

Electron shells

Extract from "Advanced chemistry for you", Lawrie RYAN, Nelson Thornes

► Electron shells or energy levels

A few years after Rutherford put forward his theory of atomic structure, the model was refined again.

Niels Bohr was trying to explain atomic spectra.

These are the characteristic amounts of energy given out (or absorbed) by different atoms.



This is part of the atomic spectrum of helium

You can see part of an atomic spectrum by using a hand-held spectroscope to look at a discharge tube. The tube contains atoms of gas.

Their electrons have been excited by electrical energy.

Or you can look at a Bunsen flame through a spectroscope during a flame test on a metal compound. In this case, the electrons have been excited by heat energy from the flame.

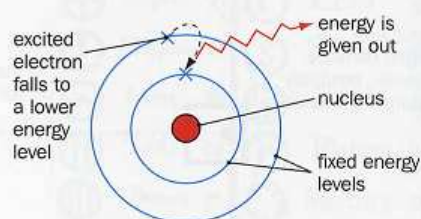
You will see lines of intense colour in the spectrum.

Bohr explained the lines in atomic spectra by assuming that the electrons in an atom could only have **certain fixed energies**.

When excited, an electron jumps up to a higher **energy level**.

When it falls back again, the difference in energy is given out.

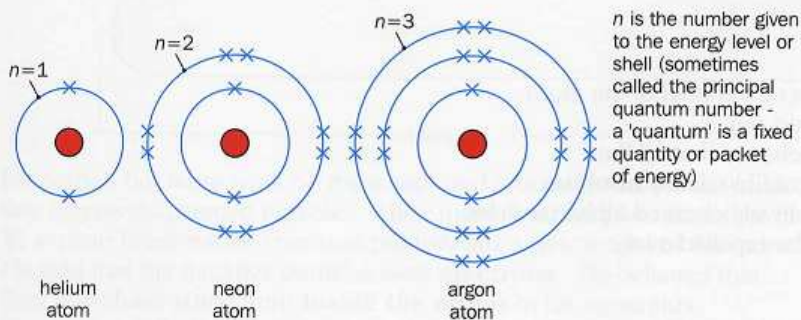
Sometimes we can see this as visible light energy.



So in 1913 a revised model of the atom had the electrons occupying fixed energy levels or '**shells**'.

- Think back to your previous work on atoms. Can you remember how many electrons can fit into the first energy level (or shell)?

Look at this model applied to the atoms below:



The electrons fill up the energy levels (or shells) from the middle outwards. They occupy the lowest energy level possible. When that is full, they start filling the next level up.

- Do you think it likely that this was the last development of the model? You can see that each new model is needed to explain new observations. Each model is useful for explaining some ideas, but not so good for others.
- What have you used the model shown above to explain?
(We will revise and extend our work on bonding in Chapters 4, 5 and 6.)

As you can imagine, there have been many refinements to our ideas about atoms throughout the last century. But the major change that we need to consider is the evidence for **sub-shells**.