



## **Arrangement of electrons in the Atom**

**Chemistry – Leaving Cert**

**Quick Notes**

# Arrangement of electrons in the Atom

Niels Bohr presented evidence for the existence of energy levels by studying the spectrum of light emitted by hydrogen atoms that have absorbed energy. Each line on the spectrum has a specific frequency and this is represented by Planck's constant.  $E_2 - E_1 = hf$ . The fact that a line spectrum is observed and not a continuous one, shows that only specific energy transitions are possible within an atom. Every atom has a different number of electrons. The frequencies of radiation that an atom emits or absorbs are characteristic of that atom, so it can be used to identify the atom. For example, the series of lines emitted by hydrogen in the visible range is called the Balmer Series. A spectrum is observed through an apparatus known as a spectrometer. Flame tests can also be used for identifying certain metals because the salts of various metals emit different colour flames e.g. lithium emits crimson, sodium produces a yellow colour. Atomic Absorption spectrometry involves white light being passed through a gaseous sample of the element so it produces dark lines on a coloured background. Atomic Emission spectrometry produces coloured lines on a dark background. An energy level is the fixed energy value that an electron in an atom may have. A number  $n$  may be assigned to each energy level, and this way the number of electrons it can hold may be calculated by the formula  $2n^2$  e.g. an energy level number of 2 may hold: 2 by 2 squared equals 8. The number of sub-levels in a main energy level is the same as the number of that level, e.g. the  $n = 2$  main energy level has two sub-levels. Heisenberg Uncertainty Principle states that it is impossible to measure at the same time both the velocity and position of an electron. An orbital is a region in space where there is a high probability of finding an electron. An s orbital is spherical in shape, a p orbital dumb-bell shaped. But there are three p orbitals in a p sub-level  $p_x$ ,  $p_y$ ,  $p_z$ . They are arranged at right angles to each other along the x, y and z axes.