

Chapter 10  
Modern Atomic Theory  
Ch. 10.4-10.6  
Notes

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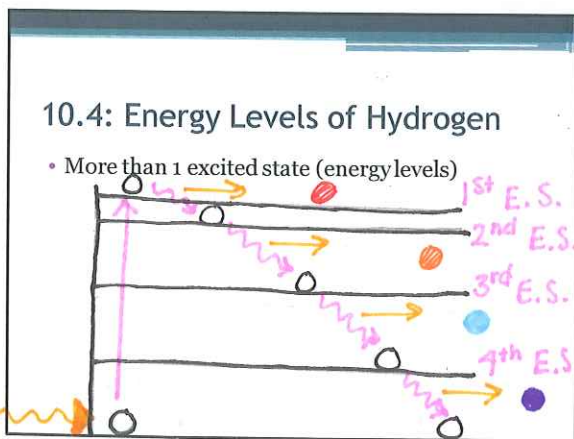
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10.4: Energy Levels of Hydrogen

- Review:
  - Wavelength vs. energy of photons.
  - Energy of photon vs. distance from excited to ground state

▶ Different wavelengths of light carry different amounts of energy per photon.

▶ The energy in a photon is directly related to the change in energy that an atom experiences when it falls from excited state to ground state.



▶ Most atoms have more than 1 excited state, or more than 1 energy level at which the atom may exist.

▶ ex) An atom may have 4 different energy levels. When energy is introduced, the atom

jumps up to the highest excited state. As it falls back down, it hits each energy level and releases a photon.

▶ Photon may have different amounts of energy depending on distance between energy levels.

Energy is introduced

increasing energy

E.S. = excited state

### 10.4: Energy Levels of Hydrogen

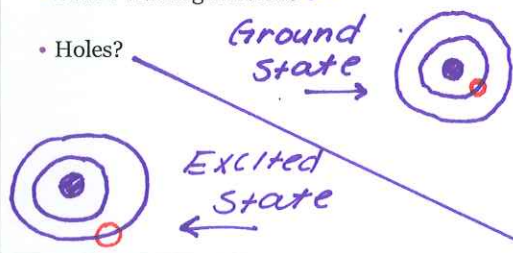
- Quantized atoms

ex) Hydrogen always has 4 energy levels.

▶ Every atom has a specific, or quantified number of energy levels.

### 10.5: The Bohr Model of the Atom

- Bohr's orbiting electrons
- Holes?



▶ Electrons orbit the nucleus like planets orbit the sun.

▶ Orbitals for electrons corresponded with energy levels and an "excited" atom contained electrons that had jumped up an orbital.

▶ Only applied to hydrogen.

### 10.6: Wave Mechanical Model

- Louis de Broglie and Erwin Shrodinger
- Electrons as waves and particles

▶ Decided Bohr was incorrect in his idea of orbiting  $e^-$ .

▶ Just as light behaves as both a wave and particle, so do  $e^-$ .

▶ Schrodiger developed a mathematical equation that supported this idea.

### 10.6: Wave Mechanical Model

- Random electron movement
- Probability Map
- Holes?



Probability: Greater density of electrons closer to nucleus.

- ▶ According to this model,  $e^-$  movement around the nucleus is random, but has a trend of remaining close to the nucleus (in the 1<sup>st</sup> orbital)
- ▶ Offers a probability map of where an electron may be at any given point in time.
- ▶ Does not pinpoint exactly where an electron will be.