

Interpreting the Bohr Model

Name: KEY

In this activity, you will explore the Bohr Model of the Hydrogen atom, and relate the energy, frequency, and wavelength of the energy emitted by its electron as it transitions from a higher to lower energy orbit.

Setting Up Your Bohr Model

- The upper part of your worksheet shows the Bohr Model. **Label the nucleus, orbits, and electrons.**
- The electrons are falling from a higher energy orbit to a lower energy orbit. In order to do this, they have to release energy. The larger the distance of their fall, the more energy they must release. The shorter the distance of the fall, the less energy they must release. **Label the electron releasing the most energy, and the electron releasing the least energy.**
- The hydrogen atom releases energy in three main regions: visible light, infrared (IR) light, and ultraviolet (UV) light. If UV light has the most energy, and IR light has the least energy, **label the three sections at the bottom of the box.**

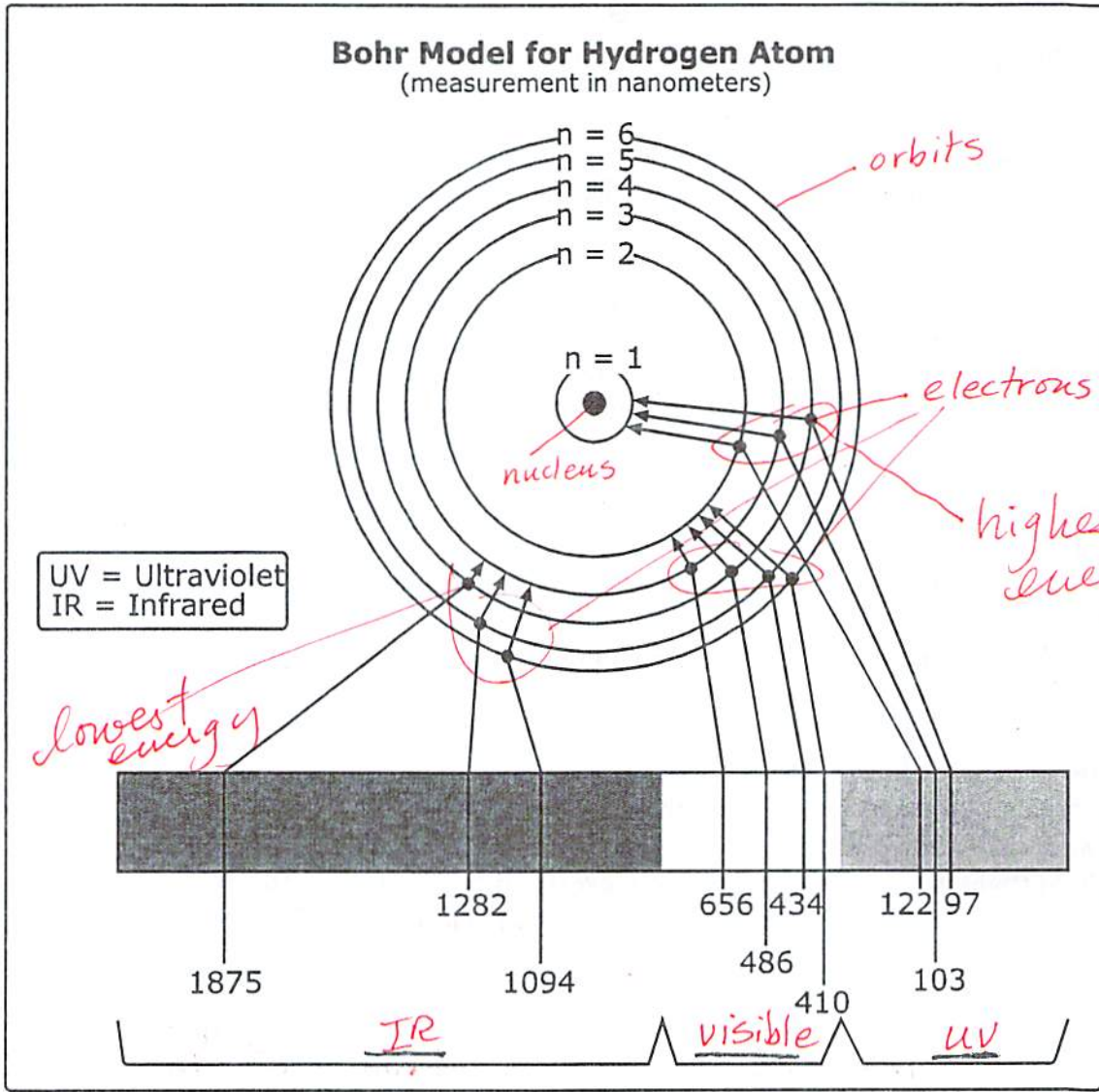
Setting Up Your Electromagnetic Spectrum

- Find the blanks that say "_____ Wavelength". This spectrum shows wavelength decreasing from left to right. **Fill in the blanks with "shorter" and "longer" – carefully choose the correct word for the blank!**
- Look at the six blanks at the bottom of the page. These correspond to the colors of the rainbow. If violet light has the shortest wavelength of all the colors, **fill in the colors correctly from left to right.**
- Look in the spectrum. There are seven types of waves. Fill in the blanks properly using the following clues:
 - Infrared** and **Ultraviolet** are close to the colors red and violet, respectively.
 - Radio waves** have the longest wavelength.
 - Gamma rays** have a shorter wavelength than **X-rays**.
 - Microwaves** have a wavelength between radio waves and infrared light.
 - Visible light** (light we are able to see with our eyes) is between 10^{-6} and 10^{-7} meters in wavelength.

Questions

- What is the unit of the wavelengths shown for the Bohr model? What is the unit for the wavelengths shown for the Electromagnetic Spectrum? How are these units related to each other?
meters *1 nm = 10⁻⁹ m*
- Is visible light a large or a small portion of the Electromagnetic Spectrum? How do you know?
small; takes up very small space of whole spectrum
- A wave has a wavelength of about 10 meters. What type of electromagnetic radiation is it?
radio wave
- What is the color of light with a wavelength of 580 nanometers? What about 5.8×10^{-7} meters?
yellow; yellow
- Which transitions of the hydrogen electron produce light that can be seen with the naked eye? (For example, UV light is produced by the following transitions: $2 \rightarrow 1$, $3 \rightarrow 1$, and $4 \rightarrow 1$.)
6 → 2; 5 → 2; 4 → 2; 3 → 2
- What are the wavelengths (in nanometers) of the four visible colors emitted by the hydrogen atom? What colors do these correspond to?
V - 410 nm; B - 434 nm; B (bluegreen) - 486 nm; R - 656 nm
- Wavelength and frequency of a wave are inversely proportional. Which of the seven types of electromagnetic radiation has the highest frequency? The lowest frequency? Label these on your spectrum.
gamma *radio waves*
- Which of the colors of the rainbow has the highest frequency? The lowest frequency?
violet *red*
- Frequency and energy of a wave are directly proportional. Which of the seven types of electromagnetic radiation has the highest energy? The lowest energy? Label these on your spectrum.
gamma *radio waves*
- Which of the colors of visible light has the highest energy? The lowest? Label these on your spectrum.
violet *red*

KEY



high energy
low frequency

Electromagnetic Spectrum

(measurement in meters)

high energy
high frequency

