HISTORY OF CHEMISTRY

Thousands of years ago people valued gold as a rare and beautiful substance. They also understood that gold had a unique ability to resist decay and corrosion. Since there was no known acid or other substance that could damage gold they thought that gold had a quality of performance that could be transmitted to humans. Therefore, every medicine that fought ageing contained gold as an essential ingredient and doctors urged people to drink from gold cups to prolong life.

This universal desire for gold made alchemy a formal discipline in the first century A.D. It first appeared among Greek scholars, then spread to eastern Mediterranean countries, and finally to Spain and Italy in the 12th century. Though the attempts to produce gold from other substances was the original and central purpose of alchemy, a number of physician-alchemists in Europe in the Middle Ages tried to produce medicines that were not dependent on gold or related to it.
They worked to produce medicines and spirits from raw materials, such as herbs, and in this way improved methods of separating elements by distillation. For example, as early as the 13th century, Thaddeus of Florence identified the medical benefits of alcohol distillates taken internally and applied locally. Paracelsus (1493-1541), the German-Swiss physician and alchemist, was the first person to unite medicine with chemistry through his use of remedies that contained mercury, sulphur, iron, and copper sulphate. This led to steam distillation and improved equipment.

The development of apparatus and the extensive efforts to break down or distil substances laid the foundation for modern chemistry, but as true science began to evolve during the Renaissance, the study of alchemy blocked the birth of modern chemistry. Some scientists tried to lead people toward reliance on empirical evidence (that is, what can actually be observed and/or measured), but the idea of four essential elements (earth, air, fire, and water) lived on and there was no recognition that these four substances are made up of a combination of basic elements.

One of the most interesting periods in the history of chemistry was that of the alchemists (500-1600 A. D.). People have long had a lust for gold, and in those days gold was considered the ultimate, most perfect metal formed in nature. The principle goals of alchemists were to find a method of prolonging human life indefinitely and to change the base metals, such as iron, zinc, and copper, into gold. They searched for a universal solvent to transmute base metals into gold and for the “philosopher’s stone” to rid the body of all diseases and to renew life. In the course of their labours they learned a great deal of chemistry. Unfortunately, much of their work was done secretly because of the mysticism that shrouded their activity, and very few records remained.

Although the alchemists were not guided by sound theoretical reasoning and were clearly not in the intellectual class of the Greek philosophers, they did something that philosophers had not considered worthwhile. They subjected

various materials to prescribed treatment under what might be loosely described as laboratory methods. These manipulations, carried out in alchemical laboratories, not only uncovered many facts of nature but paved the way for the systematic experimentation that is characteristic of modern science.

Alchemy began to decline in the 16th century when Paracelsus (1493—1541), a Swiss physician and outspoken revolutionary leader in chemistry, strongly advocated that the objectives of chemistry be directed toward the needs of medicine and the curing of human ailments. He openly condemned the mercenary efforts of alchemists to convert cheaper metals to gold.

Modern chemistry was slower to develop than astronomy and physics. It began in the 17th and 18th centuries when Joseph Priestley (1733-1804), who discovered oxygen in 1774, and Robert Boyle (1627 1691) began to record and publish the results of their experiments and to discuss their theories openly. Boyle, who has been called the founder of modern chemistry, was one of the first to practice chemistry as a true science. He believed in the experimental method. In his most important book, *The Sceptical Chemist,* he clearly distinguished between an element and a compound or mixture. Boyle is best known today for the gas law that bears his name. A French chemist, Antoine Lavoisier (1743-1794), placed the science on a firm foundation with experiments in which he used a chemical balance to make quantitative measurements of the weights of substances involved in chemical reactions. The use of the chemical balance by Lavoisier and others later in the 18th century was almost as revolutionary in chemistry as the use of the telescope had been in astronomy. Thereafter, chemistry became a quantitative experimental science. Lavoisier also contributed greatly to the organization of chemical data, to chemical nomenclature, and to the establishment of *the law of conservation of mass* in chemical changes. During the period from 1803 to 1810, John Dalton (1766-1844), an English schoolteacher, advanced his atomic theory. This theory placed the atomistic concept of matter on a valid rational basis. It remains today as a tremendously important general concept of modern science. Since the time of Dalton, knowledge of chemistry has advanced in great strides, with the most rapid advancement occurring at the end of the 19th century and during the 20th century. Especially outstanding achievements have been made in determining the structure of atom, understanding the biochemical fundamentals of life, developing chemical technology, and mass production of chemicals and related products.