Electronic structure

An *electronic structure* is the way in which *electrons* are arranged in an *atom*.

Electrons in shells

Electrons in atoms occupy electron shells, outside the *nucleus*. Different shells can hold different maximum numbers of electrons.

The electrons in an atom go into the lowest available shell first. This is the shell nearest the nucleus. When this shell is full the electrons begin to fill up the next energy level.

Below is a table showing the maximum number of electrons an element can have for each of its energy level shells. The information shown is for elements with *atomic numbers* 1 to 20:

Shell	Maximum
First	2
Second	8
Third	8

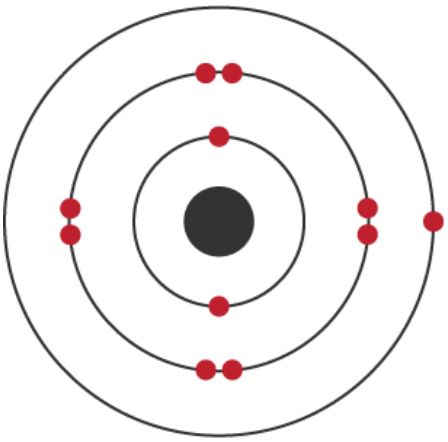
Predicting an electronic structure

The electronic structure of an atom can be predicted from its atomic number. For example, the atomic number of sodium is 11. Sodium atoms have 11 *protons* and so 11 electrons:

- two electrons occupy the first shell
- eight electrons occupy the second shell
- one electron occupies the third shell

This electronic structure can be written as 2,8,1 (each comma, or dot, separates one shell from the next).

This electronic structure can also be shown as a diagram. In these diagrams, each shell is shown as a circle. Each electron is shown as a dot or a cross.



The electronic structure of sodium as a diagram

Electronic structures and the periodic table

The electronic structure of an *element* is linked to its position on the *periodic table*.

Electronic structure feature	Link to the periodic table
Number of shells	Period number
Number of electrons in outermost shell	Group number
Total number of electrons in all shells	Atomic number

The electronic structure of sodium (2,8,1) shows that sodium, Na:

- is in period 3
- is in group 1
- has an atomic number of (2 + 8 + 1) = 11