LIGHT AND ATOMIC STRUCTURE

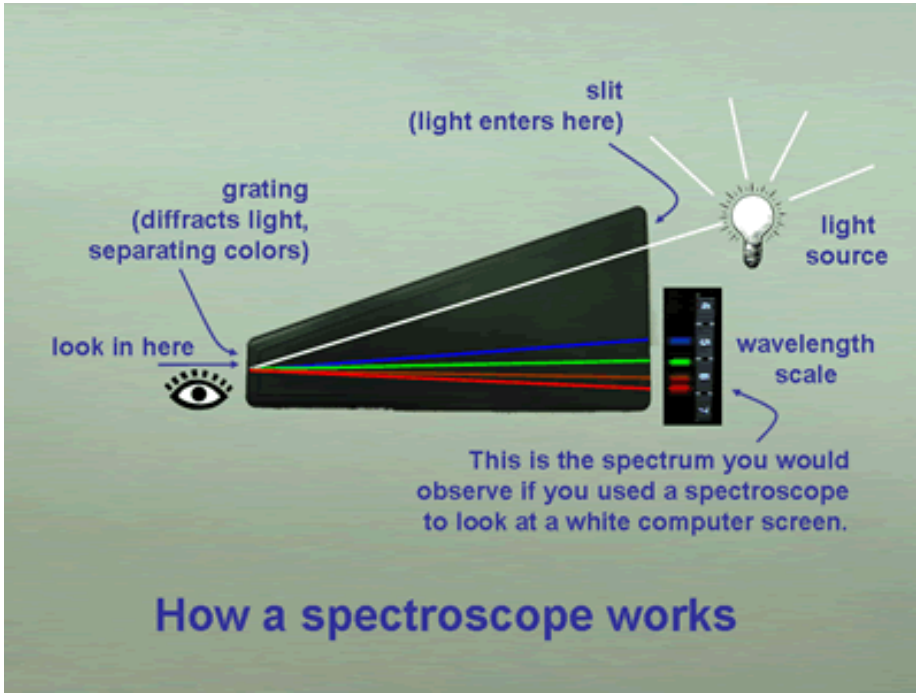
LIGHT AND ATOMIC STRUCTURE

Spectroscope Activity

What do you see?

What do you think it means?

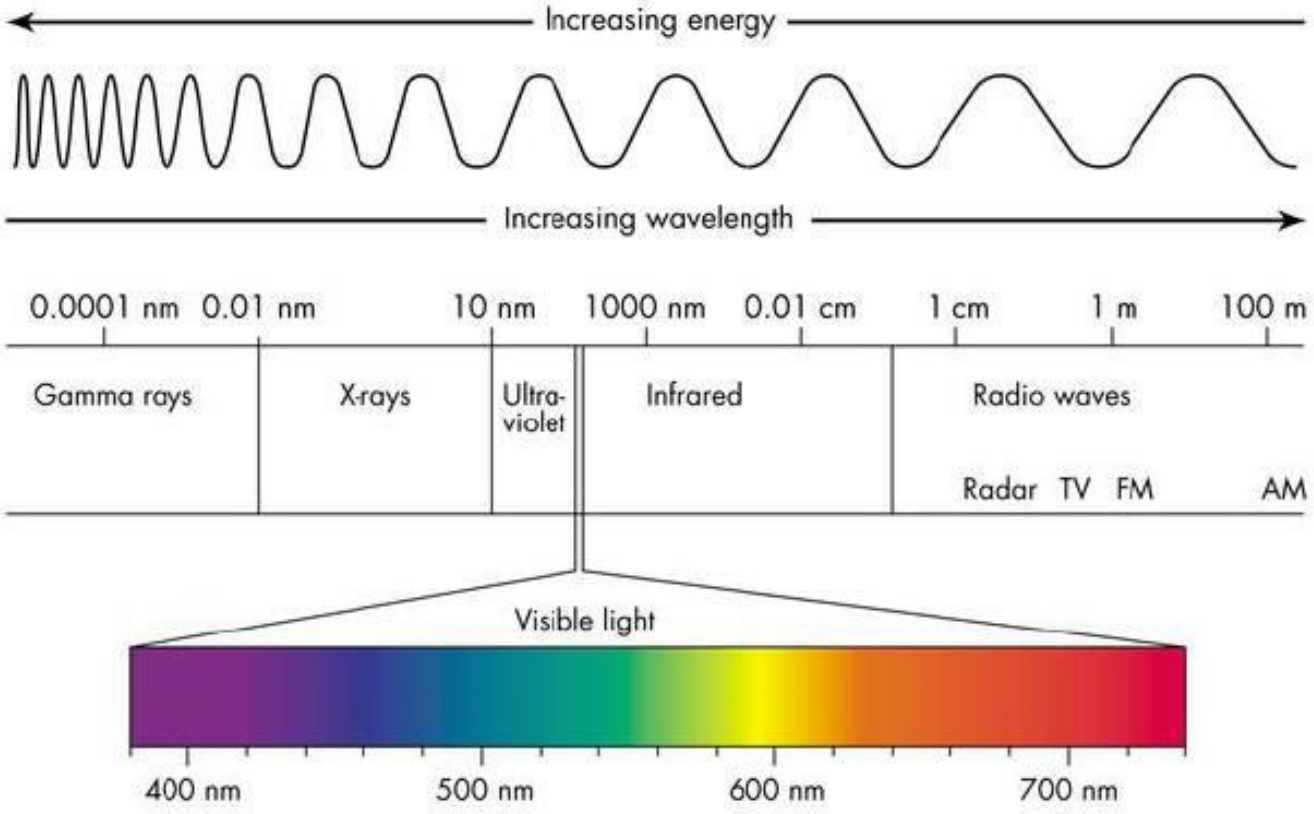
What is the source of what you observe?



LIGHT AND ATOMIC STRUCTURE

Light & Atomic Structure

Visible light consists of electromagnetic (EM) waves which our retina can detect and our brain can interpret.



Light & Atomic Structure

In a vacuum, all EM waves travel at the speed of light.

$$c = l \times f$$

c = speed of light = 3.00×10^8 m/s

l = wavelength in meters

f = frequency in Hertz (Hz = s^{-1})

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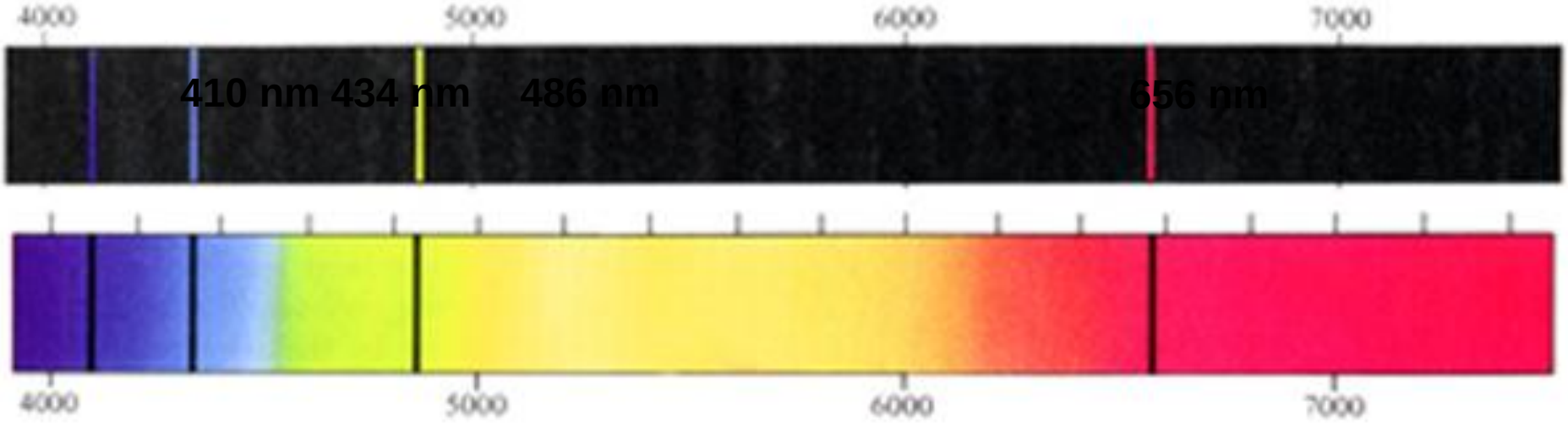
Light & Atomic Structure

Each shade of colour is a result of a very specific wavelength of light.



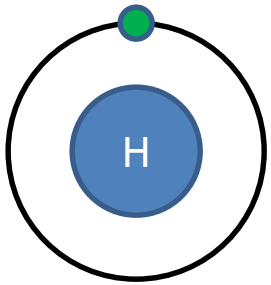
The Hydrogen Spectrum
Above: Emission
Below: Absorption

Light & Atomic Structure

Why do these lines appear?

The electrons of atoms prefer to remain at the lowest energy level.

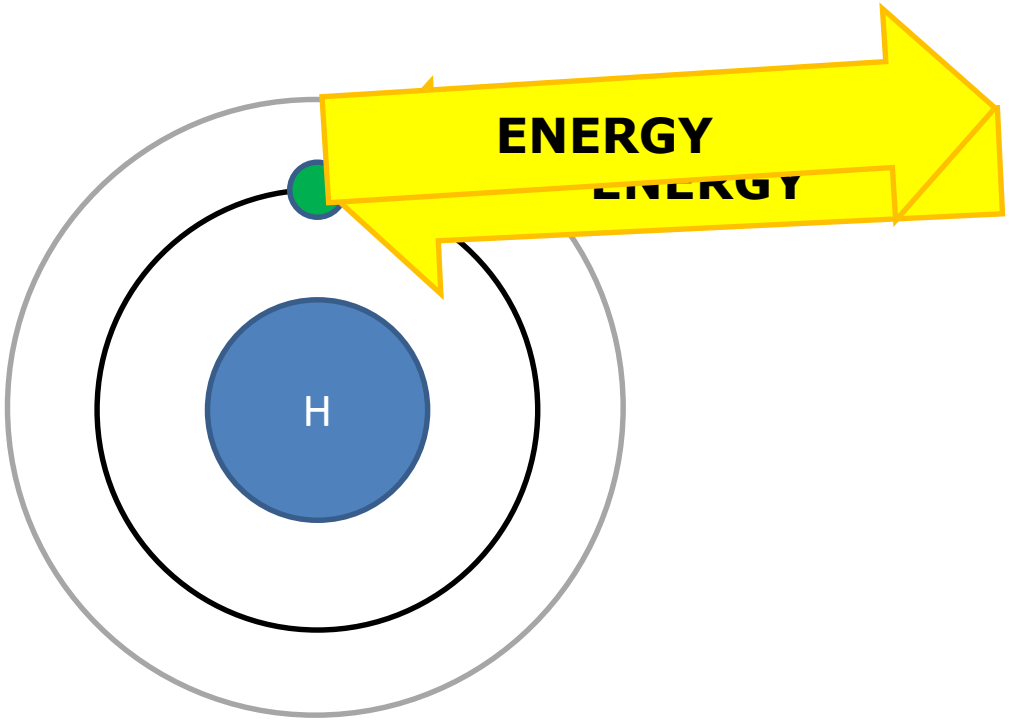
Draw the Bohr-Rutherford diagram of H.



What happens to the electron when it absorbs energy?

Light & Atomic Structure

What happens to the electron when it absorbs energy?



Electrons move to higher energy levels when excited.

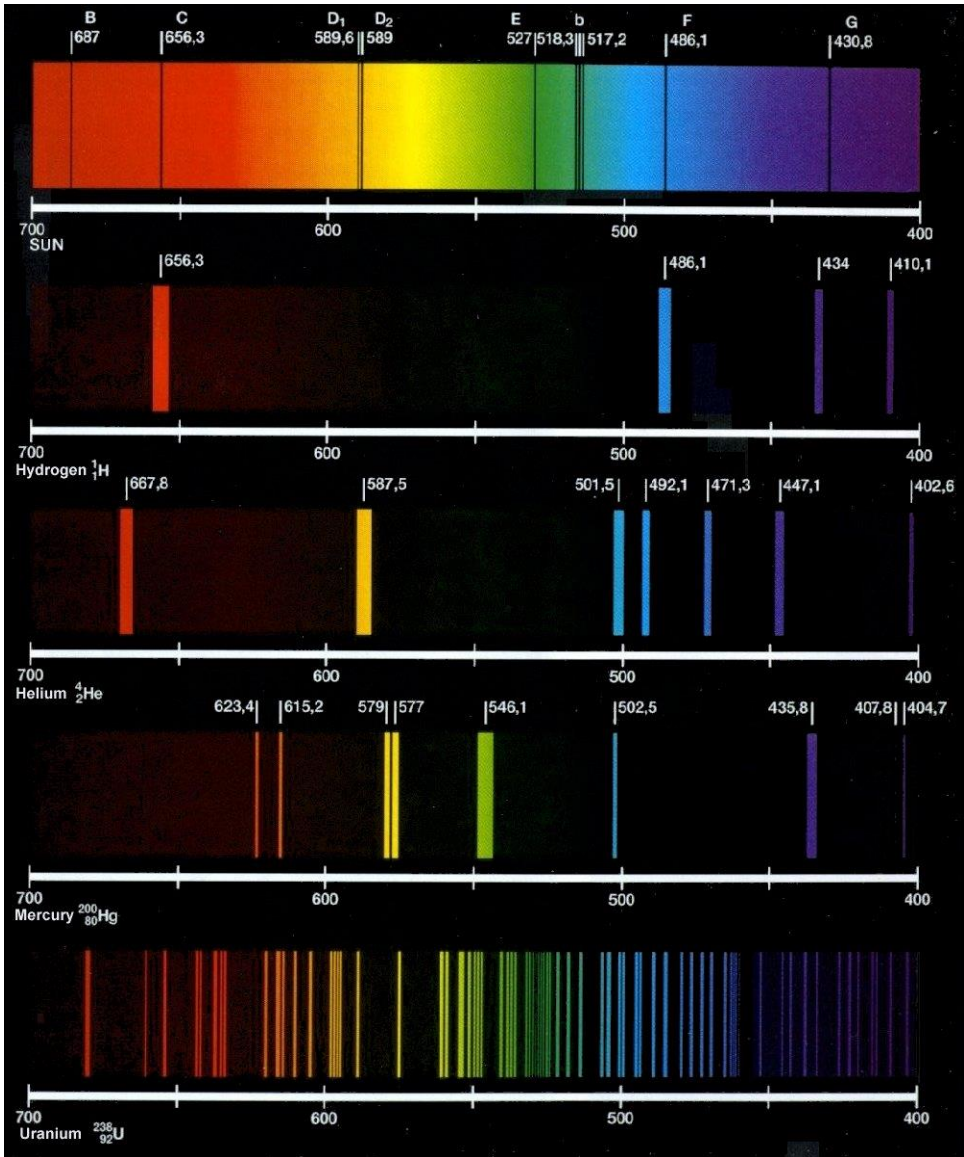
Electrons drop to a lower energy level and release energy.

LIGHT AND ATOMIC STRUCTURE

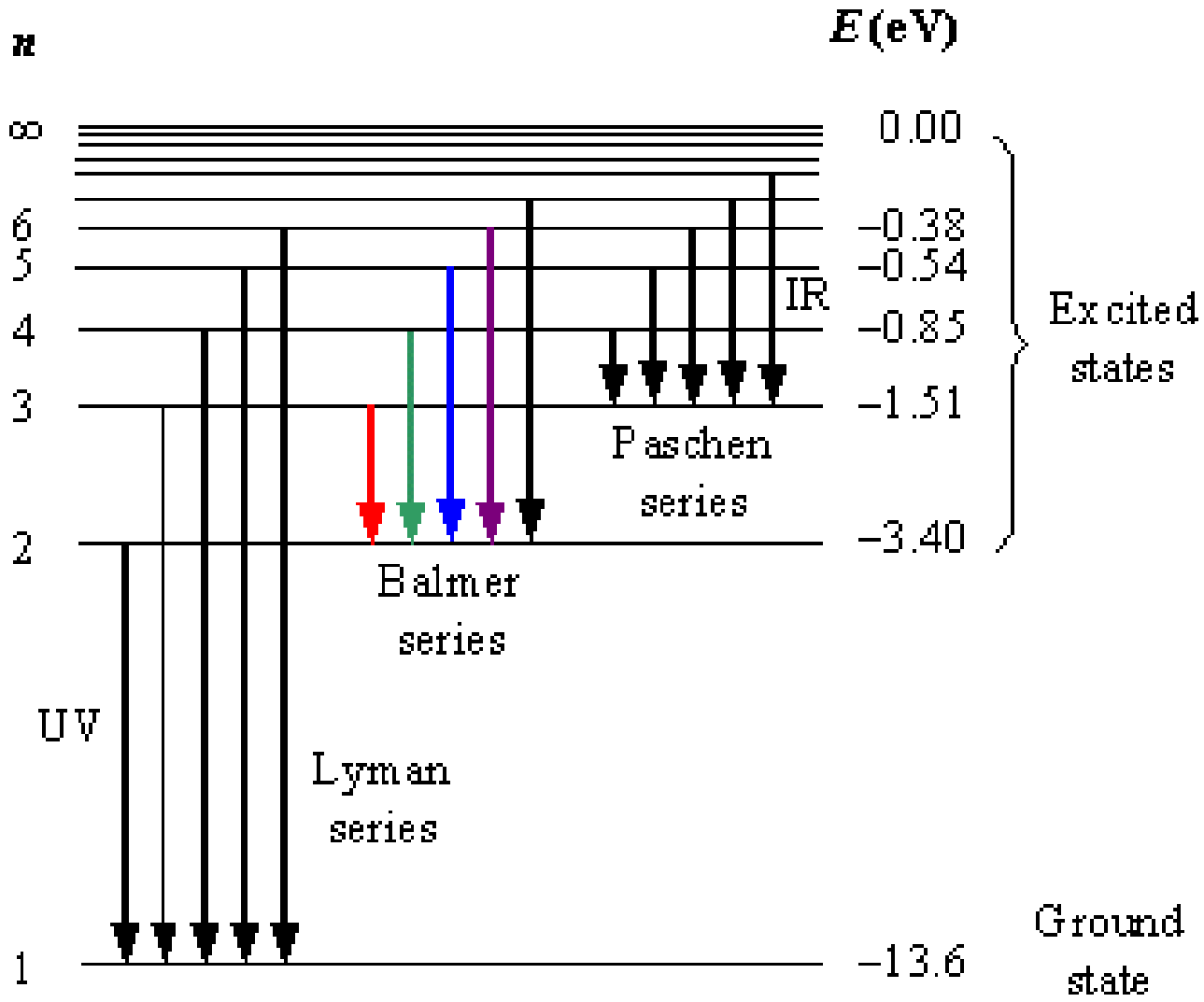
Light & Atomic Structure

Light in the visible spectrum is only observed when electrons **drop from a specific high range of energy levels to a specific low range of energy levels**.

Due to different electron configurations, each element has a different emission spectrum.



Light & Atomic Structure



Light & Atomic Structure

Atoms will only absorb specific amounts of energy (photon). Electrons must always be located at a defined energy level, not in between.

$$E = h \times f \quad \text{OR} \quad E = h \times n$$

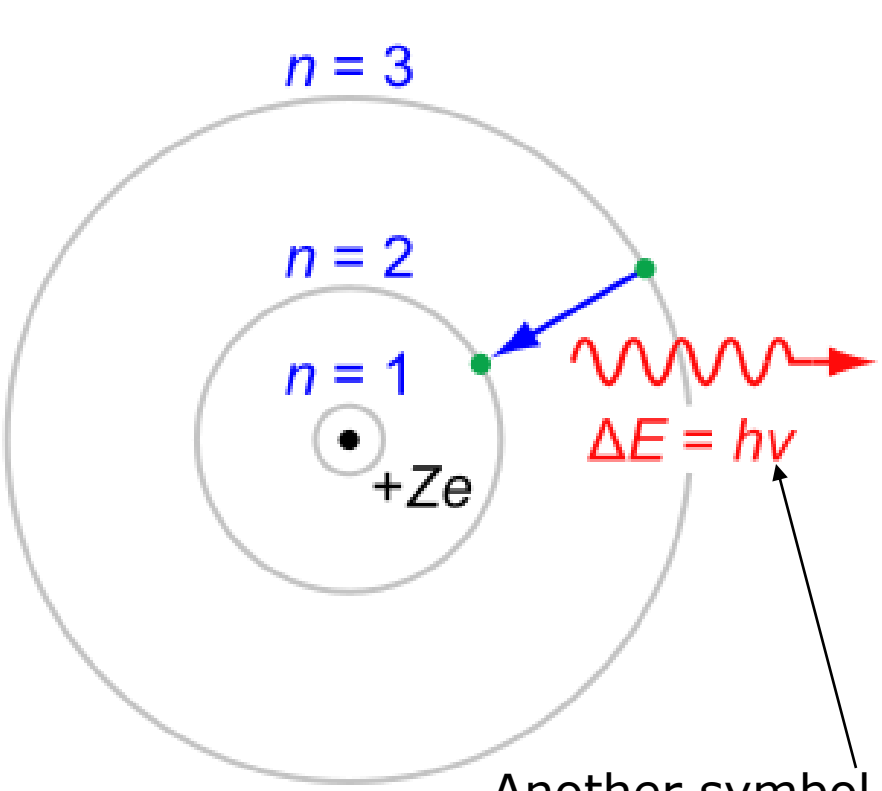
E = energy in Joules

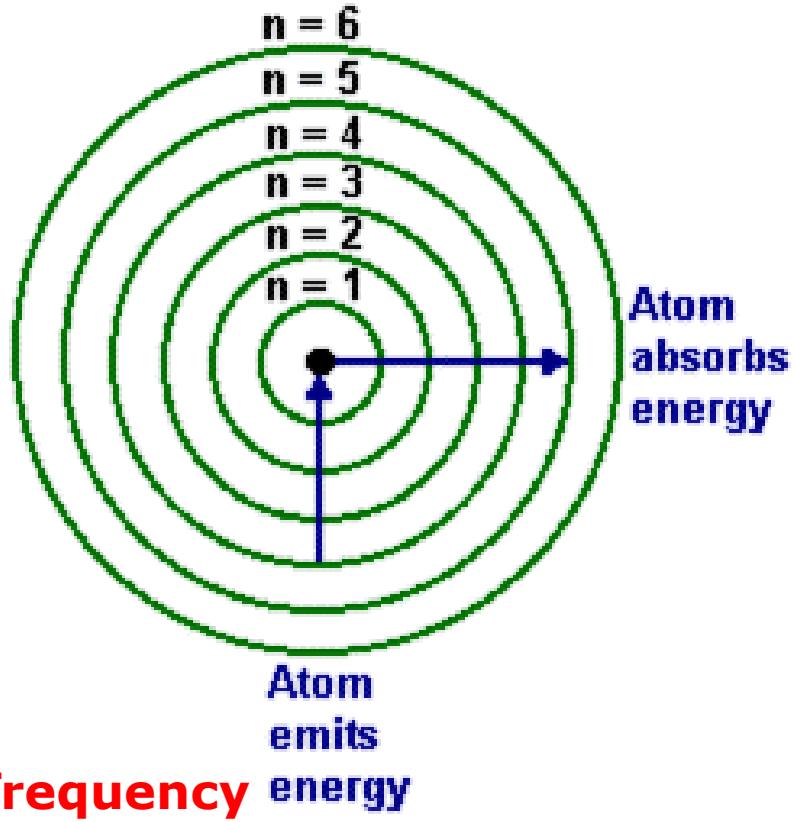
h = Planck's constant = 6.6262×10^{-34} J•s

f (n)= frequency in Hertz (Hz = s^{-1})

LIGHT AND ATOMIC STRUCTURE

Summary

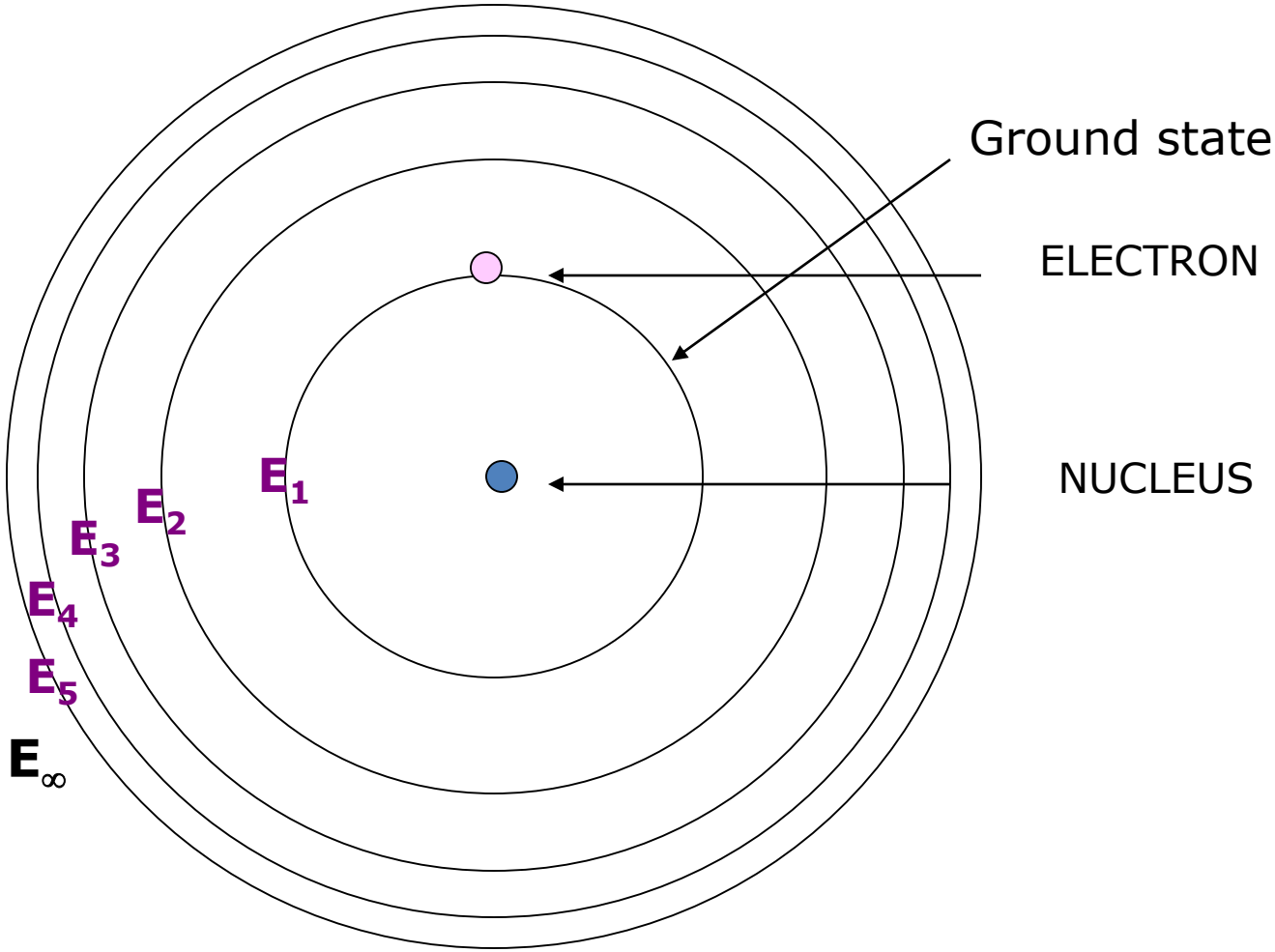




Another symbol for **frequency**

LIGHT AND ATOMIC STRUCTURE

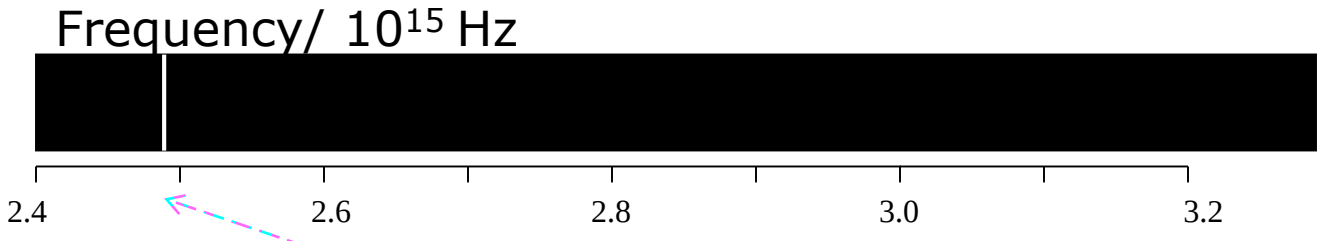
The "Ground State" is the lowest energy level available to the electron. Other energy levels may be added as follows:



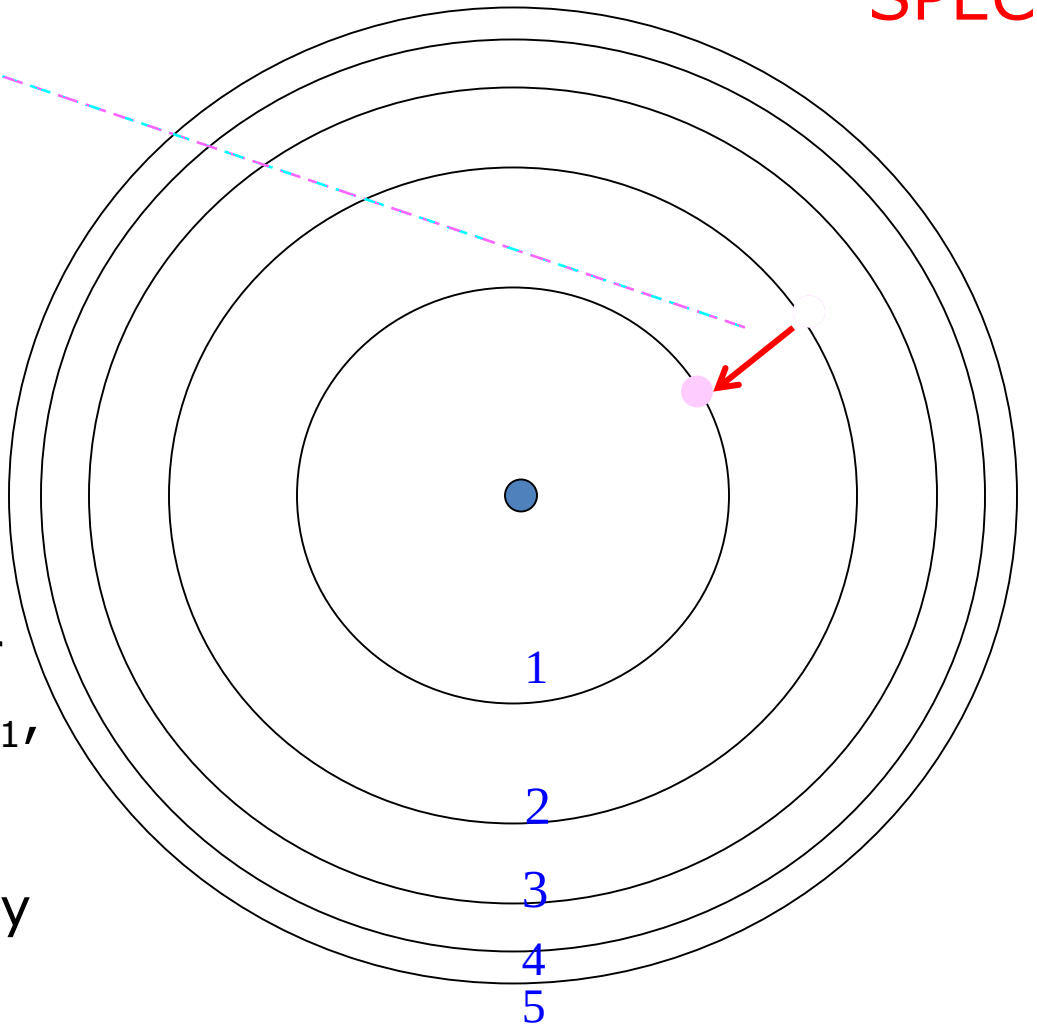
Energy levels continue to get closer until they finally converge at . . . . . E_∞

THE HYDROGEN ATOM

LIGHT AND ATOMIC STRUCTURE



EMISSION LINE SPECTRUM



As the electron falls from higher to lower energy level, E_2 to E_1, a photon of light is emitted with frequency, f, given by the equation **E = h x f**

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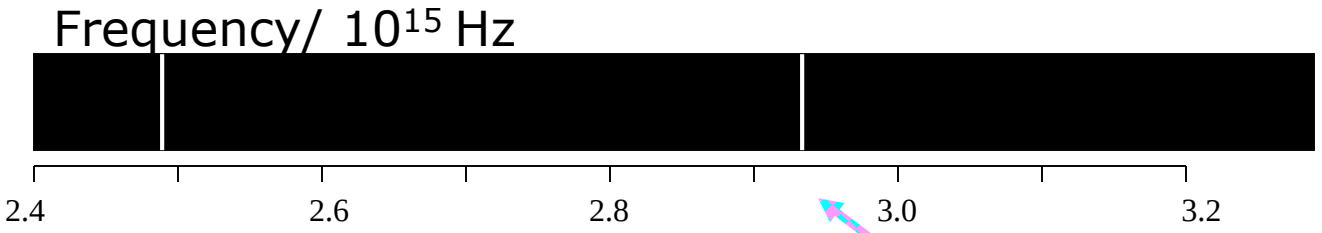

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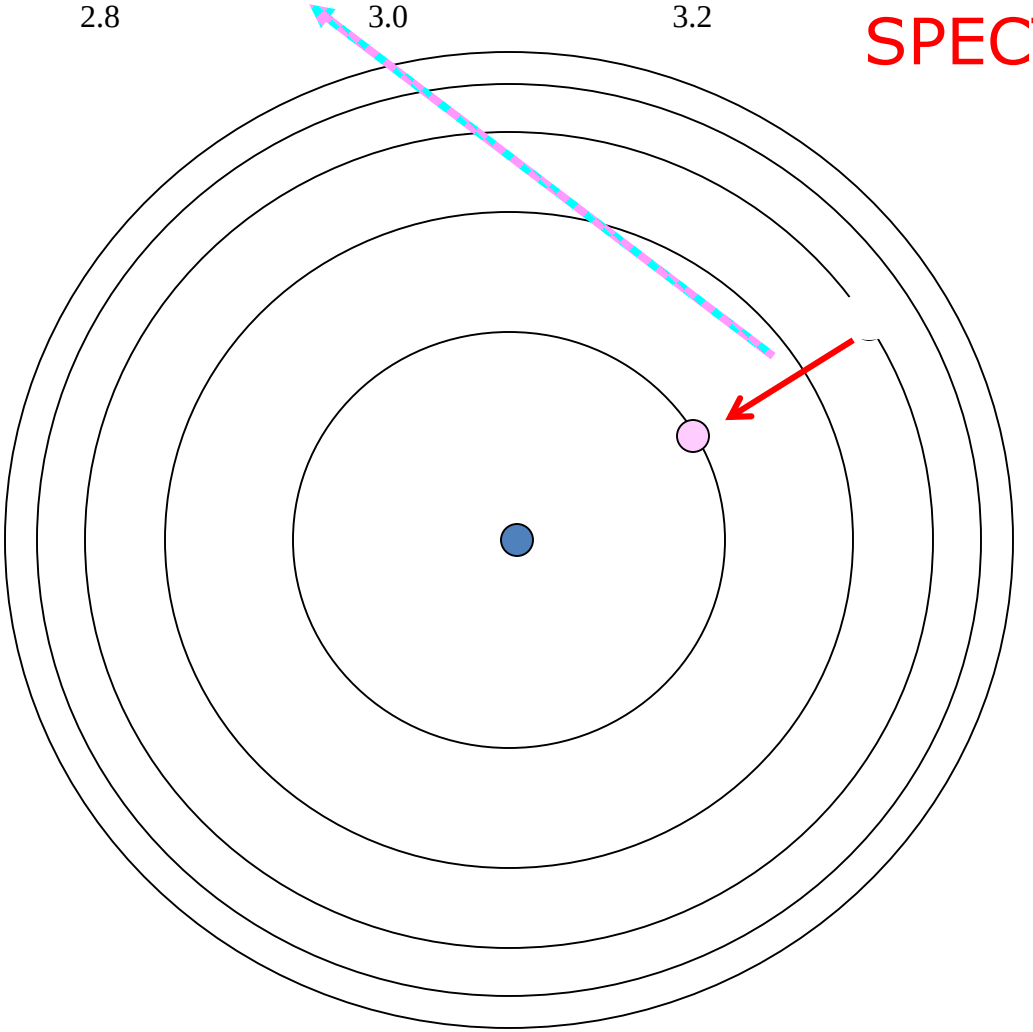

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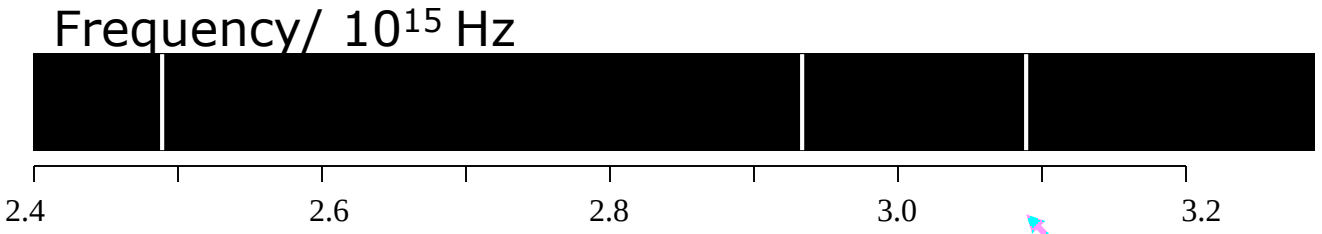

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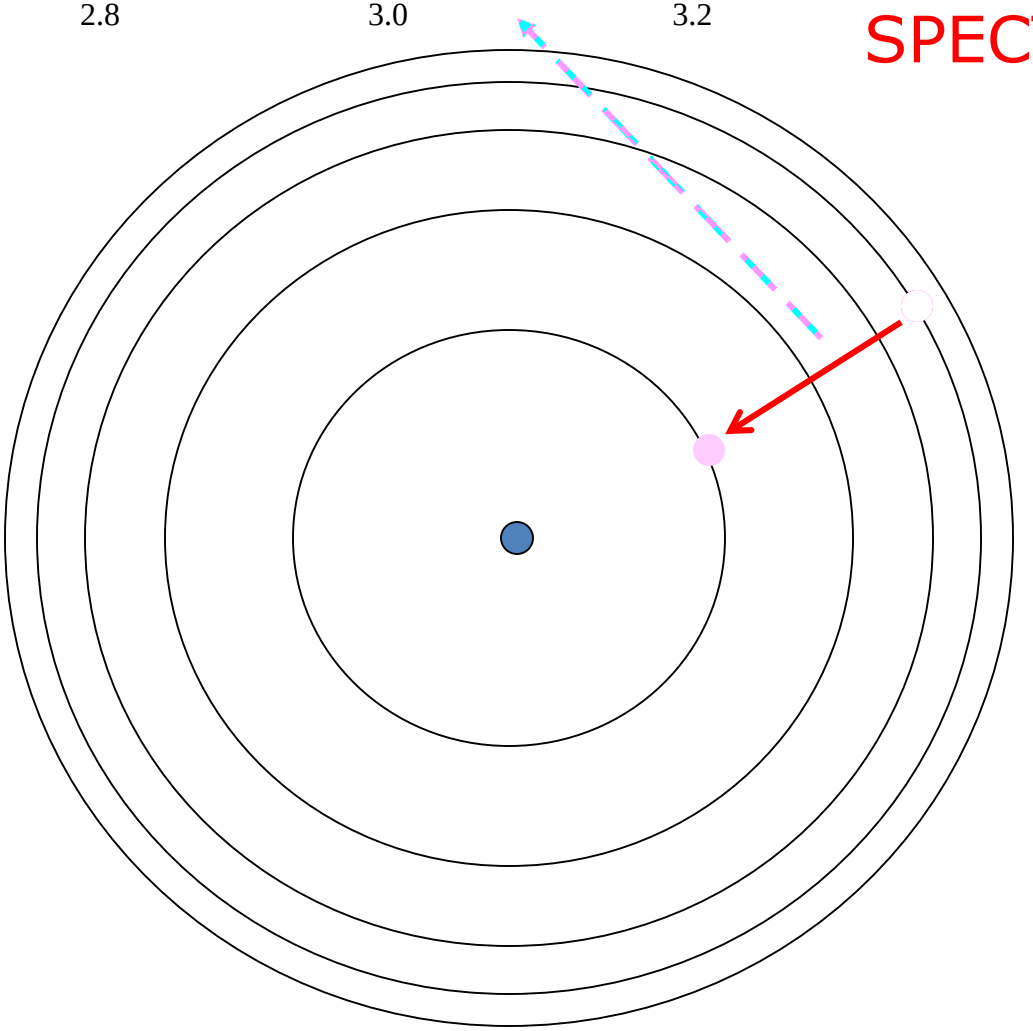

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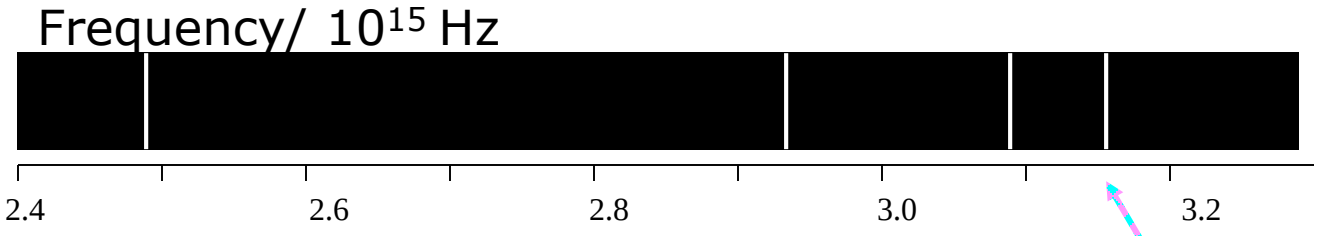
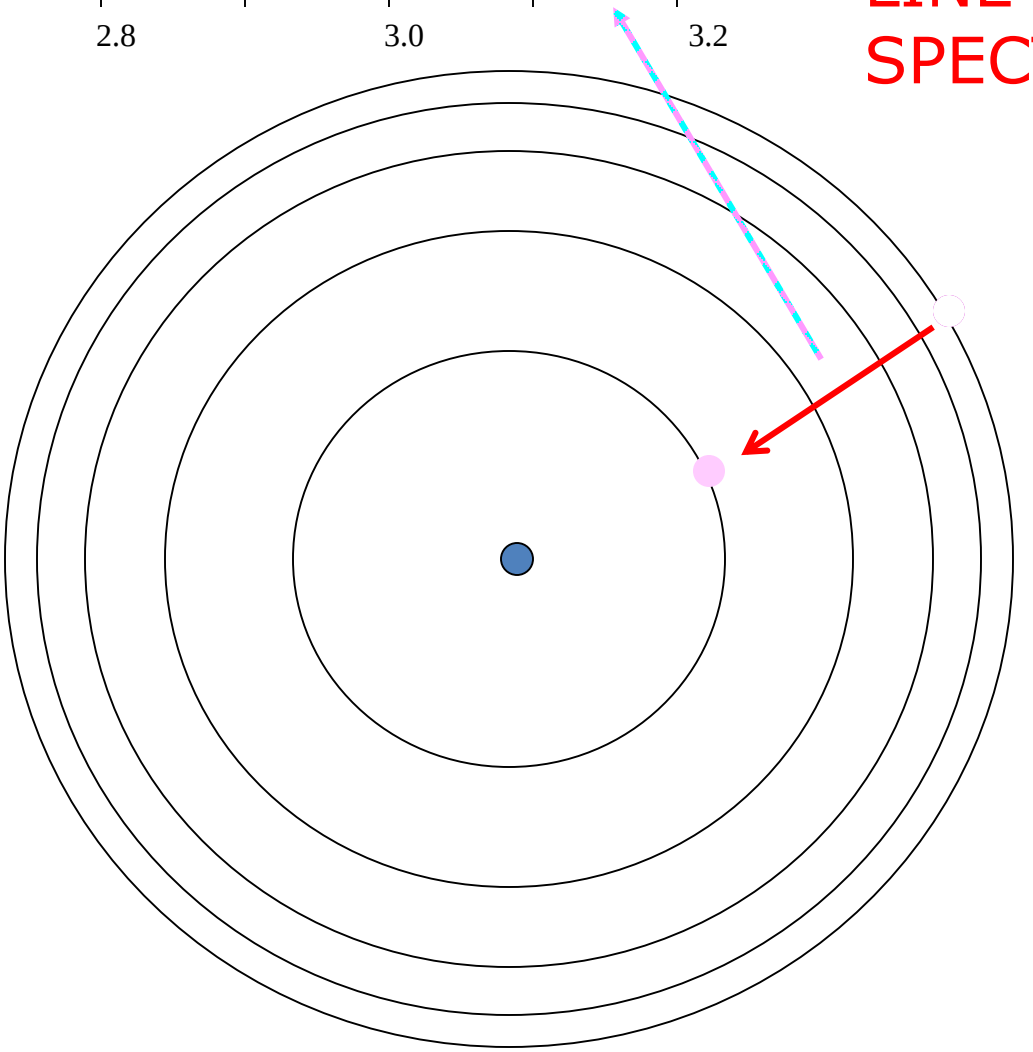
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