

Semester -I				
Course Code: 22BCH1C1	Core Course-I PHYSICAL CHEMISTRY – I	T/P T	C 5	H 5
Objectives	➤ To study the gas laws, physical properties of liquids and the classification of liquid crystals, the law of mass action, its applications and the nature of colloids.			
Outcomes	Students can learn about the behaviour of gases and liquids and solve the problems regarding molecular velocities, applications of law of mass action and also learn the chemistry of colloids.			

Semester -I				
Course Code: 22BCH1P1	Core Practical-I INORGANIC VOLUMETRIC ANALYSIS PRACTICAL – I	T/P P	C 4	H 4

Max. Marks: 60

Duration: 4 Hrs.

A double titration involves the making up the solution to be Estimated and the preparation of a primary standard solution.

I. ACIDIMETRY AND ALKALIMETRY

1. Estimation of NaOH/KOH (Std. Na_2CO_3)
2. Estimation of Na_2CO_3 (Std. Na_2CO_3)
3. Estimation of HCl/ H_2SO_4 (Std. Oxalic acid)
4. Estimation of Oxalic acid (Std. Oxalic acid)

II. REDOX TITRATIONS

a) PERMANGANOMETRY

1. Estimation of Ferrous Ammonium Sulphate
2. Estimation of oxalic acid

b) DICHROMETRY

1. Estimation of Ferrous Ion
2. Estimation of ferric ion using external indicator

III IODO AND IODIMETRY

1. Estimation of Potassium dichromate
2. Estimation of Potassium Permanganate

Distribution of External marks:

Record : 10 marks

Procedure : 10 marks 60 marks

Experiment : 40 marks`

Experiment: Less than 1% error 40 marks

1 – 2 % error 30 marks

2 – 3 % error 20 marks

3 – 4 % error 15 marks

>4 % error 10 marks

Note: University practical examination – 3 hours

Semester -II					
Course Code: 22BCH2C1	Core Course-II		T/P	C	H
	INORGANIC CHEMISTRY – I		T	5	5
Objectives	The objective of this paper is to introduce the students about the composition and stability of the nucleus and types of nuclear reactions. To know about basic metallurgical processes. To provide the detailed chemistry about p-block elements especially the Nitrogen family. To gain knowledge about the magnetic properties and its applications. To study about the solubility of ionic compounds hydrogen bonding and Van der waals forces.				
Outcomes	The students become familiar with the concepts of nuclear reactions, know the basics of metallurgy, the principles of extraction and refining on metals. Students can learn about the p-block elements, Nitrogen family. They become familiar with the magnetic susceptibilities, its applications, hydrogen bonding and Van derwaals forces.				

Semester -II					
Course Code: 22BCH2P1	Core Practical-II		T/P	C	H
	INORGANIC QUALITATIVE ANALYSIS PRACTICAL – II		P	4	4
Max. Marks: 60		Duration: 4 Hrs.			
<p>Analysis of a mixture containing two cations and two anions of which one anion will be an interfering ion. Semimicro methods are to be used.</p> <p>Anions to be studied: Carbonate, Sulphide, Sulphate, Nitrate, Chloride, Fluoride, Oxalate, Phosphate, Borate and Chromate.</p> <p>Cations to be studied: Lead, Cadmium, Copper, Aluminium, Iron (only ferrous), Cobalt, Manganese, Nickel, Zinc, Barium, Calcium, Strontium, Magnesium and Ammonium ion.</p>					
Distribution of External marks					
Record	:		10	marks	
Two anions with correct procedure	:	13 + 13	26	marks	
Group Separation	:		8	marks	
Two cations with correct procedure	:	8 + 8	16	marks	

			60	marks	

Note: University practical examination – 3 hours					

Semester –III					
Course Code: 22BCH3C1	Core Course-III		T/P	C	H
	PHYSICAL CHEMISTRY – II		T	5	5
Objectives	To understand various types of photochemical processes, the laws of photochemistry and to learn the kinetics of photochemical reactions. To know the fundamental concepts of conductance studies, to understand theory of strong electrolytes and to learn the fundamentals of electrochemical cells and the calculations of cell potential. To understand various applications of EMF measurement, To study about the storage cells, fuel cells and polarography. To equip learners with concepts of symmetrical elements and its outcome.				
Outcomes	Students gain knowledge about photochemical reactions, electrochemical conductance and the applications of conductance measurements. They learn about the galvanic cells and its applications. Students can gain knowledge on the determination of pH, storage cells and fuel cells. Students can learn the basics of group theory.				

Semester –III					
Course Code: 22BCH3C2	Core Course-IV		T/P	C	H
	ORGANIC CHEMISTRY –I		T	5	5
Objectives	To study the preparation and properties of phenols, ethers and the preparation of different alcohols. To know the methods of synthesis of aldehydes, ketones and carboxylic acids, to understand about stereochemistry, symmetry elements, optical activity and conformational analysis of acyclic and cyclic compounds. To study the synthesis, reactions, stability and significance of alicyclic compounds. To understand clearly about the classification and structural features of Carbohydrates.				
Outcomes	Students can well understand the preparation of phenols, ethers and different alcohols and the mechanism of nucleophilic substitution and elimination reactions. Students can derive an easy and elegant methods to synthesize aldehydes, ketones, carboxylic acids and alicyclic compounds. Students can well understand stereochemistry and carbohydrates.				

Semester -III

Course Code:	Core Practical-III	T/P	C	H
22BCH3P1	ORGANIC ESTIMATION PRACTICAL – III	P	4	4

Max. Marks: 60**Duration: 4 Hrs.****ORGANIC ESTIMATION**

1. Estimation of phenol
2. Estimation of aniline
3. Estimation of glucose

Distribution of External marks

- | | |
|-----------------------|----------|
| 1. Record | 10 marks |
| 2. Organic estimation | 50 marks |
| a. Procedure | 10 marks |
| b. Experiment | 40 marks |

60 marks**Organic Estimation**

Less than 2% error	–	40 marks
2 – 3 % error	–	35 marks
3 – 4 % error	–	30 marks
>4 % error	–	15 marks

Note: University practical examination – 3 hours

Semester –IV					
Course Code: 22BCH4C1	Core Course-V		T/P	C	H
	ORGANIC CHEMISTRY –II		T	5	5
Objectives	To know about aromaticity, aromatic electrophilic substitution and synthesis of some important aromatic compounds, to know the synthesis of different dyes and green chemistry.				
Outcomes	Students can understand the basic knowledge of aromaticity, aromatic electrophilic substitution and synthesis of some important aromatic compounds. Students can identify the green synthetic methods and the synthesis of dyes.				

Semester –IV					
Course Code: 22BCH4C2	Core Course-VI		T/P	C	H
	INORGANIC CHEMISTRY – II		T	4	4
Objectives	To provide the detailed chemistry about halogen family and noble gases, to introduce the students about the transition and inner transition elements, to help the students to understand the development and uses of bioinorganic compounds.				
Outcomes	It may give a clear knowledge about halogen family, noble gases, transition and inner transition elements and alloys. The students will have a better understanding of hemoglobin, oxygen transport and the role of metal ions in biological systems.				

Semester -IV

Course Code:	Core Practical-IV	T/P	C	H
22BCH4P1	ORGANIC ANALYSIS PRACTICAL – IV	P	4	4

Max. Marks: 60**Duration: 4 Hrs****I. Organic Analysis**

Substances to be analysed:

1. Aromatic acid (mono carboxylic acid)
2. Aromatic ester (mono functional group)
3. Aromatic aldehyde
4. Phenol
5. Carbohydrate (Glucose only)
6. Aliphatic amide (urea)
7. Aromatic amide
8. Aromatic amine (Aniline)

Distribution of External marks

- | | |
|-----------------------------|----------|
| 1. Record | 10 marks |
| 2. Organic analysis | 50 marks |
| a. Aromatic/Aliphatic | 10 marks |
| b. Saturated/Unsaturated | 10 marks |
| c. Elements present | 10 marks |
| d. Functional group present | 15 marks |
| e. Derivative | 05 marks |

60 marks

Note: University practical examination – 3 hours

Semester –IV

Course Code: 22BCH5C1	Core Course-VII	T/P	C	H
	PHYSICAL CHEMISTRY – III	T	4	5
Objectives	To understand the basics of the first law of thermodynamics and the laws of thermochemistry. To study the second law of thermodynamics, the concept of entropy, concept of Gibbs Free energy and their applications. To understand the kinetics and the theories of reaction rate. To know the basic principles of spectroscopy.			
Outcomes	Students gain knowledge about the concept of the first law of thermodynamics and its applications and also explain the laws of thermochemistry. Students can acquire knowledge about the second law of thermodynamics, kinetics and its theories and can solve the problems related to kinetics. Students can gain knowledge on general basic principles of spectroscopy, rotational spectroscopy and its applications.			

Semester –IV

Course Code: 22BCH5C2	Core Course-VIII	T/P	C	H
	ORGANIC CHEMISTRY-III	T	4	5
Objectives	To study the basic concepts involved in spectroscopic techniques of UV, IR, NMR and Mass spectroscopy and their instrumentation techniques along with its applications. To understand stereochemistry, symmetry elements, optical activity and conformational analysis of acyclic and cyclic compounds. To study about the basic concepts, characteristic features, preparation and reaction of heterocyclic compounds. To learn the classification, structure and properties of alkaloids, terpenoids, amino acids and proteins. To understand sulpham drugs, antibiotics and their classifications and also know the information about antiseptics and disinfectants. To study the vitamins and its classifications; Hormones and their physiological functions.			
Outcomes	Can be able to know all the spectroscopic techniques in the electromagnetic spectrum. The study of instrumentation techniques is very much useful to identify the simple as well as complex organic molecules. Students can gain knowledge on stereochemistry, symmetry elements, optical activity and conformational analysis of acyclic and cyclic compounds. It brings an idea of the synthesis, reactions, applications and important features of heterocyclic compounds. Students can learn about the chemistry of alkaloids, terpenoids, amino acids and proteins. Can be able to know about sulpham drugs, antibiotics and their important features and gives the clinical uses of Antiseptics and disinfectants. Can bring the knowledge toward vitamins and their classifications and also give information about hormones.			

Semester –IV					
Course Code: 22BCH5C3	Core Course-IX		T/P	C	H
	INORGANIC CHEMISTRY - III		T	4	6
Objectives	The objective of this paper is to expose the students about the basic concepts of coordination complexes, to help the students to understand the facts of reactions and reaction mechanism in complexes. to enable the students to make sense of bonding in organometallic compounds and to understand the nature of nanomaterials, bulk materials and solid electrolytes.				
Outcomes	The students become familiar with the nomenclature and theories of coordination compounds. Enable the students to apply the theory to the complexes and applications of coordination complexes in inorganic analysis. The students will be able to identify the bonding in organometallic compounds and learn the chemistry of nanomaterials, bulk materials and solid electrolytes.				
Semester -V					
Course Code: 22BCH5P1	Core Practical-V		T/P	C	H
	GRAVIMETRIC ESTIMATION AND ORGANIC PREPARATION PRACTICAL – V		P	4	4

Max. Marks: 60

Duration: 6 Hrs.

I. Gravimetric Estimation

1. Estimation of barium as barium chromate / sulphate
2. Estimation of lead as lead chromate / sulphate
3. Estimation of calcium as calcium oxalate
4. Estimation of nickel as nickel dimethyl glyoxime complex

II. Preparation of organic compounds

Preparations involving the following methods

- a) Oxidation b) Reduction c) Hydrolysis d) Nitration e) Ozasone formation
f) Bromination g) Diazotisation h) Benzoylation.

III. Determination of melting and boiling points of simple organic compounds: (not for examination purpose)

IV. Separation of organic mixture: (not for examination purpose)

Distribution of External marks:

1. Record	10 marks
2. Gravimetric estimation	25 marks
a. Procedure	10 marks
b. Experiment	15 marks
4. Organic preparation	25 marks
a. Procedure	10marks
b. Crude sample	10 marks
c. Recrystallized sample	5 marks
	60 marks

Gravimetric Experiments:

Less than 1% error	15 marks
1 – 2 % error	12 marks
2 – 3 % error	9 marks
3 – 4 % error	6 marks
>4% error	3 marks

Note: University practical examination – 6 hours

Semester -V				
Course Code:	Core Practical-VI	T/P	C	H
22BCH5P2	PHYSICAL CHEMISTRY PRACTICAL -VI	P	4	4

Max. Marks: 60

Duration: 6 Hrs

1. Phase diagram:

- Simple eutectic
- Compound formation

2. Determination of molecular weight:

- Rast-macro method (using naphthalene as solvent)
- Transition temperature (using sodium thiosulphate pentahydrate as salt hydrate)

3. Critical solution temperature

- CST of phenol – water system
- Estimation of sodium chloride by studying the CST of phenol-water system

4. Kinetics

Determination of relative strength of acids by acid catalysed hydrolysis of ester

5. Partition co-efficient

- Study of equilibrium $KI + I_2 \leftrightarrow KI_3$ by studying the partition co-efficient of iodine between water and carbon tetra chloride.
- Determination of association factor of benzoic acid in benzene

6. Electrochemistry

- Conductometric titration between an acid and a base (HCl Vs NaOH)
- Potentiometric method – Potentiometric titration between 1. an acid and a base (HCl Vs NaOH) and 2. $KMnO_4$ Vs FAS

7. Thermochemistry

- Determination of heat of solution – ammonium oxalate

Distribution of External marks:

Record	10 marks
Experiment	50 marks
	60 marks

Note: University practical examination – 6 hours

Semester -IV

Course Code: 22BCH5P3	Core Course-VII APPLIED CHEMISTRY PRACTICAL -VII	T/P P	C 4	H 4
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1. Determination of total, temporary and permanent hardness of a water sample by EDTA method.
2. Determination of percentage of available chlorine in the supplied sample of bleaching powder.
3. Determination of Biological oxygen demand (BOD) of a given sample of water.
4. Determination of coefficient of viscosity of the given liquid by Ostwald's Viscometer method.
5. Determination of Molecular weight of a polymer by viscometric method.
6. Determination of Acid value of an oil.
7. Determination of Saponification value of an oil.
8. Determination of the amount of Cu in the copper ore.
9. Determination of half cell potential of Zn, Cu and Ni electrodes at various concentration of electrolyte and calculation of EMF of Daniel cell.
10. To study the Adsorption of acetic acid on active charcoal and to verify the Freundlich and Langmuir isotherm.
11. Identification of adulterations in food materials

Distribution of marks

Record	10 marks
Procedure	10 marks
Experiment	40 marks

60 Marks

Note: University practical examination – 6 hours

Semester –VI				
Course Code: 22BCH6E1	DSE- IA	T/P	C	H
	ANALYTICAL CHEMISTRY	T	6	6
Objectives	To provide the basic idea about the instrumental analysis and analytical techniques, along with handling the laboratory techniques and safety procedures. To know about important terminologies involved in error analysis, and find out sources of error, methods of reporting analytical data. To study about the principles and classification of separation methods, the methods of separation techniques and its applications. To provide the principles of gravimetric analysis, methods and characteristic features of precipitation techniques, analysis of thermal analytical methods and the electroanalytical techniques.			
Outcomes	It brings about the knowledge of first aid and lab safety techniques, terms and methods of finding error analysis, and can able to determine the sources of errors and its effects towards analytical results. Clearly brings about the principles and methods of separation techniques and their applications. Brings about the methods of gravimetric analysis; can able to know the concepts and methods of precipitation techniques, Thermal Gravimetric Analysis and Electroanalytical techniques.			

Semester –VI				
Course Code: 22BCH6E2	DSE-I B	T/P	C	H
	AGRICULTURAL CHEMISTRY	T	6	6
Objectives	To provide the basic idea about the classification and properties of soil forming rocks. To know about the importance of fertilizers in plant growth and the use of biofertilizers. To study about the principles used in the manufacture of organic manure. To provide the principles of pest management and control and gain knowledge about fungicides and herbicides.			
Outcomes	It brings about the basic idea of the significance of soil fertility and nutrient availability for the plant growth. Clearly brings about the fertilizer selection based on soil testing. Brings about the principles used in the manufacture of organic manure and the importance of green manures. Students can able to know the impact of pesticides, insecticides and herbicides on environment.			

Semester –VI					
Course Code: 22BCH6E3	DSE-II A		T/P	C	H
	INDUSTRIAL CHEMISTRY		T	6	6
Objectives	The objective is to expose the students about the basic concepts of paint formulation and varnishes, to help the students to understand the manufacture of ceramics and glass and its types. To enable the students to make sense of soap and detergent making, manufacture of refractories and cement. To understand the nature of fertilizers in plant growth, sugar and match industries and use of enamels, explosives and inorganic polymers.				
Outcomes	The students become familiar with the paint formulation and varnishes. Enable the students to understand soap making, use of refractories and cement in daily life. The students will able to identify the proper use of fertilizers, explosives and sugar. Can also learn the chemistry of adhesives, enamels and inorganic polymers.				

Semester –VI					
Course Code: 22BCH6E4	DSE-II B		T/P	C	H
	MEDICINAL CHEMISTRY		T	6	6
Objectives	The student is expected to learn about important drugs and the mode of action, diagnostic medical instrumentation and clinical tests for health management and drug development				
Outcomes	Can able to study about the important terminologies of Pharma Chemistry, and brings about the knowledge towards Indian Medicinal Plants. Brings about a clear idea towards various drugs, screening tests done and its significance, and provide the importance of the drugs for cancer, Diabetes, AIDS and Blood related diseases.				

Semester –VI					
Course Code: 22BCH6E5	DSE- III A		T/P	C	H
	POLYMER CHEMISTRY		T	6	6
Objectives	To provide the basic idea about the introduction to polymers and polymerisation techniques and various industrial polymer products, along with use of plastics and textile fibres.				
Outcomes	It brings about basic knowledge of polymer science and methods of preparing polymers of industrial importance. Clearly brings about the preparative methods of plastics and their applications. Can be able to know about the textile fibres.				

Semester –VI					
Course Code: 22BCH6E6	DSE-III B		T/P	C	H
	APPLICATION OF COMPUTERS IN CHEMISTRY		T	6	6
Objectives	To impart the skills on use of various open-source chemistry tools that are essential for any student or researcher with chemistry as a major subject.				
Outcomes	At the end of course, the participants will be able to use these software for drawing chemical structures, generation of their names, retrieve information about physical properties calculations, three-dimensional molecular structure calculations, spectroscopic signatures, chemical reaction pathways prediction, molecular functional groups, docking sites predictions, and other parameters efficiently.				

Semester –VI					
Course Code: 22BCH6E7	DSE-IV A		T/P	C	H
	PHARMACEUTICAL CHEMISTRY		T	6	6
Objectives	The student is expected to learn about important drugs and the mode of action and find out the symptoms and drugs for chronic diseases. Health management and drug development				
Outcomes	Can be able to study about the important terminologies of pharmacemistry, and brings about the knowledge towards Indian Medicinal Plants, choice of drugs and the function of hormones and enzymes.				

Semester –VI				
Course Code:	DSE-IV B	T/P	C	H
22BCH6E8	MATERIAL CHEMISTRY & NANO-SCIENCE	T	6	6
Objectives	The aim is to provide the basic knowledge about the ionic crystals, solid electrolytes, important alloys and the characteristics of glass, ceramics, composites and synthetic organic metals. It also aims to provide an idea of nanomaterial synthesis and characterization techniques.			
Outcomes	The students will gain knowledge about the ionic crystals, crystal defects, solid electrolytes, important alloys and its uses. Students will have an idea to choose the glass, ceramics, composites and synthetic organic metals in their life. They can synthesize and characterize the nanomaterials.			