



Electron configuration of an atom

The electrons in an atom do not all have the same energy. They are distributed around the nucleus in correspondingly energetic **layers** (also called shells) and sublayers according to Klechkowski's rule.

KLECHKOWSKI'S RULE:

Energy layers are defined by the principal quantum number, n .
The lowest-energy layer corresponds to $n = 1$. This is the layer in which the electrons are closest to the nucleus.

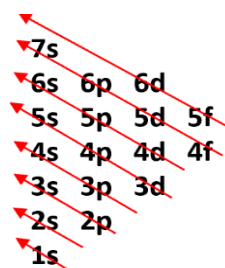
The layer defined by $n = 1$ can hold maximum 2 electrons.
The layer defined by $n = 2$ can hold maximum 8 electrons.
The layer defined by $n = 3$ can hold maximum 18 electrons.
The layers defined by $n > 3$ can hold maximum 32 electrons.

Each of the energy layers is made of several **sublayers**.
These sublayers are defined by letters: s, p, d, f.

Sublayer s can hold maximum **2 electrons**.
Sublayer p can hold maximum **6 electrons**.
Sublayer d can hold maximum **10 electrons**.
Sublayer f can hold maximum **14 electrons**.

Layer $n = 1$ is made of only 1 sublayer: 1s
Layer $n = 2$ is made of 2 sublayers: 2s 2p
Layer $n = 3$ is made of 3 sublayers: 3s 3p 3d
Layers $n = 4$ and $n = 5$ are made of 4 sublayers:
4s 4p 4d 4f and 5s 5p 5d 5f
Layer $n = 6$ is made of 3 sublayers: 6s 6p 6d
Layer $n = 7$ is made of 1 sublayer: 7s

The Z electrons are distributed around the nucleus in ascending order of energy, starting with the lowest-energy sublayer.



They progressively fill the layers and sublayers in the order indicated by the arrows (diagonals).

Notation:

$1s^2 2s^2 2p^6 3s^2 \dots$ until all Z electrons are positioned.

A layer is said to be **saturated** if it contains the maximum number of electrons it can accommodate.

The **outer** layer (or **valence** layer) is the last layer to be filled.

A layer is said to be **internal** when it is not the last layer filled.

Ex : Electron configuration (or structure) of sodium Na ($Z = 11$) : Na $1s^2 2s^2 2p^6 3s^1$

Following the example of sodium, give the electron configuration of the following atoms:

O ($Z = 8$), Ne ($Z = 10$), Si ($Z = 14$), Ar ($Z = 18$), Pu ($Z = 94$).