

Notes – Bohr Model Electron Shells

The Bohr Model of the atom shows the electrons in a series of “shells” (also called “orbitals” or “energy levels”).

The period number for an element indicates the number of electron shells the atom will have. For example, all elements in group 1 have one electron shell, and all elements in group 7 have 7 electron shells.

The atomic number of an element is both the number of protons and the number of electrons that each atom of that element has. For example, the element sodium has an atomic number of 11, and thus has 11 protons and 11 electrons. Those electrons fill the innermost shell first, and then (for periods 1 through 3 only) fill each succeeding shell in turn. The maximum number of electrons that each shell can hold is as follows:

Shell Number	1	2	3	4	5	6	7
Max. Number of Electrons	2	8	18	32	32	18	8

However, the outer shell of an atom can never have more than 8 electrons. Because middle school students only need to understand Bohr Models for elements in the first three periods, through element 18 (Argon), the maximum number of the electrons in the first three shells are 2, 8 and 8.

For the representative elements (groups 1, 2, and 13-18), the number of electrons in the outer shell, called the valence electrons, corresponds to the ones digit of the group number, as follows:

Group Number	1	2	13	14	15	16	17	18
Number of Valence Electrons	1	2	3	4	5	6	7	8

The importance of the valence electron number is in predicting how different elements will react with one another to form compounds. In chemical reactions, all atoms get a complete outer shell of 8 electrons, its most stable form. For group 1 and 2 elements, the atoms usually lose the outer shell electrons, leaving the next inner full shell as its new outer shell. For group 16 and 17 elements, the atoms usually gain one or two additional electrons to fill their outer shell to 8. This creates ionic bonds. Atoms of elements in groups 13 through 15 (and sometimes 16) will generally share electrons with other atoms to get the equivalent of a full shell of 8. This creates covalent bonds.