Chemistry 2

HW1

Electrons in an atom occupy shells (energy levels represented by the letter “n”) around the nucleus starting from the shell that is the closest to the nucleus (n=1). Shells can have sub-shells. The further from the nucleus, the more subshells are in each shell.

The number of the subshells in each shell is equal to the shell number “n”. Subshells are called “s”, “p”, “d”, “f”.

Shell number (n)	Sub-shell
1	s
2	s, p
3	s, p, d
4	s, p, d, f

Subshells are made of orbitals. All orbitals of the same subshell have the same energy. Each orbital can be occupied by one or two electrons.

Sub-shell	Number of orbitals	Maximum number of electrons
s	1	2
p	3	6
d	5	10
f	7	14

For most elements the order of placing electrons into the subshell is:

1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d,…

Rules of filling electrons' shells

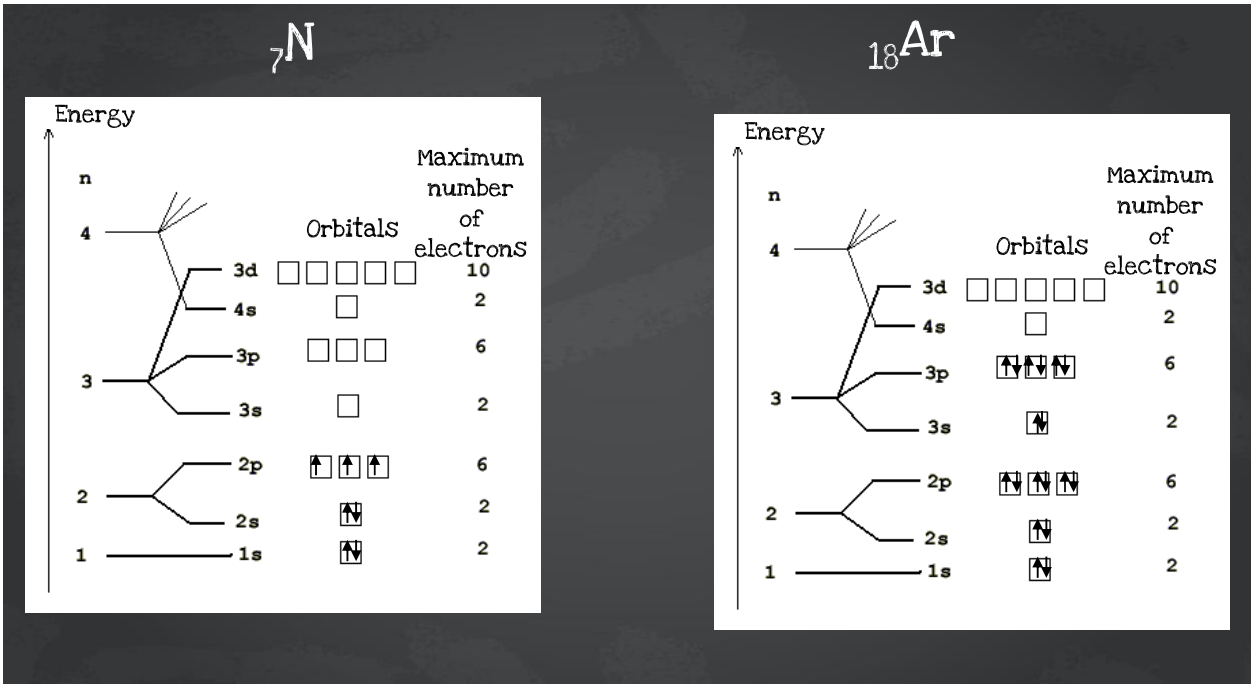
1. Decide the total number of electrons to be placed (it should be equal to the number of protons, which is its atomic number)
2. Add electrons to each orbital starting with that of the lowest energy level and keeping in mind that we cannot place more than 2 electrons on each orbital

For example, for nitrogen "N" (atomic number 7) we will have to place 7 electrons into the shells, subshells, and orbitals. We will follow the order above keeping in mind how many electrons we can place in each orbital (see the table above). The **electron configuration** for this element will look like this:

$1s^2 2s^2 2p^3$

This means that the first shell "1" with one subshell "s" will be occupied by 2 electrons (the superscript shows the number of the electrons in the subshell); the second shell "2" with 2 subshells (s and p) will be occupied by the rest of the electrons (7-2 = 5). Two of these 5 electrons will be on subshell 2s (superscript 2) and 3 electrons on subshell 2p (superscript 3). The number of electrons on the outer shell ($2s^2 2p^3$) is five, we call them valence electrons, they can participate in the chemical bond formation.

We can also write electron diagrams for each element to better visualize the electron placement and to understand how many chemical bonds elements can form (each element generally can offer the unpaired electrons to form a bond). From the diagram we can see that one of the most common valency for nitrogen is 3 (we see 3 unpaired electrons on 2p sublevel).



Questions:

1. Write electron configuration of oxygen element and draw electron diagram for this element.
2. We have compounds consisting only of carbon (C) and hydrogen (H) elements. Can you predict chemical formulas for several such compounds? Write down at least three. EXPLAIN why you wrote these chemical formulas.