Quantum Mechanics

The hidden world of the electron

Bohr

- Bohr interpreted the different energies of the atom as related to the distance away an electron orbits the nucleus
  - Planetary model
- In the Bohr model, because there are only specific amounts of energy an atom can release or absorb *(seen as lines in the emission spectra)* there are only specific orbits an electron can travel in

Bohr

- When an atom absorbs a photon, the energy of the photon is stored by an electron moving from a lower energy level to a higher energy level
- In the Bohr model, this means the electron moving from an orbit closer to the nucleus to one further away
- Orbit closer to nucleus = lower energy
- Further out orbit = higher energy

Bohr

- When the electron returns to the lower energy level, the absorbed energy is released as a photon of light
- $E = h\nu$

Shedding some light on it…

- *The energy of the photon corresponds to the difference in energy of the two different energy levels*
- Because there are only specific colors of light emitted from the atom, there are only specific amounts of energy – called ***energy levels*** – within the atoms

- *Energy in an atom is* **QUANTIZED**

Bohr

- Not every photon can be absorbed by the atom – only those with an energy that matched the difference in energy of different “orbits” in the atom to begin with
- Thus, the atom can only release photons with energy that matches the difference in the energy of different orbits in the atom.
- Results in the lines in the emission spectra

Shedding some light on it…

- A hydrogen atom could not absorb or release any random amount of energy, but only specific amounts of energy corresponding to these specific colors only

Shedding some light on it…

- The energy of the “colors” in the emission spectra must correspond to the only amounts of energy the atoms can possess

- Energy in an atom is **QUANTIZED**

Shedding some light on it…

- Energy is released when the electrons fall from the higher “energy levels” to lower “energy levels”
- The energy is released in little bundles of light energy, called “photons”

Shedding some light on it…

- Bohr interpreted this as meaning *electrons can only exist at certain distances away from the nucleus*
  - Planetary model of the atom
  - Higher energy means an “orbit” further from the nucleus

The only problem was…

- The Bohr model worked for hydrogen, but not for any system with two or more electrons