



# A CRITICAL EVALUATION OF CHEMISTRY AND MODERN PRINCIPLE OF CHEMISTRY

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**Abstract:** The scientific study of matter's properties and behavior is known as chemistry. It is a natural science that studies the elements that make up matter, as well as the compounds made up of atoms, molecules, and ions: their composition, structure, qualities, and behavior, as well as the changes that occur when they mix with other things. In terms of subject matter, chemistry is midway between physics and biology. Because it provides a fundamental foundation for understanding both basic and applied scientific fields, it is also known as primary science. Parts of plant chemistry, the formation of igneous rocks, the development of air ozone and the degradation of environmental toxins, the characteristics of lunar soil, how medications work, and how to collect DNA evidence at a crime scene are all explained by chemistry.

**Index Terms - Chemistry, Modern, Principles, Evaluation**

## 1.1 Introduction:

The scientific study of matter's properties and behavior is known as chemistry. It is a natural science that studies the elements that make up matter, as well as the compounds made up of atoms, molecules, and ions: their composition, structure, qualities, and behavior, as well as the changes that occur when they mix with other things. In terms of subject matter, chemistry is midway between physics and biology. Because it provides a fundamental foundation for understanding both basic and applied scientific fields, it is also known as primary science. Parts of plant chemistry, the formation of igneous rocks, the development of air ozone and the degradation of environmental toxins, the characteristics of lunar soil, how medications work, and how to collect DNA evidence at a crime scene are all explained by chemistry.

Chemistry is a field of natural science that studies the qualities of substances, as well as the changes they go through and the natural laws that govern these changes. The science and study of matter, including its properties, composition, and reactivity, is known as chemistry. Chemistry's fundamental units or components are the atom and the molecule. Chemists are always interested in finding and understanding how chemical transformations take place.

Our basic needs of food, clothing, shelter, health, energy, and clean air, water, and soil all require chemistry. Because it connects physics and mathematics, biology and medicine, and earth and environmental sciences, chemistry is often referred to as the central science. Chemistry teaches abilities that are important in everyday life. Learning chemistry, as a science, entails learning how to be objective, reason, and solve issues. Aids you in comprehending current events, such as petroleum news, product recalls, pollution, the environment, and technical advancements.

### **1.2 Evolution of Chemistry:**

Chemistry's history stretches from the dawn of civilization to the present day. Civilizations have been using technology that would eventually become the foundation of many fields of chemistry since several millennia BC. Metals are extracted from ores, pottery and glazes are made, beer and wine are fermented, compounds are extracted from plants for medicine and perfume, fat is rendered into soap, glass is made, and bronze alloys are made. Alchemy, which is an intuitive but non-scientific method to understanding the constituents of matter and their interactions, came before chemistry.

Although it was unsuccessful in understanding the nature of matter and its changes, alchemists laid the groundwork for modern chemistry by conducting experiments and recording the results. When Robert Boyle created a clear distinction between them in his work *The Sceptical Chymist*, chemistry as a field of knowledge distinct from alchemy began to develop.

While both alchemy and chemistry are concerned with substance and its transformations, chemists' work was distinguished by their use of the scientific method. With the work of Antoine Lavoisier, who devised a law of conservation of mass that required precise measurement and quantitative measurements of chemical events, chemistry is now regarded an established science. The history of chemistry is inextricably linked to the history of thermodynamics, thanks to Willard Gibbs' contributions.

### 1.3 Modern Principles of Chemistry:

The quantum mechanical model of atomic structure is now in use. Traditional chemistry begins with the study of fundamental particles, such as atoms, molecules, and substances, as well as metals, crystals, and other matter groupings. In isolation or in combination, matter can be investigated in solid, liquid, gas, and plasma phases. Chemical interactions, reactions, and transformations are usually the result of interactions between atoms, which result in rearrangements of the chemical bonds that hold atoms together. In a chemistry lab, such behaviors are investigated. Various types of laboratory glassware are commonly used in chemistry laboratories. Glassware, on the other hand, is not essential to chemistry, and much experimental (as well as applied/industrial) chemistry is done without it.

The conversion of one or more compounds into others is referred to as a chemical reaction. At the heart of such a chemical transition is the rearranging of electrons in chemical bonds between atoms. It can be symbolically described using a chemical equation, which usually involves atoms as subjects. The number of atoms on the left and right sides of a chemical transformation equation is equal. (When the number of atoms on either side is uneven, the change is known as a nuclear reaction or radioactive decay.) Chemical laws restrict the sorts of chemical reactions that a substance can undergo, as well as the energy changes that can occur as a result of those processes.

1. **Matter:** Matter is defined in chemistry as anything that has rest mass and volume (takes up space) and is composed of particles. The particles that make up matter have rest mass as well not all particles, such as photons, have rest mass. Matter can be a single chemical substance or a combination of several substances.
2. **Atom:** Chemistry's fundamental unit is the atom. It is made up of a dense core termed the atomic nucleus that is surrounded by an electron cloud. The nucleus contains of positively charged protons and uncharged neutrons (together known as nucleons), whereas the electron cloud is made up of negatively charged electrons that orbit the nucleus. The negatively charged electrons in a neutral atom balance out the positive charge of the protons. The nucleus is dense; a nucleon's mass is roughly 1,836 times that of an electron, whereas an atom's radius is roughly 10,000 times that of its nucleus.

3. **Element:** A chemical element is a pure material made up of only one type of atom. It is identified by the number of protons in the nuclei of its atoms, which is known as the atomic number and symbolised by the letter Z. The total of the number of protons and neutrons in a nucleus is the mass number. Although all the nuclei of all atoms belonging to one element will have the same atomic number, they may not have the same mass number; isotopes are atoms of the same element with varying mass numbers. For instance, all atoms having 6 protons in their nucleus are carbon atoms, however carbon atoms can also have mass numbers of 12 or 13.
4. **Compound:** A compound is a pure chemical substance made up of several components. A compound's properties differ greatly from those of its individual elements. The International Union of Pure and Applied Chemistry develops a standard nomenclature for chemicals. Organic substances are named using the organic nomenclature system. Inorganic compounds are given names using the inorganic nomenclature system. When a molecule has more than one component, the electropositive and electronegative components are classified. The Chemical Abstracts Service has also created an indexing system for chemical substances. Under this method, each chemical substance is designated by a number known as its CAS registration number.
5. **Molecule:** A molecule is the tiniest, indivisible part of a pure chemical substance with its own set of chemical properties, such as the ability to undertake specific chemical interactions with other chemicals. This concept, however, only applies to substances made up of molecules, which is not the case for many substances. Molecules are normally made up of a collection of atoms joined by covalent bonds in such a way that the structure is electrically neutral and all valence electrons are paired with other electrons in bonds or lone pairs.
6. **Substance and Mixture:** A chemical substance is a type of stuff that has a certain composition and set of characteristics. A mixture is a group of substances. Air and alloys are examples of mixes.
7. **Mole and Substance Quantity:** The mole is a unit of measurement for a substance's quantity. The number of particles per mole is known as the Avogadro constant, and one mole is defined as containing exactly particles (atoms, molecules, ions, or electrons). The molar concentration of a material is the amount of that substance per volume of solution, and it's usually expressed as mol/dm<sup>3</sup>.

#### 1.4 Conclusion:

Chemistry is one of the most significant fields of modern science, and it is concerned with the chemical properties of various substances. Chemistry's Importance: Chemistry is extremely vital and is required in our modern lifestyle for effective living. Our basic needs of food, clothing, shelter, health, energy, and clean air, water, and soil all require chemistry. Chemical technologies improve our quality of life in a variety of ways by giving new answers to health, material, and energy-related issues. Chemistry is an important aspect of our daily lives. Chemistry is the first class of the day. The meals we eat, the air we breathe, cleaning chemicals, our emotions, and literally every object we can see or touch all contain chemistry.

#### 1.5 References:

1. Zoology - Wikipedia. (2021, June 10). Zoology.
2. Chemical Sciences in the Twentieth Century: Bridging Boundaries, Carsten Reinhardt. ISBN 3-527-30271-9. pp. 1–2. Wiley-VCH, 2001. ISBN 3-527-30271-9.
3. Ernest Weekley (1967). Modern English Etymological Dictionary Dover Publications, New York, ISBN 0-486-21873-2
4. James Armstrong (2012). An Applied Approach to General, Organic, and Biochemistry p. 48, Brooks/Cole. The ISBN for this book is 978-0-534-49349-3.
5. Magnesium and Magnesium Alloys, by M.M. Avedesian and Hugh Baker, ASM International, p. 59.