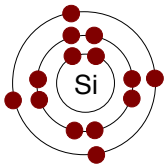
ORBITALS

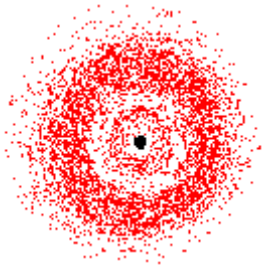
In each of these questions, all you have to do is decide whether the statement(s) in the question are true or false. If there is more than one statement in a given question, ***all*** the statements have to be true for you to give the answer "true".

If you aren't sure of the answer to a question, don't guess. Leave it out, and count it as wrong when you check your answers. Just because you happened to guess something right doesn't mean that you understand it – and that's what you are trying to check.



1. The circles in this simple diagram for the electronic structure of silicon show energy levels. The further the circle is from the nucleus, the higher the energy of the electrons.

2. Because of the Heisenberg Uncertainty Principle, it is impossible to know exactly what an electron is doing in an atom. All we know is what its energy is and where it is likely to be found a certain percentage (say, 95%) of the time. We call this region of space an orbital.



3. The diagram on the right gives an impression of the electron density around the nucleus in a 1s orbital.

4. Each orbital can hold two electrons.

5. In the second level of a silicon atom (above right), the eight electrons are in a 2s orbital and 3 separate 2p orbitals.

6. A 2p orbital has a shape similar to the diagram on the right. Each electron in a 2p orbital is doing a figure-of-eight loop around the nucleus.

7. At the 1 level, there is only a 1s orbital. At the two level, there is a 2s orbital as well as 3 separate 2p orbitals. At the 3 level there is the possibility of a 3s, three separate 3p and 5 separate 3d orbitals. That means that the 3 level could hold a total of 18 electrons.

8. When you work out the electronic structure of an atom by building it up using the Aufbau Principle, you fill lower energy orbitals before you fill higher energy ones. The order of filling for the atoms up to calcium is 1s, 2s, 2p, 3s, 3p, 4s. The 3d level doesn't fill with electrons until after the 4s level is full. That means that the detailed electronic structure of calcium (atomic number 20) would be $1s^2\ 2s^2\ 2p_x^2\ 2p_y^2\ 2p_z^2\ 3s^2\ 3p_x^2\ 3p_y^2\ 3p_z^2\ 4s^2$.