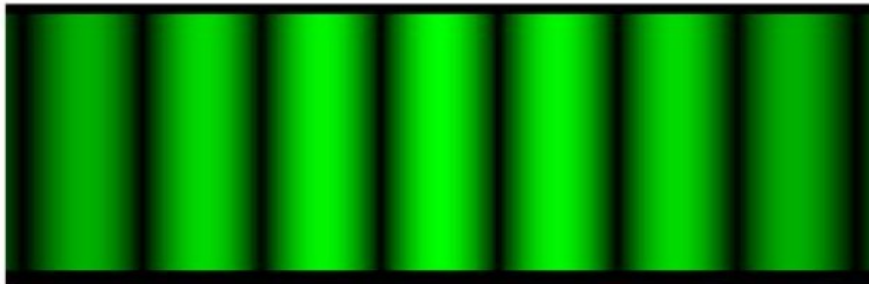
Two Openings



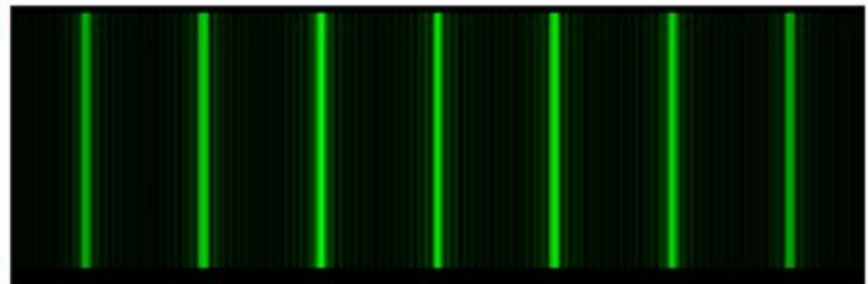
Many Openings

Double Slit vs. Multi Slit

- Interference pattern becomes brighter and sharper
- Maxima become narrower and more spread out



Double Slit



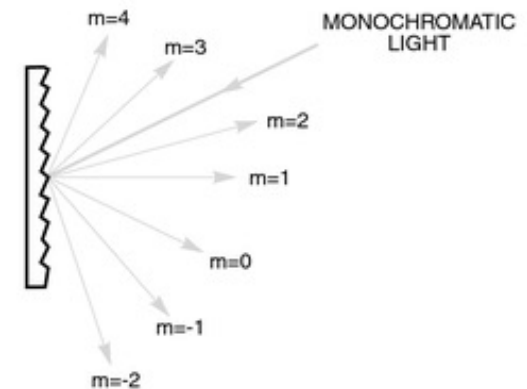
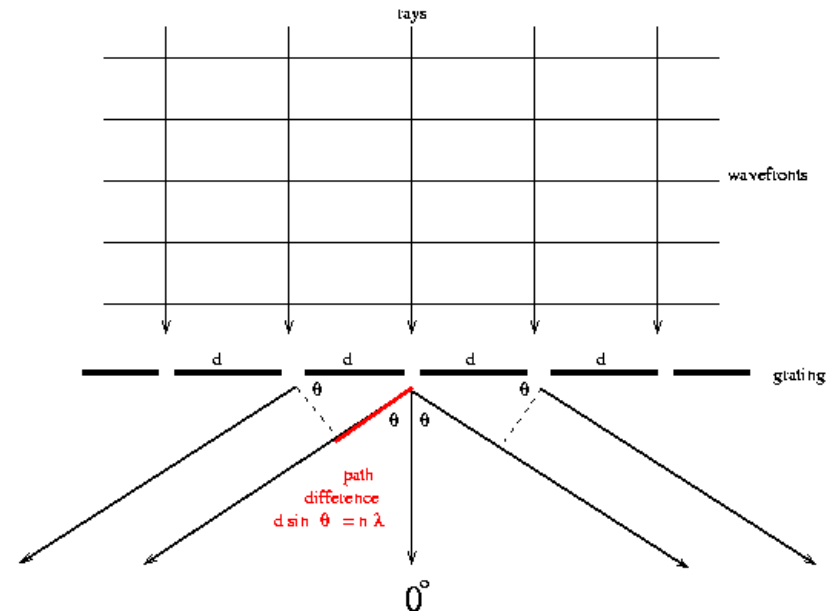
Multiple Slit / Grating

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The Grating Equation

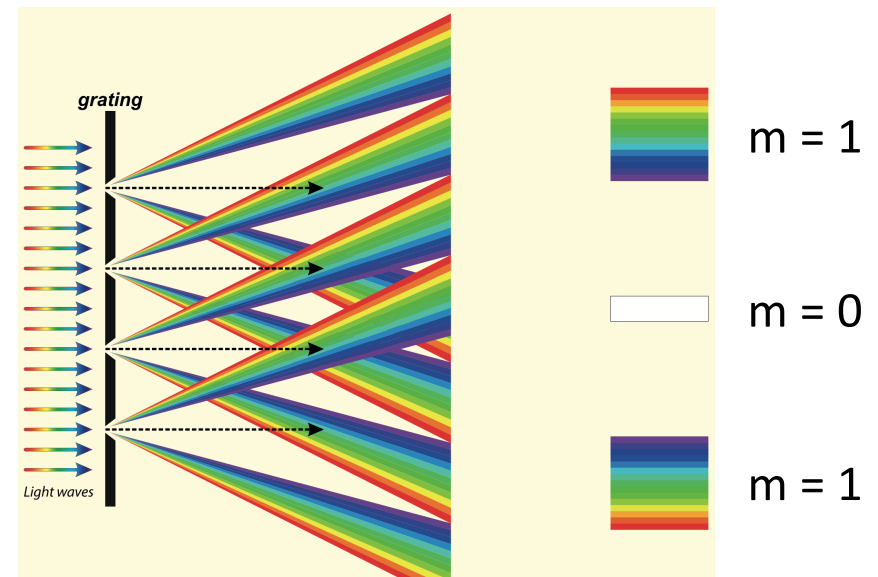
- d = distance between slits
- λ = wavelength
- Θ = emergent angle.
Different wavelengths will have different Θ due to refraction
- m = the order of the diffraction (i.e. 1st order)

$$\sin \theta_m = \frac{m\lambda}{d}$$



The Grating Equation

- Constructive interference (solid bands) occurs when $m = \text{an integer (positive or negative whole number, no fractions)}$. When fractions occur, you get destructive interference and therefore, no bright spot $\rightarrow$ _____
- Different wavelengths will diffract at different θ producing a nice spectrum



Check Your Understanding

At what angle will 638 nm light produce a second-order maximum when passing through a grating of 900. lines/cm?

$$\sin \theta_m = \frac{m\lambda}{d}$$

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Check Your Understanding

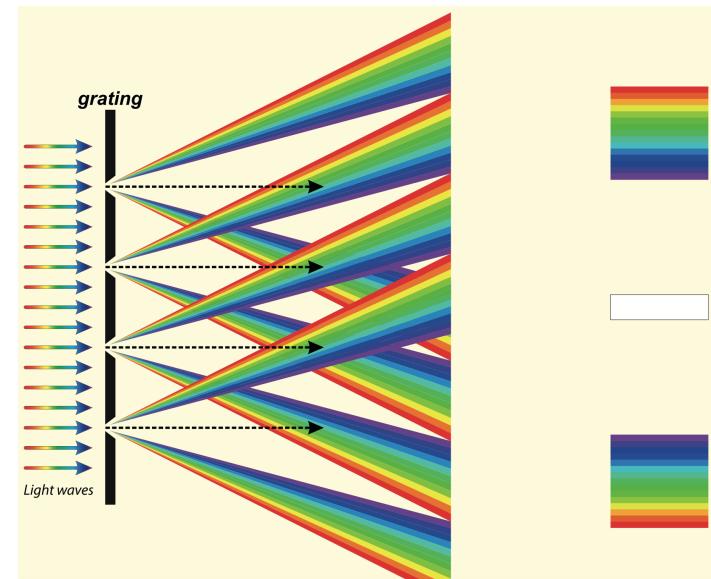
A diffraction grating with slits 1.00×10^{-5} m apart is illuminated by monochromatic light with a wavelength of 6.00×10^2 nm. Calculate the angle of the third-order maximum.

$$\sin \theta_m = \frac{m\lambda}{d}$$

Types of Diffraction Grating

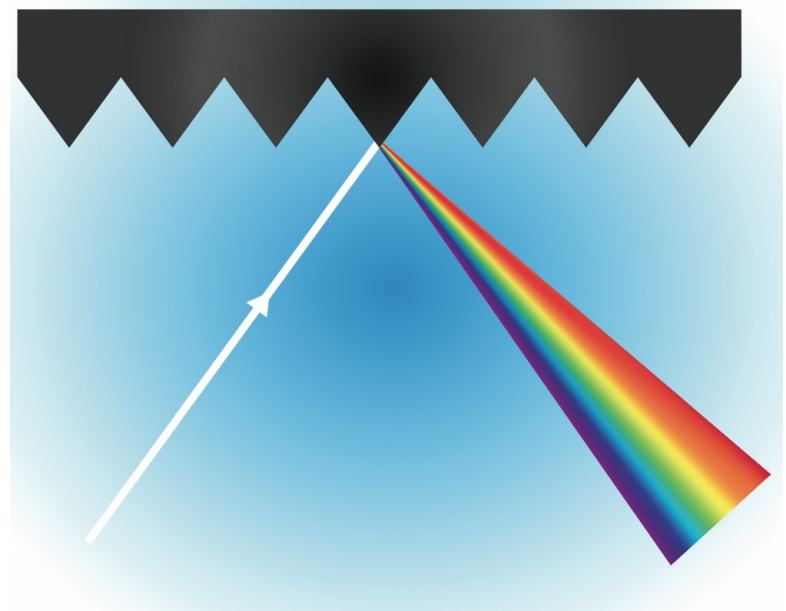
1) Transmission Grating

- The light passes through the slits



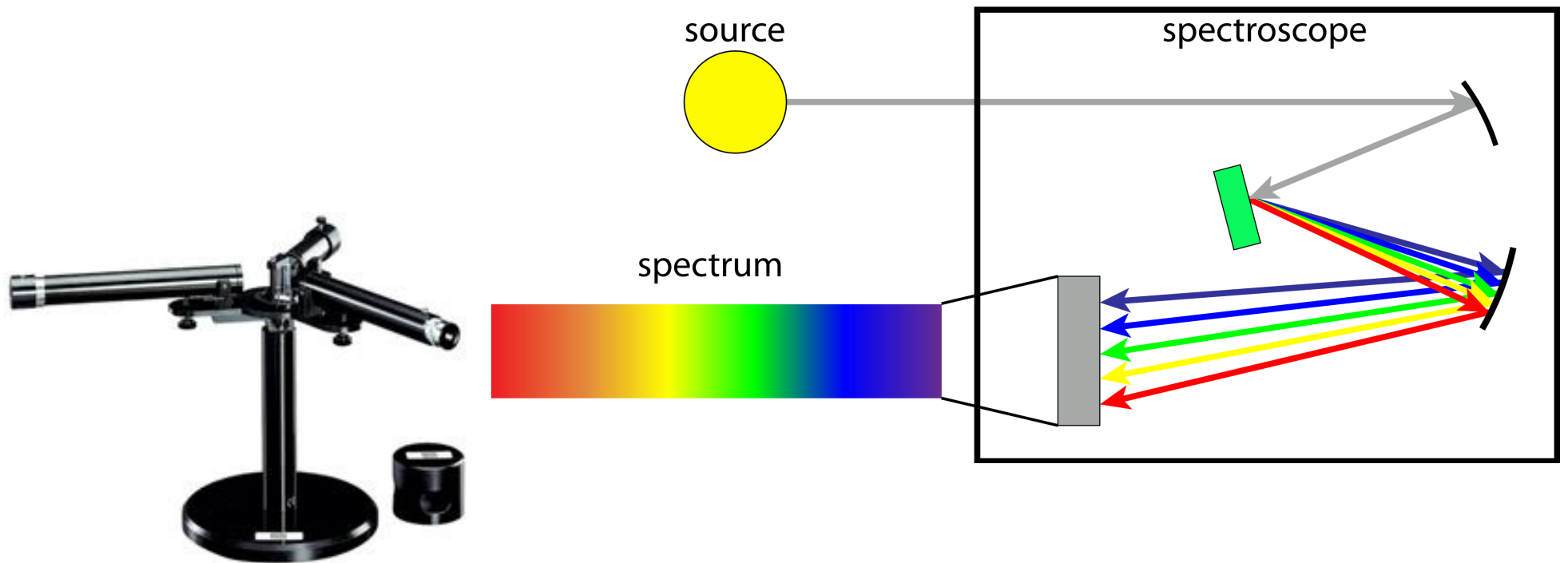
2) Reflection

- _____



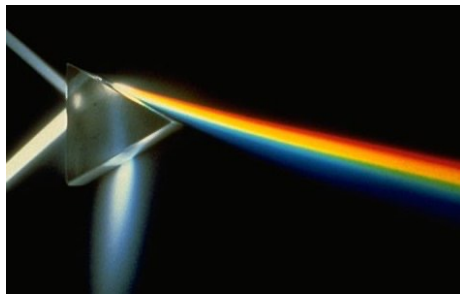
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Spectroscope

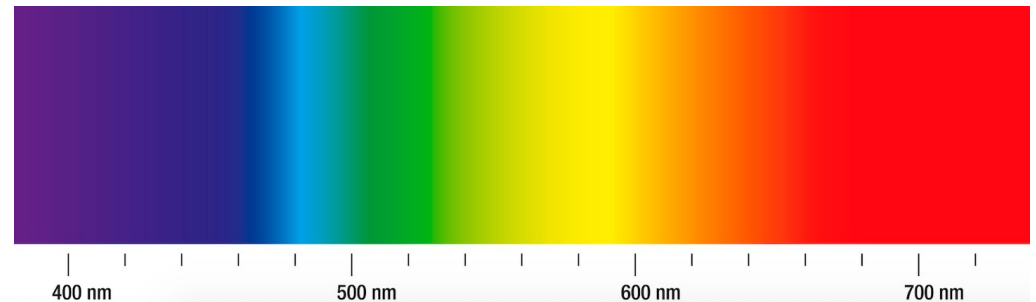


Application: Spectral Analysis

- After light is emitted (or passed through) a substance, it is then passed through a prism to allow it to spread out

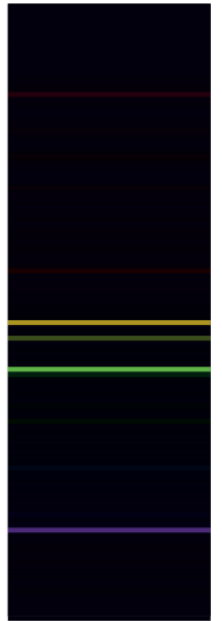


- Normal white light would have a spectrum that looks like this:

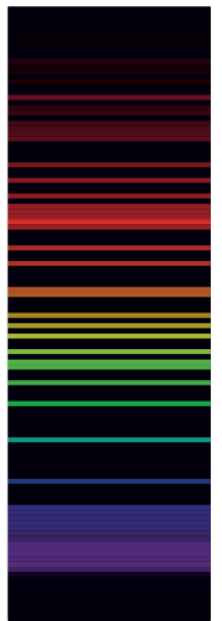


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- Every element has a unique spectrum
- Different elements will absorb different and specific wavelengths
- It's like a fingerprint for the element
- _____

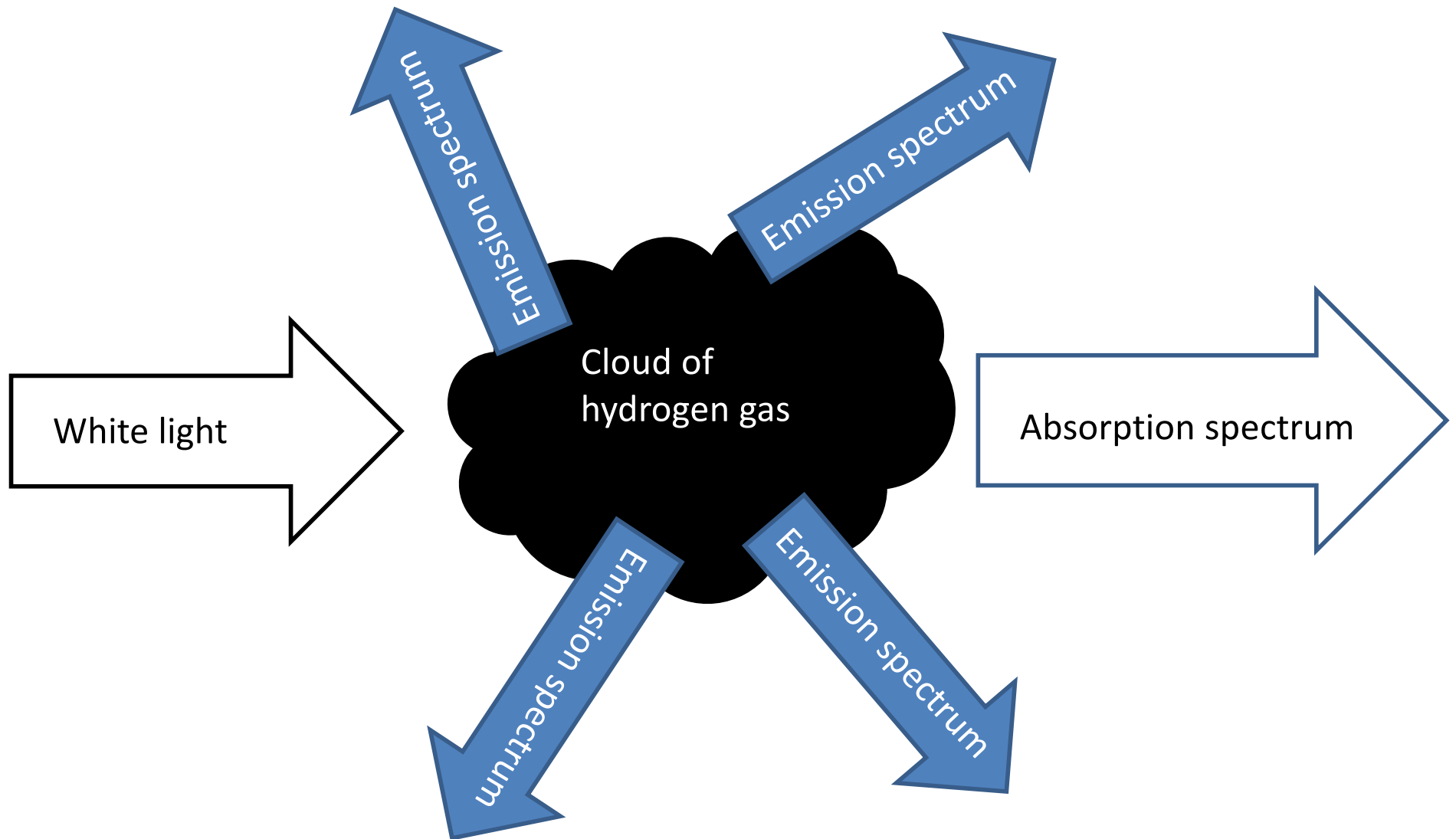


Mercury



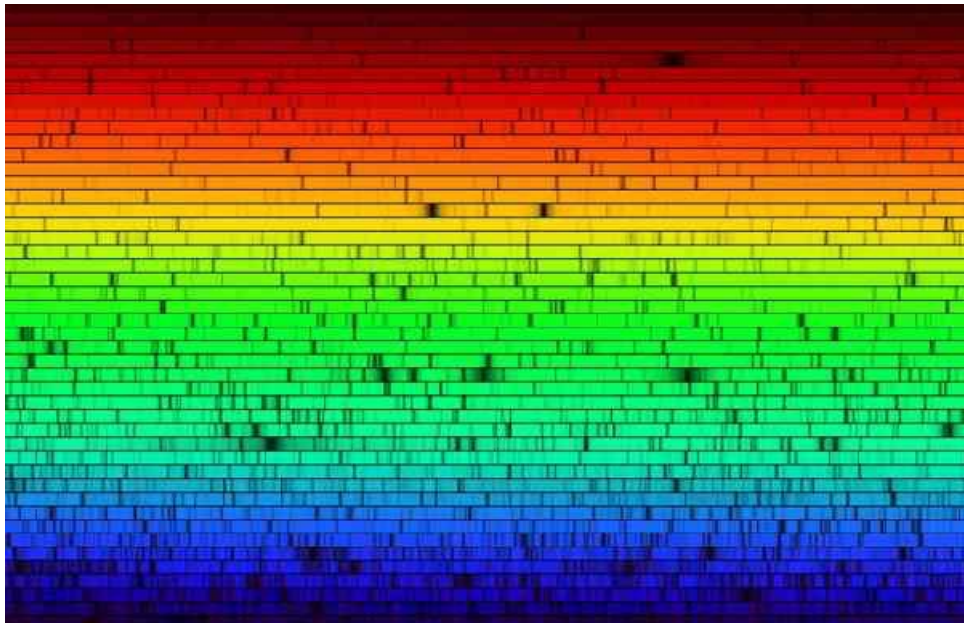
Plutonium

Absorption and Emission

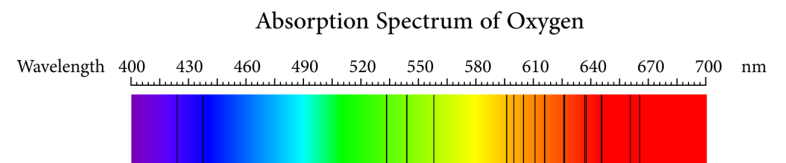
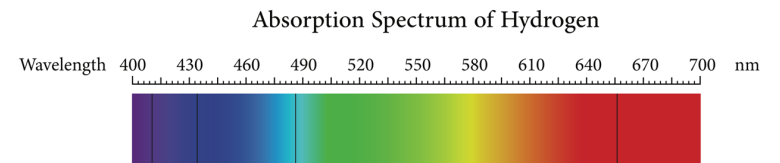


The Sun's Actual Spectrum

- _____
- If portions of the spectrum contain hydrogen absorption lines, the Sun's atmosphere contains hydrogen

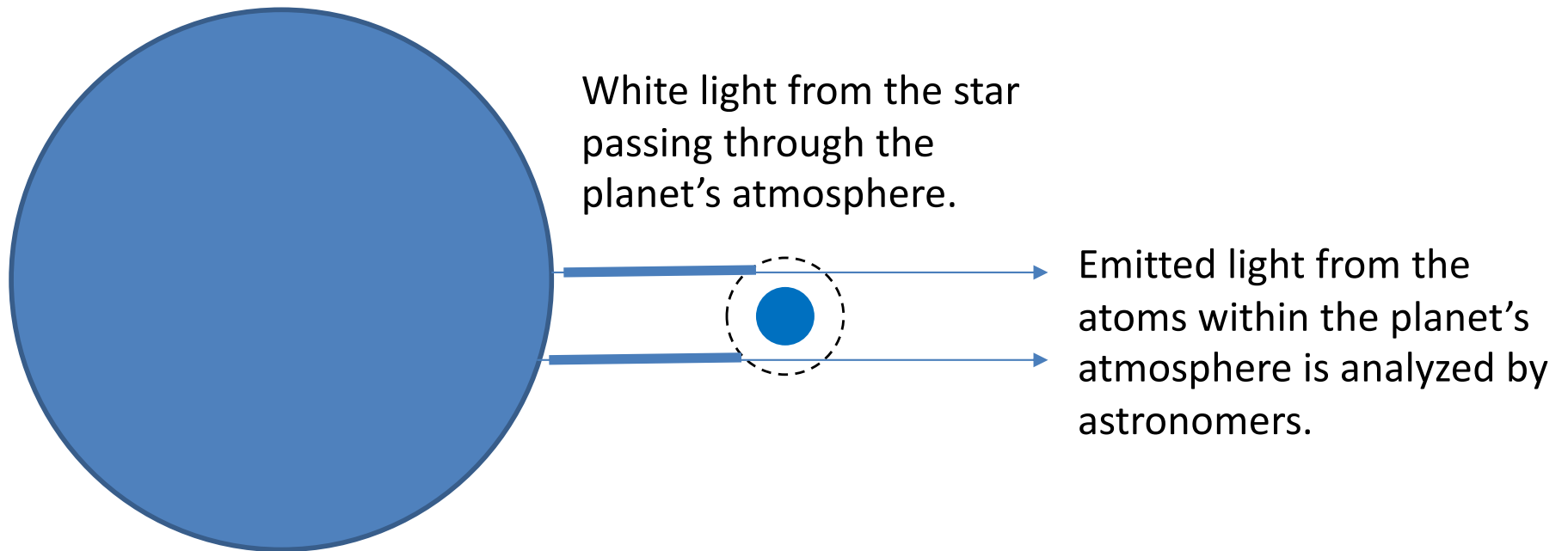


The full spectrum of the Sun



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Atmospheric Composition



- The emitted light can be analyzed by astronomers
- This allows us to determine the composition of the planet's atmosphere without traveling to it

Spectral Analysis

- _____
- As we begin to explore space, this will play a critical role in determining where we go

