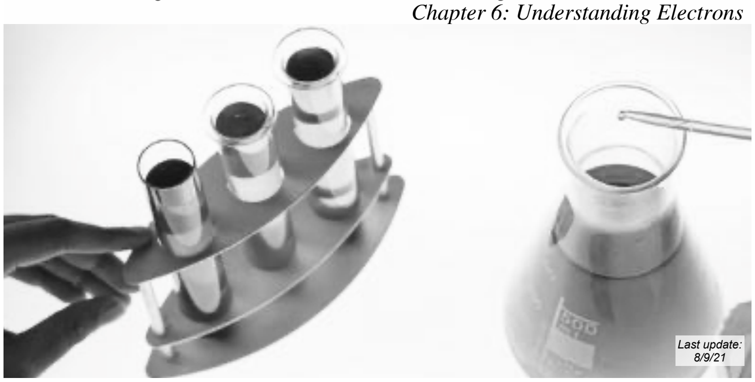
Chemistry 151: Basic Chemistry

Chapter 6: Understanding Electrons

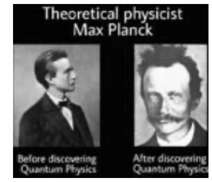


Electrons in Atoms

From previous sections, we know that protons and neutrons are in the nucleus... but what about the electrons?

Most of chemical reactions involve transferring electrons from reactant(s) to product(s), so knowledge of their location is critical.

Quantum physics delivers us answers... but they might make you think twice about the nature of our reality!



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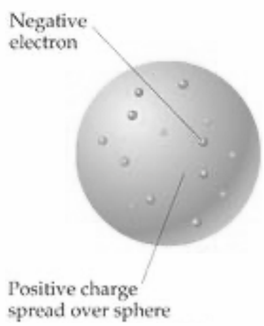
The Plum Pudding Model of the Atom

JJ Thomson (discoverer of the electron) proposed the "plum pudding" model for the atom (and electrons) in 1904.

Large volume, negative "spheres" in a positive "cloud" of low density

Rutherford's Gold Foil Experiment proposed the correct (current) model *for the nucleus*



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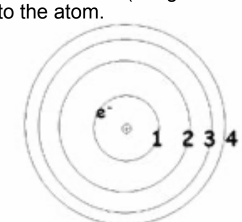
The Bohr Model of the Atom

Niels Bohr proposed electrons exist in "orbits" - *shells* - around an atom

Electrons want to have the lowest energy possible, thus will occupy orbits closest to the nucleus (the ground state) – unless energy is added to the atom.



Ground state (lowest energy electronic configuration) for the Hydrogen atom.

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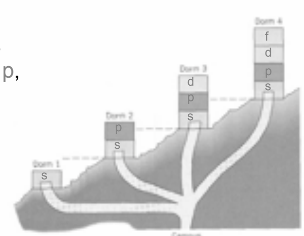
Limitations of the Bohr Model

Bohr model worked great for H, not so great for other atoms

Schrödinger and others built a better model: **quantum mechanics**, where energy levels are split into *subshells* labeled s, p, d, and f.

The maximum number of sub-levels per energy level = energy level number



Floors within a Dorm
The floors represent different subdivisions of energy within each dorm, analogous to the subshells within each shell

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Electronic Structure of Atoms

Quantum mechanical model of atomic structure gives info on electrons

Electrons *restricted* to moving within a certain region of space in atom - not free to "move about".

Position depends on the amount of energy the electron has.

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