

PROGRAM/COURSE OUTCOME

SUBJECT: CHEMISTRY

PROGRAM OUTCOME:

The government laboratories , universities or college and the industries, mainly chemical & pharmaceuticals are the three major sectors which recruit the chemistry graduate for the entry level jobs in these fields, graduates need atleast a bachelor degree in chemistry . Professionals working in this field are called chemist.

After the Successful completion of B.Sc. Chemistry, students can either opt for advanced studies or search for jobs in related fields; there are plenty of opportunities which exist for the chemist in the present scenario. Almost every field in the world use chemicals as a part in some or other ways. So the needs for the chemist are also high in demand. There are various specializations in the field of chemistry the option for higher studies in the field of chemistry are:

1. M.Sc. Chemistry
 2. M.Sc. analytical chemistry.
 3. M.Sc. Drug Chemistry.
 4. M.Sc. Pharmaceuticals Chemistry
 5. M.Sc. Physical and Material chemistry
- **Carrier opportunities after B.Sc. Chemistry are :-**
1. Analytical Chemistry
 2. Biomedical Chemistry
 3. Quality Controller.
 4. Safety, health and environmental specialist.
 5. Chemical Engg. Associate
 6. Industrial Research Scientist

COURSE OUTCOME:

Class: B.Sc. 1st (Semester: 1st)

Core course: I

Paper: Inorganic Chemistry (CCL-104)

Atomic structure (I and II)

Atoms are building blocks. In chemistry, we like to study atoms and their structure because the universe revolves around the properties of elements. Till the time of early Indian and Greek philosopher around 400 BC. It was difficult to explain why the reaction took place in nature and they combined to form compound. And it was difficult to explain because they don't know the constituents of atom and its structure.

Chemical bonding and molecular structure

A chemical bond is a lasting attraction between atoms that enables the formation of chemical compounds. The bond may result from the electrostatic force of attraction between atoms with opposite charges, or through the sharing of electrons as in the covalent bonds. Chemical bonds hold an enormous amount of energy. The bonds connect atoms and molecules and thus literally make all baryonic mass possible. Without Chemical bonds, everything we know would not exist. We would not exist. The Earth, the stars, asteroids, moons, every item ever invented. It would not exist. Because atoms would not 'connect' and so all matter could not be formed. Chemical structure determines the molecular geometry of a compound by portraying the spatial arrangement of atoms and chemical bonds in the molecule. This provides chemists with an important visual representation of a chemical formula.

Core Course:-II

Paper:-Organic Chemistry (CCL-105)

Fundamental of organic chemistry

It includes the study of life and all of chemical reactions related to life. Organic chemistry play a part in the development of common household chemicals, food, plastics, drugs and most of the chemical part of daily life.

Stereochemistry

Stereochemistry involves the study of the relative spatial arrangement of atoms that form the structure of molecules. It includes methods for determining and describing physical or biological properties. It also determine the stereo selectivity of a particular reaction, a drug is active to a particular part of the body.

Hydrocarbons (Alkane, Alkene, Alkyne)

Organic chemistry is the study of carbon compounds, so the study of organic chemistry is important because all living things are based on carbon compounds. Carbon is unique in that it can form up to four bonds in a compound, so they can easily bond with other carbon atoms forming long chains or rings.

Class: B.Sc.-I (Semester: II)

Core course: III

Paper: Physical chemistry-I (CCL-204)

Chemical Energetics

It's of practical importance because it governs the behaviour of chemical reactions and processes that convert energy in the form of heat into other forms of energy like mechanical work or electrical potentials. Since these sorts of things are what make modern life as you know it possible. Thermodynamics is of central interest to people who want to make things like pharmaceuticals and power plants. It's of theoretical and intellectual importance because it concerns how energy interacts with matter, which is one of the basic objects of study in chemistry and because it's the basis of the "arrow of time" in our understanding of the universe.

Chemical equilibrium

Chemical equilibrium is the study of how heat and work relate to each other both in changes of state and in chemical reactions. It involves a series of rules and laws that explain which processes can happen spontaneously and which need some help. It also helps to determine if a particular reaction will occur and if it will release or absorb energy as it occurs. It is also possible to calculate how much energy a reaction will release or absorb and this information can be used to determine if it is economically viable to use a particular chemical process. There are several basic principles of chemical thermodynamics to consider: systems, the laws of thermodynamics, and enthalpy. Chemical thermodynamics is also concerned with four particular quantities: internal energy, enthalpy, entropy and the Gibbs free energy.

Ionic equilibrium

Equilibrium in general refers to a state where no further changes in concentration of reacting species involved takes place, provided none of conditions like temperature, pressure, catalyst etc. remain unchanged too. In industries or in daily life we need stuff to be done. In general, I would not want my chemical process to practically stop but unfortunately it happens because of thermodynamics. So, we study this concept just to tackle this problem. For instance, Habers' process is an extremely important process to produce ammonia which in turn is used in production of numerous fertilizers. So, the study of chemical equilibrium enables us to know the steps which we can take to ensure continuous supply of ammonia.

Core course: - IV

Paper: - Organic Chemistry-II (CCL 205)

Aromatic Hydrocarbon:-

Aromaticity is important because it makes molecules more stable. Aromatic compounds play important role in biochemistry and in industry.

Alkyl and Aryl Halides:-

Alkyl halides are used as refrigerants, propellants for aerosol, for generating foamed plastics like expanded polystyrene and as a solvent for dry cleaning. Aryl halides like chlorobenzene is used as a solvent for dispersing the herbicide lasso.

Alcohol, Phenol and Ether :-

Apart from human consumption these are used in many applications or to get different compounds. By reacting with a suitable reagents we can get the desired compound.

Aldehyde and Ketone :-

These are used in the production of textile, varnishes, plastics, paint remover, paraffin wax etc. Acetone is used in chemical peeling and for acne treatment.

Class: B.Sc.-II (Semester: III)

Core Course:-V

Paper:-Physical chemistry-II (CCL-304)

Unit-1(Solution)

Understanding the chemistry of solution is important because most chemical reaction both in the laboratory and in nature take place in solutions.

Unit-2 (Conductance)

Testing the electrical conductivity of water provides much practical information about a solution. Not only is the conductivity measurement itself useful, but it can also be used to estimate the total dissolved solids of water.

Unit-3 (Phase equilibria)

Gibb's phase rule provides the theoretical foundation, based in thermodynamics, for characterizing the chemical state of system and predicting the equilibrium relations of phases present as a function of physical conditions such as pressure and temperature.

Unit-4 (Electrochemistry)

Electrochemistry is defined as that branch of chemistry deals with the study of the production of electricity from the energy that is released during spontaneous chemical reactions and the use of electrical energy to bring about non-spontaneous chemical transformations.

Core Course:-VI

Paper: - Organic Chemistry-III (CCL-305)

Unit-1 (Carboxylic acids and their derivatives)

Many fruit aromas including banana (isoamyl acetate) and pineapple (ethyl butanoate) can be synthesized from carboxylic acids using esterification reaction.

Unit-2 (Amines and Diazonium salts)

Diazonium salts are used in dye and pigment industry. Many analgesics contain amine group like morphine, demerol, that relieve pain.

Unit-3 (Amino acids, proteins and peptides)

Amino acids are building blocks of protein. Proteins and peptides are fundamental components of cells that carry out important biological functions.

Unit-4 (Carbohydrates)

Mainly carbohydrates give energy to body, they may be monosaccharides, disaccharides and polysaccharides.

Class:-B.Sc 2nd (Semester-IV)

Core Course:-VII

Paper:-Inorganic Chemistry-II (CCL-404)

Unit-1(Transition elements)

Transition metals are those elements which have filled incompletely d subshell in their ground state. These elements are used as catalyst in chemical industry. For example iron and its amalgam, steel are utilised in development industry.

Unit-2 (Lanthanoids and activities)

These are the f-block elements. These are of great importance in nuclear chemistry as actinoids are radioactive elements.

For example plutonium is a part of nuclear reactor and nuclear bombs.

Unit-3(Coordination chemistry)

Coordination compounds have specific colours. Therefore they find a common place in industries. One of the most important human medical applications of coordination compounds is as chelating agents. A chelating agent used in medicine to capture heavy metals.

Unit-4(Crystal field theory)

Crystal field theory is a model for the bonding interaction between transition metals and ligands. It describes the effect of attraction between the positive charge of metal cation and negative charge on the non bonding electrons of the ligand.

Core Course:-VIII

Paper:-Physical Chemistry (CCL-405)

Unit-1 (Kinetic theory of gases)

Explains the macroscopic properties of gases, such as pressure, temperature, viscosity, thermal conductivity and volume by considering their molecular composition and motion known as brownian motion, the motion of the pollen or dust results from their collisions with the liquid molecules.

Unit-2 (Liquids)

Many liquids are used as solvent to dissolve other liquids or solids solutions are found in a wide variety of applications, including paints, sealants and adhesives.

Unit-3 (Solids)

The reason a solid has a rigid shape is that the atoms or molecules are tightly connected via chemical bonds. Solid state physics and solid state chemistry are two branches of science dedicated to studying the properties and synthesis of solids.

Unit-4 (Chemical kinetics)

Chemical kinetics also known as reaction kinetics, is the branch of physical chemistry that is concerned with understanding the rates of chemical reactions .It is to be contrasted with thermodynamics which deals with the deviation in which a process occurs but in itself tells nothing about its rate .

CLASS: - B.Sc. III (Semester-V)

PAPER :- INORGANIC CHEMISTRY

PAPER-XV (CH-301)

CHAPTER	OBJECTIVES
1. METAL LIGAND BONDING IN TRANSITION METAL COMPLEXES	Crystal field theory is a model for the bonding interaction between transition metals & ligands. It describes the effect of attraction between the positive charge of metal cation and negative charge on the non bonding electrons of the ligand.
2. THERMODYNAMIC AND KINETIC STABILITY OF METAL COMPLEXES	This topic tells about the various types of stability associated with metal complexes. Trans effect helps in the synthesis of particular type of complexes i.e. cis & trans.
3. MAGNETISM	In this topic we study the various types of magnetism associated with metal complexes. Also the methods for the determination of magnetic susceptibility. Variation of magnetic moment with temperature. Orbital contribution to the total magnetic moment.
4. ELECTRONIC SPECTRA OF TRANSITION METAL COMPLEXES	This topic tells about the origin of colours which are associated with metal complexes. Determination of no. of microstates, term symbols. Identification of ground state terms. Orgel diagram tells about the various types of transition with Complexes

PAPER: - ORGANIC CHEMISTRY

PAPER-XVII (CH-303)

CHAPTER	OBJECTIVES
1. NMR SPECTROSCOPY	It is an analytical chemistry techniques used in quality control and research for determining the contents and purity of a sample as well as its molecular structure. for e.g. NMR can quantitatively analysed mixtures containing known compounds
2. CARBOHYDRATES	The main advanced analytical methodologies applied to determine the different carbohydrates family (mono, Oligo & polysacharrides) macromolecules including different glycosilated compounds are reviewed consider in the sample preparation required.
3. ORGANOMETALLIC COMPOUNDS	These compounds are widely used for both stoichiometrically in research and industrials chemical reactions as well as in the roll of catalyst , where target molecules include polymer pharmaceuticals & many other types of practical products

PAPER: - PHYSICAL CHEMIS (SEMESTER-V)

PAPER-XVI (CH-302)

CHAPTER	OBJECTIVES
1. QUANTUM MECHANICS	It is important because it plays a fundamental role in explaining how the world works Physists says that quantum mechanics governs the behaviour of microscopic system, when it governs the behaviour of all physical system regardless of their size. The theory of relativity describes the behaviour of large everyday objects in the world around us. Moreover this theory is not enough to describe things at a very small scale. At the level of atoms and subatomic particles object behaves very differently and quantum theory is an attempt to describe the behaviour of matter and energy at this subatomic scale
2. SPECTROSCOPY	It represents scientific measurement techniques for the study of matter through its interaction with different components of electromagnetic spectrum. The Spectrum can be used to detect identify the information about the atoms and molecules. Spectroscopy is also used in astronomy and remote sensing on earth
3. PHYSICAL PROPERTIES & MOLECULAR STRUCTURE	Different physical properties such as molar refraction, optical activity, dipole moment, magnetic susceptibility etc. Are very helpful in elucidating the chemical structures of the compounds

PAPER: - INORGANIC CHEMISTRY (SEMESTER –VI)**PAPER-XVIII (CH-306)**

CHAPTER	OBJECTIVES
1. ORGANOMETALLIC COMPOUNDS	Organometallic compounds are widely used in both stoichiometrically in research and industrial chemical reactions, as well as in the role of catalysts to increase the rates of such reactions (e.g., as in uses of homogeneous catalysis), where target molecules include polymers, pharmaceuticals, and many other types of practical products.
2. ACIDS & BASES	Acids & bases function to balance the pH levels in the body .Acids & bases are found in foods, the environment and in chemicals including pharmaceuticals. The pH level in the blood is required to stay neutral, which is at a level of 7.
3. BIO- INORGANIC CHEMISTRY	Bio-inorganic chemistry deals with the role of metals and non metals in biological systems. Many biological processes such as photosynthesis, respiration, metal ion transport, enzymatic action etc. Fall into the realm of bio-inorganic chemistry. The application of bio-inorganic chemistry can also be realized in medical fields.
4. SILICONES & PHOSPHAZENES	Inorganic polymers are polymers with a skeletal structure that does not include carbon atoms in the backbone. Inorganic polymers offer some properties not found in organic materials including low temperature ,flexibility, electrical conductivity etc.

PAPER: - ORGANIC CHEMISTRY (SEMESTER –VI)**PAPER-XX (CH-306)**

CHAPTER	OBJECTIVES
1. ORGANIC SYNTHESIS VIA ENOLATES	Enolates or oxyallyl anions are versatile reagent for the formation of α -substituted carbonyl compounds and are therefore important intermediated for the synthesis of complex molecules. The spectrochemical outcome of an enolates reaction occurs depend on the geometry of the enolates
2. HETROCYCLIC COMPOUNDS	These compounds have a wide range of applications They are predominantly used as pharmaceuticals, as agrochemicals and as veterinary products. They also find application as sanitizers developers antioxidants, co-polymers, dye stuffs.
3. AMINO ACIDS PEPTIDES AND PROTEINS	They are essential for the structure function and regulations of the bodies tissues and organs. Proteins are made up of 100 of smaller units called amino acids they are attached with the peptide bonds and forming along chain you can think of a proteins as a strings of beads where each beads is an amino acids
4. SYNTHETIC POLYMERS	Are human made polymersw classified intop four main categories thermoplastic, thermosets, elastomers and synthetic fibers .These are commonly found in a variety of consumer products.

PAPER: - PHYSICAL CHEMISTRY (SEMESTER-VI)

PAPER-XIX (CH-305)

CHAPTER	OBJECTIVES
1. PHOTOCHEMISTRY	It is the study of chemical process that occurs because of the absorption of light Study of photochemical systems that use sunlight to derive important chemical reactions or to generate electricity is of great practical significance for the development of sustainable sources of energy
2. SOLUTIONS	Understanding the chemistry of solutions is important because most chemical reaction both in lab and in nature take place in solution. Solution chemistry is central to many industrial processes.
3. PHASE RULE	It provides the theoretical foundation based on thermodynamics for characterising the chemical state of the system and predicting the equilibrium of phase rule (minerals, melts, liquid, vapours) present as a function of physical condition such as pressure, temperature & concentration