derived from the electrolytic decomposition of bodies, as in the electrolysis of water. When compound bodies are thus decomposed, those elements that are liberated at the *negative* pole are called *electro-positive* elements, while those set free at the *positive* pole are called *electro-negative* elements. Such a classification is not, however, absolute; the same element may be obtained at either pole, according to the particular combination in which it occurs. This will explain why the same body is sometimes an acid and sometimes a base. (*See Acid ante.*) The principal elect. pos. bodies are Hydrogen and the metals, and the elect. neg. are O, N, S, Cl, Br, I, F, Cy, and some others.

Formulæ. By *formula* is meant a combination of symbols, systematically arranged, so as to express briefly some chemical fact, either of the composition of a compound or the process by which compounds are formed, or the manner in which the several elements of the compound are united. In accordance with the different facts formulæ illustrate they get their name.

Molecular formulæ. A mol. being the smallest particle of a simple or compound body capable of existing in a free state—that is, generally a cluster of atoms—that combination of symbols which represents it, is called a *molecular formula.* H_2 is the mol. form. of Hydrogen, O_2 of Oxygen, N_2O of Nitrogen Monoxide, and H_2O of Water. Each of these formulæ represents *one* mol. of the substance for which it stands. If we wish to express two or more molecules, we do so by prefixing a 2, 3, &c., to the mol.; thus, $3H_2O$ means three mols. of water, $5KClO_3$ is five mols. of Potassium Clorate, and so for others. Elements whose mol. is not definitely known in the free state, are marked in works on chemistry by placing an asterisk over the symbol, thus, $\overset{*}{Cu}$, $\overset{*}{Zn}$.

Empirical formulæ represent the composition of bodies—the number of atoms, &c., as determined by experiment. Experimentally we determine the percentage of different elements present in a compound, and from this we calculate the formula. Thus suppose Alcohol is analysed and is found to consist of 52.174 of Carbon, 13.043 Hydrogen, and 34.783 of Oxygen; we then determine the formula by dividing the amount of each element present by its atomic weight, thus:

C = 52.174 : 12 = 4.348 or 2 nearly.
H = 13.043 : 1 = 13.043 or 6 "
O = 34.783 : 16 = 2.174 or 1 "

hence we conclude that the *empirical* formula for alcohol is C_2H_6O.

Rational, Constitutional or *Structural* formulæ are used to indicate the structural form of a compound. By its use we can illustrate the substitution of one radical for another in any chemical reaction. It must be remembered that such formulæ do not pretend to point out the actual position of the atoms in the molecule—they are used merely to illustrate and make simple what could not otherwise be easily understood. If we wish to show how Water is the type of a number of analogous compounds, we give Water the rational formula, $\left.\begin{matrix}H\\H\end{matrix}\right\}O$, then the formula for Nitric acid is $\left.\begin{matrix}NO_2\\H\end{matrix}\right\}O$, and for Sulphuric acid the formula is $\left.\begin{matrix}SO_2\\H_2\end{matrix}\right\}O_2$, where we show by the *structure* of the formula the relative position of the elements, and also how the one may be substituted for the other. The same compound may have more than one rational formula.

Graphic formulæ are nearly the same as rational formulæ, but seem to differ in this: the latter represents only the relative position of an atom in a molecule, whereas the former points out the attraction, direction of the forces, or arms, so to say, by which the atoms are bound together. It is generally used when treating of the *valency* of bodies. If lines represent the forces by which atoms are bound together, the following *graphic* formulæ will represent