—cohesion and heat—the former tending to hold them closely together, the latter to separate them. It is these two forces which determine the condition of all matter, solid liquid or gaseous. Some substances at a certain temperature are solid. If heat be applied to these substances liquids are produced, and by a further application of heat these liquids may become gases. A good example of this is ice, which is a well-known solid. By the action of heat this solid soon becomes liquid, and if the heat be continued a gas known as steam will be produced. Ice, water and steam are precisely the same except in their condition.

While molecule is considered the smallest particle into which any substance can be divided by mechanical means, or "the smallest quantity of a substance that can exist in the free state," yet by chemical means the molecule may be divided into smaller particles called *atoms*. For instance the chemist by passing a current of electricity through a volume of water divides it into two distinct substances oxygen and hydrogen. Every molecule of this water then must consist of these two distinct substances. If this volume of water be weighed and the oxygen and hydrogen be also weighed, it will be found that the weight of the oxygen and hydrogen combined will be the same as the water before its decomposition. It will be further discovered that the volume of hydrogen will be double that of the oxygen. But when taken by weight the oxygen will be found to be eight times as heavy as an equal volume of hydrogen, therefore he will conclude that the weight of hydrogen and oxygen will be in the ratio of 2 to 16. By experiment this ratio of hydrogen to oxygen has always been found to exist in water. Further it has been clearly proved by experiments that all substances combine chemically in definite proportions and that when one body united with another in more than one proportion, the second is always some multiple of the first. For instance nitrous oxide is formed by taking 28 parts by weight of nitrogen and combining with 16 parts of oxygen. Again nitric oxide is formed by taking 28 parts of nitrogen and 32 parts of oxygen. Here we have by weight oxygen double of what it was in the formation of nitrous oxide. It is impossible to combine oxygen with any substance in different proportions than 16 or some multiple of 16 to the weight of the substance with which the combination takes place. If 28 lbs. of nitrogen and 24 lbs. of oxygen were used the chemist would be unable to produce anything but nitrous oxide, and the 8 lbs. of oxygen would remain uncombined.

The term *radicle* in chemistry may be divided into two classes, simple and compound.

Simple radicles are those which include all the elements. For instance potassium is termed the radicle of a number of compounds, combining with oxygen, chlorine, etc.

A compound radicle is one which is composed of two or more simple substances, which are so closely united as to act in every way like a simple substances, combining with various substances to form compounds. Thus ammonium, a compound of hydrogen and nitrogen, is termed a compound radicle since it may be used in combination the same as the elements and its action in forming compounds is very nearly the same as sodium.

The word *element* which has been used several times, is used in chemistry to denote a substance which will not admit of being analyzed. Chemistry recognises sixty-four simple substances or elemeuts. To these sixty-four ele-