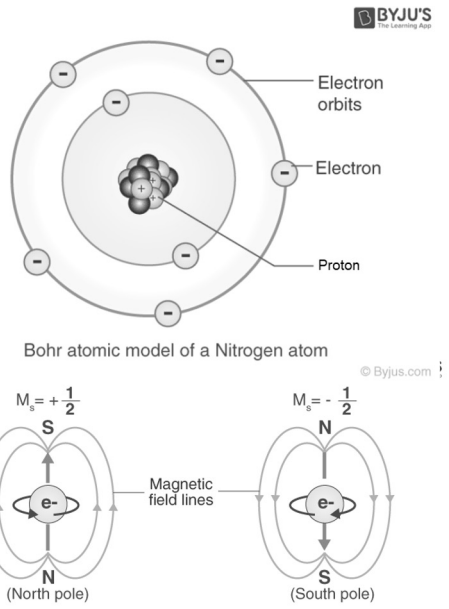
Subatomic Particles

Atomic Orbital Theory

In the *Bohr Atomic Model*, the atom consists of an inner *nucleus* and electrons around the nucleus

Electrons move within the atom in *orbitals* in circular paths around the center of the atom (*the nucleus*)

Electrons also *spin* around their axis in either a clockwise (+1/2) or counterclockwise (-1/2) direction



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Subatomic Particles

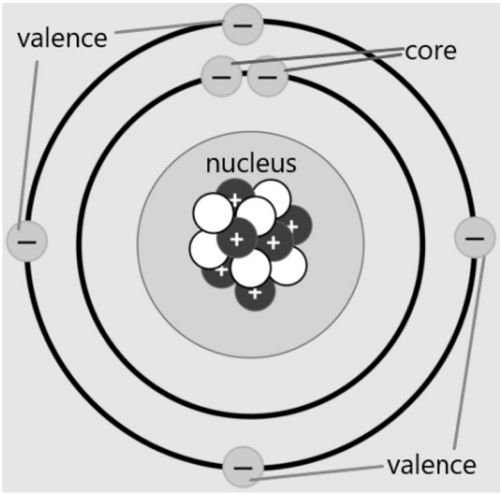
Roles of Electrons in Bohr Model

Two Roles of Electrons in the Atom

Inner (core) Electrons are the electrons closest to the nucleus

Valence Electrons (val. e^-) are electrons in the outer energy levels.

Valence Electrons form connections with other atoms (*known as bonds*) while Inner Electrons shield val. e from the pull of the nucleus



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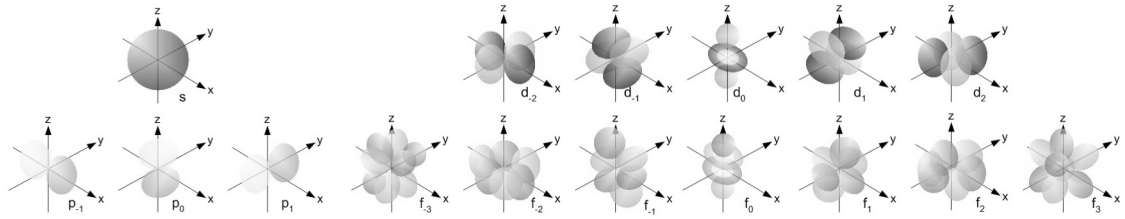
Subatomic Particles

Electrons within Bohr Model

Orbitals are also known as *energy levels*, places where electrons exist within energy levels of the atom. Electrons fill in areas based the number of valence electrons in atom

Orbital	Orbital Name	# of valence e^-
S Orbital	Spherical	Up to 2
P Orbital	Peanut	Up to 6
D Orbital	Double Peanut	Up to 10
F Orbital	Flower	Up to 16



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Subatomic Particles

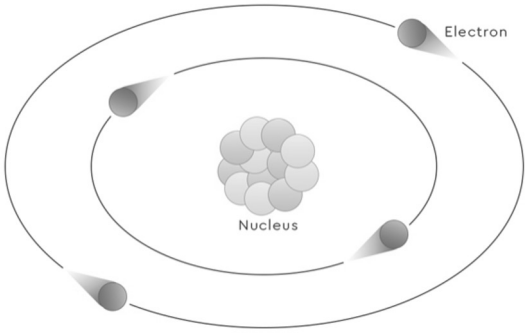
Uncertainty Principle

The *Heisenberg Uncertainty Principle* states that you can't know both the *position of a particle* and the particles momentum (*p*).

Momentum (*p*) is the multiplication of the particle mass and particle velocity (*speed*)

$$p = m \times v$$

Momentum can be described as the difficulty in changing particle direction



The *Heisenberg Uncertainty Principle* means we can't know the exact position of path of an electron (e^-) in the orbit of an atom disproving the *Bohr Model* orbital pathways

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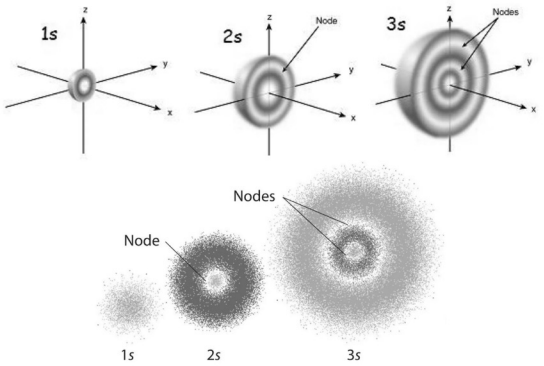
Subatomic Particles

Electron Cloud Model

The *Heisenberg Uncertainty Principle* requires a modification of Bohr's Model into a new modern model.

Schrodinger discovered that electrons are randomly arranged within energy levels of the atom.

The *electron cloud model* is a modern atomic model placing val. e^- in *electron clouds* around the nucleus of the atom



Schrodinger's *Electron Cloud Model* includes traditional orbitals and energy levels along with the randomness of electron position within the atom

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Subatomic Particles

With the final *electron cloud model*, the roles of each subatomic particles were finally defined within the modern atom

Protons

Protons identify the atom, keep electrons within their energy levels, and with their + charge balance the – charge of electrons

Electrons

Valence Electrons connect (*bond*) with other atoms while Inner Electrons reduce the Proton/Electron attraction from the nucleus

Neutrons

Neutrons reduce proton repulsion within nucleus keeping atom stable

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