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Chem 115

Locating Elements on the Periodic Table

All the elements on the periodic table are arranged in order of their atomic numbers, elements with similar chemical properties will occur at regular intervals.

- The arrangement of elements in a table based on the periodic law is called periodic table.
- The horizontal rows in the table are called periods
- The vertical columns are called groups (see page 5 on the lecture slides for more details).

IONS

Ions are neutral because they don't have a balanced amount of protons and neutrons (see the diagram of hydrogen on page 6 for more). Hydrogen sometimes can behave like non metals.

Elements become ions when the number of electrons on the last shell is not at 8. Elements on group 1A are all +1 charge and elements on group 2A are +2 charges when they become ions.

A fluorine atom with atomic number 9 has 9 protons and 9 electrons so it is neutral. If the electrons are to be divided in their shells, it would be 2 + 7. the first shell which can only hold a maximum of two electrons would take two and the others ones need 8 in order for the shell to be complete, since the remaining electron left in a fluorine is 7 after 2 had been placed in the first shell. The shell would not be complete because its 7 and it needs 8 to complete, its easier for fluorine to gain 1 more electron than to lose 7 because a shell won't usually gain or lose more than 3 electrons. So therefore the fluoride ion (notice the name change when it becomes an ion) would be F^- because it is gaining one electron. (See page pg 6)

Note:

- If an atom gains 1 electron it would be an ion that carries a negative charge, if it gains two electrons, the ion carries a -2 charge and so on
- If an atom loses electrons, it would become an ion that carries a positive 1 charge and if it loses two it would carry a +2 charge.
- If the remaining number of electrons on the last shell is close to 8, then the elements gain electrons but if it's closer to 1 the element loses electrons.
- When an element carries a charge they are ions.

Class work page 8

When sulphur atoms becomes ions, what charge are they, what is the symbol of the sulphide ion?

Answer: since sulphur has 16 electrons , it would be 2-8-6 , the last shell need 2 more to be 8, so it would gain 2 more electron since 6 is close to 8, it gain so it carries a –2 charge, the symbol would be S^{2-}

(2) What is the charge on an aluminum ion?
3+ because it lost 3 electrons.

Ions and their names
When elements are chemically bonded they form compounds.

All metal ions are positively charged when they become ions because they always lose electrons, metals atoms lose electron while non metals gain them.
When naming ions there are two different types of bonding involved, they are
Ionic bonding and molecular bonding
In ionic bonding the ions inside the crystal are positively and negatively charged and since unlike charges attract they stay together that way.
Molecular bonding is not ionic, instead the atoms are more like neutral. (*it's actually more complicated than this, but they are not ions)
See example of ionic compounds and molecular compounds on pg 10-12. The NaCl (salt) shows clearly that every positive ion are surrounded by negative ions which attract each other making them stay that way,
Difference between ionic and molecular bonding

Ionic	Molecular
Smallest repeatable unit of the two kinds of ions	smallest repeatable unique unit
Contains ions (+, -)	Neutral, do not contains ions

Chemical formula is a way to represent two or more elements chemically bonded together.
$AlCl_3$= ionic (made out of Al^{3+} ions and Cl^- ions)
NH_3= molecular (made of N and H atoms)
NH_4Cl=ionic (made of NH_4^+ ions and Cl^- ions)
$NaCH_3COO$= ionic (made of Na^+ ions and CH_3COO^- ions)

Note that ionic compounds usually contain metals ions while molecular compounds contain only non metals in them.

In order to name compounds you will need to memorize all common polyatomic ions and also the name and formula with the number of charge of all polyatomic ions.