Terminology

Chemistry: Chemistry is study of matter and changes matter undergoes. Matter is defined as anything that mass occupies space. The substances that make up matter have unique properties that chemists use to identify them. Chemists are concerned with developing tools to study matter and concepts to describe the properties of matter. Elements and compound a pure substance is a form of matter that has a fixed composition and distinct properties. Examples are water, chalk and iron just as each individual person has a set of unique characteristics, such as mass, density, color….

Types of pure substance: elements and compounds

Element: An element is pure substance and cannot be decomposed into a simpler substance by chemical reaction: oxygen, mercury and iron….

Compounds are pure substances that are composed of two or more elements in fixed proportions. Compounds can be broken into simpler substances by chemical reaction.

Atomic Number and Mass Number: Atoms are defined by the number of protons in nucleus. The number of protons in the atomic nucleus is called the atomic number Z of an element. The total mass of an atom is determined almost entirely by the number of the protons and neutrons, in most cases the masse of electrons can be neglected because they are so much smaller. The mass number A is the total number of neutrons and protons in the nucleus of an atom. The number of neutrons in an atom is A-Z.

Isotopes: atoms of a given element that differ in the number of neutrons and consequently in mass are called isotopes.

Viscosity: one characteristic of liquids that we have all observed is related to how freely they flow. For example water pours much more freely than motor oil, and motor oil more readily than glycerol.

Buffer solution is a solution where the pH does not change significantly on dilution or if an acid or base is added at constant temperature. Its pH changes very little when a small amount of strong acid or base is added to it. It's consists of a mixture containing a weak acid and the conjugate base of the weak acid or a weak base and the conjugate acid of the weak base.

Titration is a technique used to determine the concentration of a substance in a solution. It involves the controlled addition of a solution of known concentration (titrant) to a solution of the substance being analyzed(analyte) until the reaction between the two is complete. The point at which the reaction is just complete is calledthe equivalence point, and it is often detected using an indicator or by monitoring a physical property, such as pH.

Precipitation Titration: Formation of a precipitate by the reaction between the titrant and analyte. The endpoint is reached when the precipitate just starts to form or disappears.

Redox Titration: Involves a redox (reduction-oxidation) reaction between the titrant and analyte. The endpoint is determined by a change in oxidation states.

Colorimetric titration is a technique that combines the principles of titration and colorimetry. In colorimetric titrations, the endpoint of the titration is determined by a visible color change rather than a pH change or other physical property.

Colours indicators: are substances that change color as the titration progresses, allowing for the visual detection of the endpoint. These indicators are chosen based on their ability to form a colored complex with one of the reacting species at or near the equivalence point.

Bromothymol Blue: is yellow in acidic solutions, green in neutral solutions, and blue in basicsolutions.

Phenolphthalein: is colorless in acidic solutions but turns pink or red in basic solutions.

Organic chemistry is the study of the structure, properties, composition, reactions, and preparation of carbon-containing compounds. Most organic compounds contain carbon and hydrogen, but they may also include any number of other elements (e.g., nitrogen, oxygen, halogens, phosphorus, silicon, sulfur).

Inorganic chemistry is concerned with the properties and behavior of inorganic compounds, which include metals, minerals, and organometallic compounds.

Analytical chemistry is the chemistry discipline that studies the chemical composition of materials and develops the tools used to examine chemical compositions. It involves wet lab chemistry as well as use of instrumentation. Analytical chemistry is important in science, engineering, medicine, and industry.

Qualitative analysis and quantitative

Qualitative analysis and quantitative analysis are two essential methods used in chemistry to identify and measure the chemical components of a sample.

Qualitative analysis is used to identify the presence or absence of certain chemical compounds or elements in a sample. This method involves observing the sample's physical properties, such as color, texture, and odor, and performing chemical tests to identify specific ions or functional groups.

Quantitative analysis, on the other hand, is used to determine the amount or concentration of a particular compound or element in a sample. In this method, we measure the sample's physical properties, such as mass, volume, and density, and perform calculations to determine the amount or concentration of the compound or element.

Both qualitative and quantitative analysis are essential in chemistry and are often used together to provide a more complete analysis of a sample. Qualitative analysis is used to identify the presence of specific compounds or elements, while quantitative analysis is used to determine the amount or concentration of those compounds or elements.

Physical chemistry is the study of macroscopic and microscopic phenomena in chemical systems in terms of the principles, practices, and concepts of physics.

Biochemistry, study of the chemical substances and processes that occur in plants, animals, and microorganisms and of the changes they undergo during development and life.

Environmental chemistry: Environmental chemists study how chemical properties and reactions happen in nature as well as how chemicals affect and exist in water, soil and air.

Industrial chemistry: Chemists in this field usually work in the private sector and use methods that chemically improve products, like adhesives and cosmetics.

Nuclear chemistry: Specialists in this branch of chemistry study nuclear processes like radioactivity and the transformations of atoms. They understand the complexities of nuclear properties and may use their knowledge to develop alternative methods of harnessing nuclear energy.

Petrochemistry: This is the branch of chemistry that focuses on chemicals and reactions within petroleum and natural gases. Chemists in this field may study materials to learn how to make fuels more efficient and environmentally friendly.

Pharmaceutical chemistry: Chemists within this field study chemicals and reactions in medicinal drugs to better design and produce treatments and cures for illnesses.

Phytochemistry: This is the study of chemicals and reactions within plants, as well as the chemical derivatives of plants. Chemists in this field study plants to better understand how they intake and process chemicals and perform chemical reactions.

Radiochemistry: This is the study of radioactive materials. Chemists within this field strive to understand the nature of chemicals and reactions within radioactive fields and how the two interact and influence one another.

Polymer chemistry: This field of chemistry focuses on the synthesis, properties and structures of macromolecules like polymers. Scientists in this branch of chemistry help to optimize gloves, tubing, sutures, artificial joints and bandages.

Stereochemistry: Stereochemistry is a branch of chemistry that focuses on the structure of atoms and how they connect to form molecules. Scientists within this field study spatial arrangements within molecules and experiment on manipulating those structures.

Polymers: is a compound with an unusually high molecular mass, consisting of a large number of small molecular units that are linked together. The small unit is repeated many times is called a monomer. A typical polymer molecule contains a chain of monomers several thousand units long. Polymers are often called macromolecules.

Proteins, nucleic acid, carbohydrates and rubber are natural polymers. Synthetic polymers such as nylon, polyester and polyethylene are organic compounds.

Carbohydrates, or carbs, are sugar molecules. Along with proteins and fats, carbohydrates are one of three main nutrients found in foods and drinks.

Your body breaks down carbohydrates into glucose. Glucose, is the main source of energy for your body's cells, tissues, and organs. Glucose can be used immediately or stored in the liver and muscles for later use.

Different types of carbohydrates: There are three main types of carbohydrates:

Sugars: They are also called simple carbohydrates because they are in the most basic form. They can be added to foods, such as the sugar in candy, desserts, processed foods, and regular soda. They also include the kinds of sugar that are found naturally in fruits, vegetables, and milk.

Starches: They are complex carbohydrates, which are made of lots of simple sugars strung together. Your body needs to break starches down into sugars to use them for energy. Starches

include bread, cereal, and pasta. They also include certain vegetables, like potatoes, peas, and corn.

Fiber**:** It is also a complex carbohydrate. Your body cannot break down most fibers, so eating foods with fiber can help you feel full and make you less likely to overeat. Diets high

in fiber have other health benefits. They may help prevent stomach or intestinal problems, such as constipation. They may also help lower cholesterol and blood sugar. Fiber is found in many foods that come from plants, including fruits, vegetables, nuts, seeds, beans, and whole grains.

Polysaccharids are major classes of biomolecules. They are long chains of carbohydrate molecules, composed of several smaller monosaccharides. These complex bio-macromolecules functions as an important source of energy **in animal cell** and form a structural component of a plant cell. It can be a homopolysaccharide or a heteropolysaccharide depending upon the type of the monosaccharides.

Polysaccharides can be a straight chain of monosaccharides known as linear polysaccharides, or it can be branched known as a branched polysaccharide.

Characteristics of polysaccharides

1. They are not sweet in taste.
2. Can be extracted to form a white powder.
3. They are high molecular weight carbohydrates.

Cellulose is an organic compound with the formula $(C_6H_{10}O_5)_n$, a polysaccharide consisting of a linear chain of several hundred to many thousands of D-glucose units. Cellulose is an

important structural component of the primary cell wall of green plants, many forms of algae. Cellulose is the most abundant organic polymer on Earth.

Polyester a synthetic resin in which the polymer units are linked by ester groups, used chiefly to make synthetic textile fibers.

Plastic is a material consisting of a wide range of synthetic organic compounds that are malleable and, therefore, can be molded into solid objects. Plasticity is the general property of all materials that involves permanent deformation without breaking.

Plastic is an incredibly versatile category of materials that are used in packaging, construction, medical equipment, and electronics.

Types of plastic:

a) Acrylic or Polymethyl Methacrylate (PMMA)
b) Polycarbonate (PC)
c) Polyethylene (PE)
d) Polypropylene (PP)
e) Polyethylene Terephthalate (PETE or PET)
f) Polyvinyl Chloride (PVC)
g) Acrylonitrile-Butadiene-Styrene (ABS)