For the REVIEW.]

Practical Chemistry.

J. BRITTAIN, NORMAL SCHOOL, FREDERICTON.

LESSON VI.

(Continued from February, 1891.)

The formula HCl denotes, strictly, one molecule of hydrochloric acid gas. But, for the sake of brevity, it is customary to use the formula as an abbreviation of the name of the substance whose molecule it represents.

We may say, then, that at our last lesson we mingled in water some HCl and KOH, and that the water was found thereafter to contain a substance differing from either. If we evaporate the water this substance will remain as a white solid resembling common salt. It has been found by chemists to be a compound of sodium and chlorine. Its name is potassium chloride and its formula KCl. From its resemblance to common salt it is called *a salt*. Since the water contained neither K nor Cl, the salt must have been formed by the metal K of the KOH combining with the Cl of the HCl, thus taking the place of the H in the acid. By careful weighing it would be found that the quantity of water had slightly increased. This is easily accounted for by supposing that the displaced H of the acid took the place o. the K in combining with OH of KOH forming HOH or H_2O, which is water. It will be noticed that not an atom was lost; only a re-arrangement of the atoms took place.

We may, therefore, express the re-action thus:

Base + Acid = Salt + Water

or, $KOH + HCl = KCl + H_2O$

Dissolve a small piece of caustic soda (sodium hydrate, NaOH) in water. Taste the solution and test it with litmus paper. It will turn reddened litmus back to blue. This, with its pungent taste, will convince you that NaOH, like KOH, is a *base.* The chemical change by which the red litmus was turned blue is called a *basic* or *alkaline* re-action. Dip the same litmus into a solution of the acid HCl. It becomes red again. An *acid* re-action took place. Now carefully mix the two solutions till the mixture gives neither a basic nor an acid re-action. Taste the mixture. You perceive an unmistakable taste of common salt.

The metal sodium of the base has exchanged places with the hydrogen of the acid, just as the metal potassium did in the preceding experiment, thus:

Base + Acid = Salt (common) + Water

or, $NaOH + HCl = NaCl + H_2O$

You will now begin to suspect that the metal of a base has a tendency to replace the hydrogen of acids.

Taste and test with litmus some aqua ammonia (Ammonium hydrate, NH_4OH). Its pungent taste and basic re-action will show you that it is a base. Mix the solution, as in the preceding experiments, with a solution of sulphuric acid (hydric sulphate, H_2SO_4). This is a very corrosive acid. If the experimenter should get any of it on his face, or in his eyes, the consequences would probably be serious. In making solutions of sulphuric acid, the acid should always be slowly poured or dropped into the water. If the water be poured upon the acid an explosion is liable to occur. There is no risk, however, if the danger be kept in mind and reasonable care be taken. The solution of sulphuric acid will be found to have a very sour taste and a strongly acid re-action. In tasting solutions merely touch your tongue with a drop of the mixture.

Mingle the acid solution with the base as before until you obtain a mixture which is *neutral* to litmus. The re-action in this case is as follows:

Base + Acid = Salt + Water

or, $2(NH_4OH) + H_2SO_4 = (NH_4)_2SO_4 + 2H_2O$.

Mix solutions of NH_4OH and HCl. The re-action is: Base + Acid = Salt + Water

or, $NH_4OH + HCl = NH_4Cl + H_2O$

You will notice that we have always obtained, by mixing an acid and a base, a *salt* and *water*.

Notice, too, that the group of atoms NH_4 acted, in the last two experiments, like the metals did in the preceding ones. It took the place of the hydrogen in the acids, thus forming salts. The group NH_4 did not break up, but behaved like a single element. Such a group of atoms is called a compound *radical*. And since NH_4 acts like a metal it is called a positive radical and is named like a metal, ammonium. The group OH also remains intact while the metal deserts it and hydrogen takes its place, forming with OH the compound substance, water. OH is another compound radical. It is named *hydroxyl* from the elements of which it is composed. Since it does not act like a metal it is to be regarded as a *negative* radical.

Compare the formulas for the different bases we have used, KOH, NaOH, NH_4OH. Each consists of a metal (NH_4 is equivalent to a metal) and OH. A base, then, is a compound substance, consisting of a metal (or positive radical) in combination with hydroxyl and having usually a pungent taste and a basic or alkaline re-action.

Compare the formulas for the acids, HCl, H_2SO_4, HNO_3. They all contain hydrogen. There is no metal in any of them. Cl is a negative element. The groups SO_4 and NO_3 acted like negative elements in not breaking up, but combining with the metals