

Electron arrangements

An *electron arrangement* is the way in which *electrons* are arranged in an *atom*.

Electrons in shells

Different shells can hold different maximum numbers of electrons. Electrons occupy shells starting with the innermost one. They begin to occupy the next shell when a shell becomes full.

For elements with *atomic number* 1 to 20:

Electron shell Maximum number of electrons

First 2

Second 8

Third 8

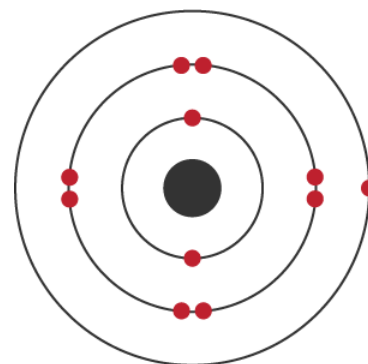
Predicting an electron arrangement

The electron arrangement 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:

- 2 electrons occupy the first shell
- 8 electrons occupy the second shell
- 1 electron occupies the third shell

This electron arrangement can be written as 2.8.1 (each dot separates one shell from the next). This electron arrangement can also be shown as a diagram.



The electron arrangement of sodium

In these diagrams:

- each shell is modelled as a circle
- each electron is modelled as a dot or a cross

Electron arrangements and the periodic table

The electron arrangement of an element is related to its position on the periodic table.

Electron arrangement feature	Link to the periodic table
Number or numbers of circles	Period number
Number of electrons in outermost shell	Old group number
Total number of electrons in all shells	Atomic number

Note that:

- helium and the other elements in group 0 (IUPAC group 18) have full outer shells
- hydrogen has 1 electron, so it is placed above the top of group 1 (but it is not in group 1)

Example

The electron arrangement of sodium is 2.8.1. This shows that sodium:

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

Question

The electron arrangement of nitrogen is 2.5. Explain what this shows about the position of nitrogen in the periodic table

Classwork

Write out the electronic configuration of each of the following elements. In which group and period of the periodic table is each element found. Include its symbol.

1. carbon
2. fluorine
3. phosphorus
4. magnesium
5. lithium
6. sulfur
7. silicon
8. sodium
9. chlorine
10. aluminium