

## ELECTRONS

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### The Bohr Model of the Atom:

- Electrons orbiting the nucleus are not like planets orbiting the sun, but they are like bees around a hive.

### Quantum Mechanical Model of the Atom:

- Mathematical laws can identify the regions outside of the nucleus where electrons are most likely to be found.

### Heisenberg Uncertainty Principle:

- As said by Werner Heisenberg “one cannot simultaneously determine both the position and the momentum of an electron.”
- You can find out where the electron is, but not where it is going. Or you can find out where the electron is going, but not where it is.

### Electron Energy Level:

- Generally symbolized by  $n$ , it denotes the probable distance of the electron from the nucleus. “ $n$ ” is also known as the Principle Quantum number
- Number of electrons that can fit in a shell:  $2n^2$

### Electron Orbitals:

- An orbital is a region within an energy level where there is a probability of finding an electron.
- Orbital shapes are defined as the surface that contains 90% of the total electron probability.

### S Orbital Shape:

- The S orbital has a spherical shape centered around the origin of the three axes in space.

### P Orbital Shape:

- There are three dumbbell-shaped p orbitals in each energy level above  $n=1$ , each assigned to its own axis (x, y, and z) in space.

### D Orbital Shape:

- Things get a bit more complicated with the five d orbitals that are found in the d sublevels beginning with  $n=3$ .
- To remember the shapes, think of “double dumbbells” and a “dumbbell with a donut.”

### Energy Levels, Orbitals, Electrons:

Energy Level ( $n$ )	Orbital type in the energy level (types = $n$ )	Number of Orbitals	Number of Electrons	Number of Electrons per Energy Level ( $2n^2$ )
1	S	1	2	2
2	S P	1 3	2 6	8
3	S P	1 3	2 6	18

	D	5	10	
4	S	1	2	32
	P	3	6	
	D	5	10	
	F	7	14	

**Electron Spin:**

- Electron spin describes the behavior (direction of spin) of an electron within a magnetic field.
- Possibilities for electron spin:  $+1/2$   $-1/2$