

IMPORTANCE AND SCOPE OF CHEMISTRY

Science can be viewed as a continuing human effort to systematize knowledge for describing and understanding nature. It is such a wide subject that for the sake of convenience, it is sub-divided into different disciplines which mainly include physics, chemistry, biology and geology etc. **“Chemistry is the branch of science that studies the composition, structure and properties of matter and changes which the matter undergoes under different conditions and the laws which govern these changes”.**

Scope of chemistry: In chemistry we study the composition of materials to find out what they are made of. The marvelous thing about chemistry is that all the matter in the universe is made up of tiny smallest particle called atoms and molecules. It is very astonishing that only about 114 types of atoms make up whole of the matter in the universe. We also learn how their composition affects their characteristics and behavior so that we can plan to make new materials with properties that are desired by us. For this we have to learn how substance undergoes changes in composition and properties. There is no progress in science without chemistry. Thus, studying chemistry is essential for us to understand better the world in which we live.

Main applications of chemistry: Chemistry plays an important role in our daily life. It has helped us to meet all our requirements for a better life such as food, good health and comfort etc. Without the knowledge of chemistry, our life would have been very dull and dreary. Some of the important applications of chemistry are given below:

Supply of food: With increase in population, the need for the overall amount of food has increased manifold. Chemistry has helped to provide chemical fertilizers such as urea, calcium superphosphate, sodium nitrate, ammonium sulphate etc. which have increased the yield of crops and fruits. It has helped to protect the crops from insects and harmful bacteria by the use of certain effective insecticides, fungicides and pesticides. The use of preservatives has helped to preserve food products like jam, butter, squashes etc. for longer periods.

Contribution to better health and sanitation: It has given us a large number of life saving drugs like cis-platin and taxol have been found to be very effective for cancer therapy and AZT (Azidothymidine) is used for AIDS victims. It has also given us a variety of drugs such as antipyretics (to lower body temperature in high fever), analgesics (to relieve pain), tranquilizers (for treatment of stress and mental diseases), antibiotics (cured a variety of diseases due to harmful microorganisms). Antiseptics such as dettol are used to stop infection of the wounds. Disinfectants such as phenol are used to kill the microorganisms present in drains, toilets, floors etc. In fact, the use of more effective medicines and vitamins etc. and better sanitary conditions have helped to increase the average life span.

Shelter and metals: It has given us building materials like cement, glass, bricks, steel and plastics in the construction of safer homes and multi-storied building, dams and bridges which can last for centuries. Metals like gold, silver, copper, iron, aluminium, zinc and a large number of their alloys are used for making ornaments, utensils, coins and many industrial and agricultural implements.

Articles of domestic use: Chemistry has made our homes more comfortable by supplying a large number of articles of domestic use such as detergents, oil and fats, sugar, paper, glass, unbreakable plastic wares, paints, varnishes, cosmetics, perfumes, cooking gas etc.

Transport and communication: Almost all means of transport including automobiles (scooter, cars, trucks, buses etc.) aero planes, helicopters, and railways use either petrol or diesel (petroleum products) or coal which are all chemical products. Chemistry has also given high quality fuels which have made possible the landing of Apollo on the moon and Viking on the Mars. Knowledge of chemistry has also helped in the development of telephone and telegraph as important means of communication.

Applications in industry: Chemistry has played an important and useful role towards the development and growth of a number of industries, e.g., glass, cement, paper, textiles, leather, dye, paint, pigment, petroleum, sugar, plastics, pharmaceuticals etc.

Entertainment: Cinemas, one of the common sources of entertainment and also video-cameras as well as simple cameras make use of films which are made of celluloid (a chemical compound) and coated with suitable chemicals.

With a better understanding of chemical principles it has now become possible to design and synthesize new materials having specific magnetic, electric and optical properties. This has led to the production of superconducting ceramics, conducting polymers, optical fibers and large scale miniaturization of solid state devices.

Problems caused by progress in chemistry:

- (i) Nuclear energy is useful but disposal of nuclear waste poses a serious problem to humanity.
- (ii) Phonograph records have added to our pleasure for listening music but they are made of polyvinyl chloride, produced from vinyl chloride which can cause liver cancer in industrial workers.
- (iii) Antibiotics have eliminated infectious diseases but their overuse is very harmful.
- (iv) Insecticides have increased the food supply but they do a lot of harm to birds, fishes and useful insects.
- (v) Use of polythene bags is posing a serious threat to sewerage system.
- (vi) Chemistry has given drugs like LSD, cocaine, brown sugar etc. which are proving a curse to the society.
- (vii) Refrigerants like chlorofluorocarbons (CFCs) which destroy the ozone layer have been replaced by environment friendly chemicals. However, green house gases like CH_4 , CO_2 etc. are still posing a challenge to the chemists.

Understanding of biochemical processes, use of enzymes for large scale production of chemicals and synthesis of new exotic materials are some of the intellectual challenges for the future generation of chemists. A developing country like India needs talented and creative chemists for accepting such challenges.

Career opportunities after studying chemistry – Chemical sciences offer access to a wide range of career. In fact it is the study of all materials and is vital to every aspect of our lives. Physical chemistry, Inorganic chemistry, organic chemistry, analytical chemistry and biochemistry are the main branches of chemistry. The career options in chemistry are practically endless! However, employment options depend on how far the education, training and experience taken. A chemistry or biochemistry degree can lead to career paths in professions such as professors, medicine, pharmacology, agriculture, chemical engineering, forensic science etc. Some of the important career opportunities after studying chemistry at senior secondary level is as:

1. Clinical biochemist
2. Chemical development engineer
3. Toxicologist
4. Laboratory assistant
5. Research associate/ Research assistant
6. Textile industry
7. Biotechnology
8. Plastics and Polymer industry
9. Quality controller
10. Teacher
11. Biochemistry
12. Scientific journalist
13. Forensic scientist
14. Analytical chemist
15. Petrochemical and Pharmaceutical industries