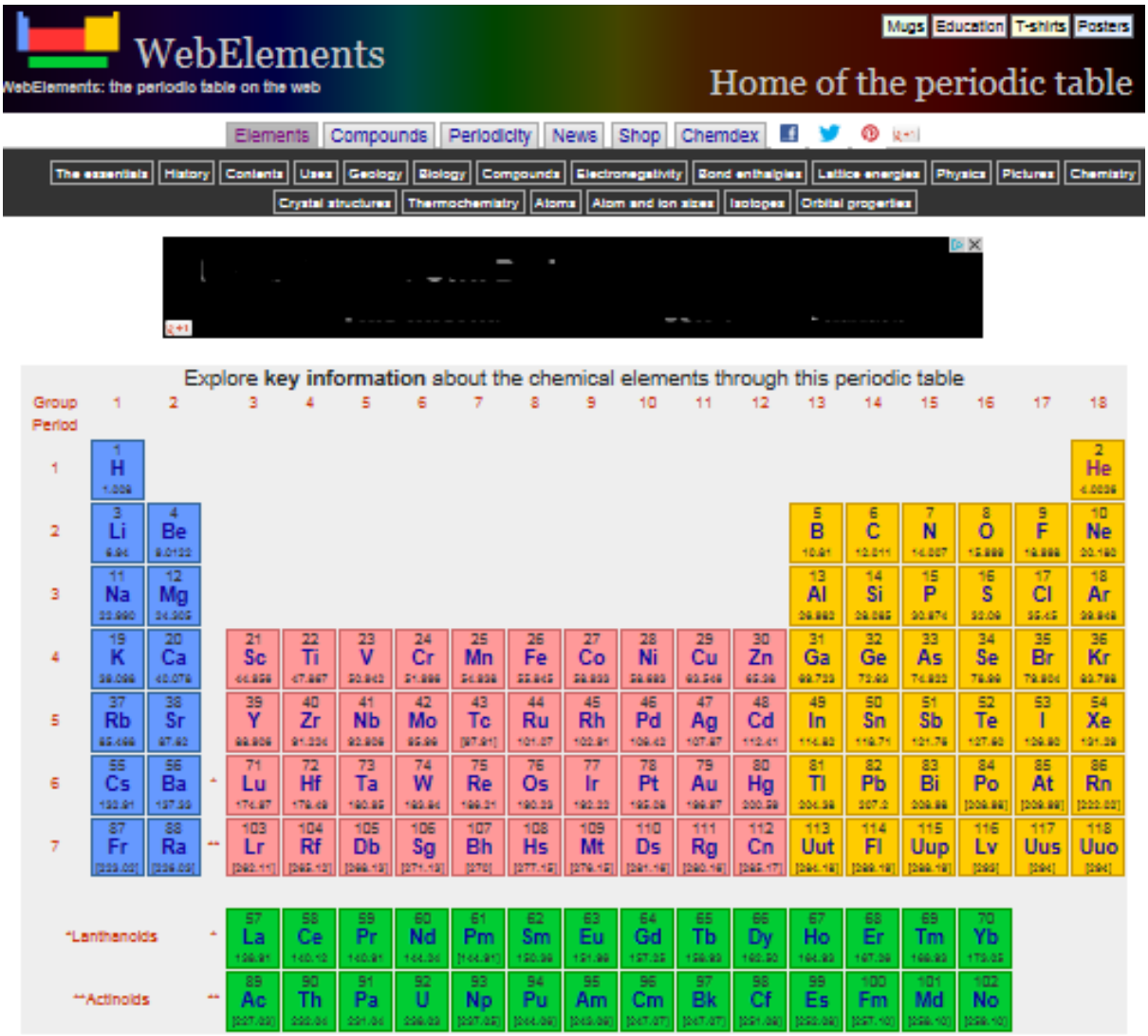
Atomic Structure and the Periodic Table

Matter is made up of around 118 distinct elements. Each element is made up of atoms. Each atom is made up protons and neutrons in the nucleus and electrons in the space orbiting the nucleus. The protons are positively charged, the electrons are negatively charged and the neutrons have no charge.

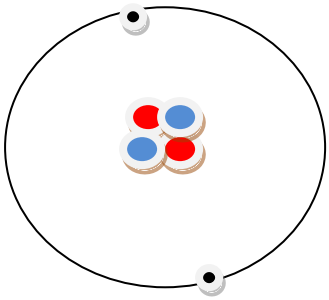
The periodic table is a tabular arrangement of the elements of matter. The periodic table below is taken from the WebElements website[1]. The elements are arranged firstly in a sequence from the element with the smallest atom (hydrogen (H)) in the top left hand corner and then to the right He (Helium), the second smallest atom, in the top right hand corner. Then the third and fourth elements, lithium (Li) and beryllium (Be) are found on the next row or *period*, on the left hand side. The next elements boron (B), carbon (C) and so on follow on the right hand side. The WebElements[1] website gives the properties of each element by clicking on it.



[1] www.webelements.com

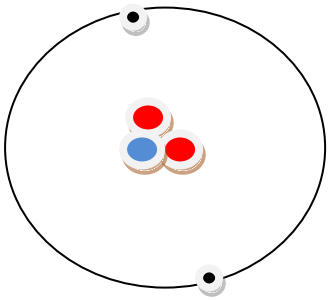
The number above the symbol is the *atomic number* or the number of protons. The number below the symbol is the *atomic weight*. The atomic weight is the sum of the number of protons and neutrons. However, the number of neutrons in atoms of a particular element varies and the value for this is a weighted average.

For example helium (He) mostly occurs in nature with two neutrons. Its atomic sructure may be symbolised as follows, with two protons symbolised in red, two neutrons symbolised in blue and two electrons symbolised in black.



Atomic structure of ^{4}He.

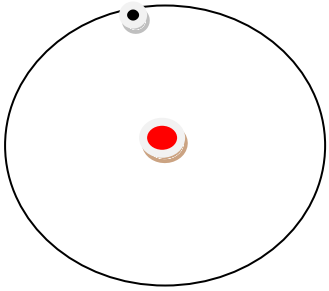
However, 0.000137% of helium occurs in the following form



Atomic structure of ^{3}He.

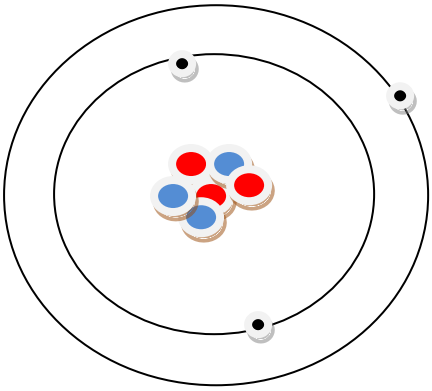
The number of protons determines the element; both have two protons so both are helium atoms. The two different atomic structures are called *isotopes*. Elements on the right hand column of the periodic table, such as helium, have complete electron shells; the two electrons in the only electon shell of helium completes the shell..

Moving back to hydrogen, ^{1}H has the following structure



Atomic structure of ^{1}H.

We note that hydrogen has an 'incomplete' shell of electrons. If we now move up the table to lithium, ^{6}Li has the following atomic structure



Atomic structure of ^{6}Li.

Lithium lies at the start of a new row or period of the periodic table and this means that a new electron shell is initiated. This electron shell has up to eight elements and in complete when the element neon (Ne) is reached. Then for the next element, sodium (Na), a third shell is iniitiated and the pattern continues.

Placing the elements ion colums or groups is also useful since we find tht elements in the same group have similar properties.