B.Sc. Chemistry

Academic Year 2018-2019 – Odd Semester Programme
Outcomes of B.Sc.

- Apply the broaden and in-depth knowledge of science and computing to analyse, think creatively and generate solutions to face the global challenges.
- Foster intellectual curiosity, critical thinking and logical reasoning.
- Adapt to different roles and responsibilities and develop leadership qualities in multicultural working environment by relating to diversity and ethical practices.
- Update the techniques and acquire skills to develop systems and methods to solve current problems.

Programme Specific Outcome

PSO No.	*Upon completion of B.Sc Chemistry,students will be able to:*
PSO 1.	Understand the fundamentals, theories and principles of Organic, Inorganic and Physical chemistry
PSO 2.	Interpret the mechanism of chemical reactions.
PSO 3.	Analyze and solve problems systematically.
PSO 4.	Relate the presence and impact of chemical compounds in life
PSO 5.	Prepare / isolate/ synthesize and characterize chemical compounds
PSO 6.	Analyze the properties of metals, non-metals, alloys and other chemical compounds / macro molecules
PSO 7.	Carryout procedures as per laboratory standards in the areas of inorganic, organic and physical chemistry
PSO 8.	Identify and estimate the chemical compounds using classical and modern methods.
PSO 9.	Understand the applications of chemistry in medicine, research, agriculture and industry.

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Semester : III
Name of the : Organic Chemistry – I
Subject Code : CC1731

Number of Hours Per week	Number of Credit	Total Number of Hours	Marks
4	4	60	100

Course Outcome

CO No.	Expected Learning Outcomes *Upon completion of this course, the students will be able to*:	PSO	CL
CO 1.	Name and to understand the nomenclature of organic molecules based on IUPAC system & apply the rules to name the organic compounds	**PSO** 1, **PSO** 3	U
CO 2.	Relate the shapes of molecules with hybridization	**PSO** 2 **PSO** 4	Ap
CO 3.	Understand and apply the different polar effects occurring in organic molecules	**PSO** 1,	A
CO 4.	Prepare hydrocarbons, alkyl halides, ethers, alcohols reactions, distinction among alcohols & estimation of alcohols	**PSO** 5	C
CO 5.	Differentiate Markowni and Anti Markownikoff addition	**PSO** 3	An, C
CO 6.	Infer different types of reactions and reaction mechanisms	**PSO** 2	E

Teaching Plan
Total Contact hours : 60 (Including lectures, assignments and tests)

Unit	Module	Topics	Lecture hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Basics Concepts of Organic Chemistry**					
	1	Classification of organic compounds and IUPAC system of nomenclature, Longest chain rule, lowest number rule.	2	Know to write IUPAC name	Lecture, Group discussion	Multiple choice questions Assignment on IUPAC names
	2	IUPAC naming of hydro carbons, alcohols, aldehydes, ketones, amines, and compounds with additional	3	Ability to solve problems	Lecture, Seminar	
	3	Hybridisation – types – sp^3 Sp^2SPhybridisation with CH_4 C_2H_4, C_2H_2 as examples.	4	Differentiate various	Lecture with ppt	
	4	Influence of hybridization on bond properties Homolytic and heterolytic fission	2	Learn types of fission	seminar	
	5	Electrophiles and nucleophiles – examples. Preparation, structure and stability of Carbanions, carbocations and free radicals.	2	Distinguish between	Lecture Question answer session	
II	**Electronic Displacements**					

	1	Inductive effect in organic molecules, +I and − I groups, comparison of strength of substituted	3	Understand the Inductive effect		
	2	Electromeric effect − definition − types − examples and its applications, Resonance effect − definition − relative strength of acids, resonance effect and conjugated system, Hyper conjugation effect − definition − stability of carbocations and free radicals.	5	Analyse the stability of intermediates.	Lecture with ppt, Group discussion	Quiz Short test Formative assessment - I
III	**Chemistry of Aliphatic hydrocarbons**					
		Chemistry of alkanes, general methods of preparation, Wurtz reaction, free radical substitutions - halogenation.	2	Learn the synthesis of alkanes	Short test	
		Formation of alkenes and alkynes by elimination reactions - Saytzeff and Hofmann eliminations.	2	Know the difference between elimination.	seminar	
		Electrophilic addition of hydrogen halide - mechanisms of Markownikoffand AntiM Markownikoffaddition.	2	Know addition reactions	Lecture	Evaluation through multiple choice questions Qquiz
		Hydroboration, oxidation, ozonolysis, reduction (catalytic and chemical), cis and transa hydroxylation, 1, 2- and 1, 4 - addition reactions in conjugated dienes, Diels-Alder reaction.	3	Evaluate the 1, 2- and 1, 4 - addition	Group discussion and writing mechanism	
		Acidity, electrophilic and nucleophilic additions of alkynes, Birch reduction- mechanism.	2	Analyse the additions of alkynes	Lecture	
IV	**Chemistry of halogenated hydrocarbons**					
	1	General methods of preparation of alkyl halides, Nucleophilic substitution reactions − $S_N1$mechanism, S_N2 mechanism with stereochemical aspects and effect of solvent, S_Ni mechanisms with stereochemical aspects and effect of solvent, Differences between S_N1, S_N2.	5	Be able to evaluate the substitution reactions	Lecture	Evaluation through short test Assignment on nucleophilic substitution reactions
	2	E2 mechanism. elimination − E1 mechanism.	2	Differentiate E1 from E2 mechanism	Lecture	Quiz Multiple

	3	Preparation, properties of vinyl chloride, allyl chloride, tetrafluoro ethylene, Freon, westron, chloroform, idoform carbon tetrachloride. andwestrosol.	4	Learn the preparation of alkyl halides	Lecture Question answer session	choice questions Formative assessment II
V	**Functional groups containing oxygen**					
	1	General methods of preparation and properties of alcohols.	2	Learn the synthesis	seminar	
	2	Distinction among 1°, 2°, 3° alcohols – oxidation method, Victor Meyer method and Lucas method.	2	Analyze the alcohol samples	Lecture Demonstration	
	3	Preparation and properties of glycols, Oxidation of glycols by periodic acid and lead tetra acetate. Mechanism of Pinacola Pinacolone rearrangement.	3	Learn the preparation of Dihydric	Lecture with ppt	Short test
	4	Glycerol -manufacture (hydrolysis of fats and oils), synthesis of glycerol from propene, reactions, preparation of nitroglycerine. Estimation of number of hydroxyl groups.	3	Synthesise glycerol	Lecture Demonstration	Formative assessmentIII
	5	Preparation and reactions of ethers ethers with acids, epoxides – reactions of epoxides with alcohols.	2	Know the preparation of ethers	Illustration seminar	

Course Instructor: R. GladisLatha HOD: G. Leema Rose

Semester : III
Name of the Course : Dairy Chemistry
Subject Code : CC1732

Number of Hours Per week	Number of Credit	Total Number of Hours	Marks
4	4	60	100

Course Outcome

CO No.	Expected Learning Outcomes *Upon completion of this course, the students will be able to*:	PSO	CL
CO 1.	Recall the physical properties of milk	**PSO** 1	R
CO 2.	Cite examples of various factors affecting the quality of	**PSO** 6	U
CO 3.	Assess the microbiology of milk	**PSO** 6	E
CO 4.	Collect various methods to pasteurize milk	**PSO** 1	C
CO 5.	Apply the methods of manufacture of	**PSO** 7	Ap

	special milks and dairy cleaning		
CO 6.	Correlate the acidity, moisture content and fat content of milk	**PSO** 6	An
CO 7.	Estimate the amount of lactose in milk	**PSO** 7	E
CO 8.	Choose milk proteins, milk carbohydrates and milk vitamins and dairy products	**PSO** 5	E
CO 9.	Utilize methods of separation of cream, utter, ghee, cheese &kheer	**PSO** 7	Ap
CO 10.	Explain preparation of Dairy sweets	**PSO** 5	Ap

Teaching Plan

Total Contact hours : 60 (Including lectures, assignments and tests)

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Properties of milk**					
	1.	Definition , composition and physico chemical properties of milk – colour, odour, acidity, specific gravity, conductivity of milk Factors affecting composition of milk Food and nutritive value of milk.	4	Gain knowledge about milk. Recall the factors affecting composition of milk. To know the nutritive value of food.	Lecture	Assignment
	2.	Flavour defects in milk their causes and prevention Uses of milk and Estimation of fat Estimation of acidity and total solids in milk Adulterants in milk – definition, common adulterants and their	4	Know the methods of estimating the acidity and total solids in milk Detect the adulterants present in milk.	Lecture wirh PPT illustration	
	3.	Estimation of acidity and total solids in milk Adulterants in milk – definition common adulterants and their detection	3	To know the preservatives added to milk.		Multiple choice questions
	4.	Preservatives in milk – definition, common preservatives and detection Neutralizers in milk – definition,	3	Know the importance of neutralizers in milk	Group discussion	Quiz
II	**Microbiology of milk**					
	1.	Pasteurization – definition, objectives and requirements Various methods of pasteurization – in the bottle	4	Realize the importance of	Lecture	Short test Seminar Quiz

		pasteurization and batch (LTLT) pasteurization HTST pasteurization and UHT pasteurization Uperization, vacuum		of pasteurization Know the methods of pasteurization.		
	2.	Dairy detergents, cleaning and sanitizing procedure CIP (Cleaning in place).	2	Gain knowledge about dairy detergents. Recognize the	Mind mapping	Formative assessment -I
	3.	Sterilizers – definition , properties Cleaning and sterilization of dairy utensils, Chloramine – T and hypochlorite solution	5	Define sterilizers and know their properties. Discuss the methods of cleaning and sterilizing	Question answer session	
III	**Special Milks**					
	1.	Sterilized milk – definition, equirements, advantages and disadvantages and method	2	To discuss the advantages and disadvantages	Lecture with PPT illustration	Quiz
	2.	Homogenized milk – definition, merits and demerits, method of manufacture	3	Gain knowledge about the merits and demerits of homogenized milk. Know about flavoured milk	Mind mapping	
	3.	Vitaminized milk and Standardized milk Single and double toned milk, Humanised milk.	2	Explain the importance of vitaminized and standardized milk. To explain about single and double toned milk.	Question answer session	
	4.	Dried milk - Definition, composition, objectives of production andmanufacture Role of milk constituents,	3	To know about dried milk. Realize the need for quality in drying milk	Panel session on adulterants in milk	Formative assessmen t -II
	5.	Condensed Milk - Definition, composition, objectives and manufacture Uses of condensed and evaporated milk Types of condensed milk – plane, super-heated& frozen condensed milk.	3	Recognize the objectives and composition of condensed milk. List the uses of condensed milk To explain the types of condensed milk.	Lecture	
IV	**Cream, Butter, Ghee, Ice cream and Cheese**					
	1.	Creams: Definition,	4	Define creams. Gain knowledge	Question answer	short test

		in cream Butter: Definition, composition, manufacture and estimation of fat in butter		about butter Know the methods of determination of acidity and moisture content.	session	
	2.	Ghee – constituents, adulterants and their detection Rancidity of ghee and their types Ice cream – definition, classification , composition, food and nutritive value Defects in ice cream, their	4	Gain knowledge about ghee. List the types of rancidity Gain knowledge about ice creams Recall the methods of prevention of defects in ice cream	Lecture	Quiz
	3.	Cheese: Introduction – definition – classification – composition – food and nutritive value Cottage cheese, processed cheese – defects in cheese their causes and prevention.	3	Gain knowledge about cheese. List the various types of cheese.	Lecture	Assignment
V	**Proteins, Carbohydrates, Vitamins in milk and dairy sweets**					
	1.	Physical and electrical properties of Milk Proteins Effects of heat on Milk Proteins, Milk Enzymes and functions Milk carbohydrate:Lactose – structure.	4	List the physical and chemical properties of milk. Understand the effect of heat on milk proteins. Elucidate	Mind mapping	Quiz Formative assessment -III
	2.	Reactions of lactose Estimation of lactose in milk – Picric acids method and chloroamine – T method Milk vitamins – water soluble and insoluble.	3	Recall the reactions of lactose. Gain knowledge about the estimation of lactose. List the various vitamins present in	Lecture	Multiple choice questions

	3.	Dairy Sweets – preparationKheer – Khoa/ Mawa – Khurchan – RabriM Kulfi/Malai –Ka-baraf- Dahi – Paneer Chhana – Makkhan – Lassi – Ghee Residue, butter milk.	3	Gain knowledge about the methods of preparing dairy sweets. Know the different kinds of dairy product.	Lecture wirh PPT illustration	Multiple choice questions Assignme nt Multiple choice questions

Course Instructor: L. Deva Vijila HOD: G. Leema Rose

Semester : **III**
Name of the Course : **Allied Chemistry - General Chemistry**
Course Code : **CA1731**

Number of Hours Per week	Number of Credits	Total Number of Hours	Marks
4	**4**	**60**	**100**

Course Outcome

CO No.	Expected Learning Outcomes *Upon completion of this course, the students will be able to*:	PSO	CL
CO 1.	Know about the filling of electrons in atomic orbitals	**PSO** 1	R
CO 2.	Understand the principles behind atomic structure, dipole- moment applications & Born Haber cycle	**PSO** 1	U
CO 3.	Interpret the characteristics of ionic covalent, hydrocarbons compounds	**PSO** 2	U
CO 4.	VSEPR theory, deduce the shapes of molecules using VSEPR theory & hybridization	**PSO** 2	Ap
CO 5.	Validate the VB theory and benzenoid compounds	**PSO** 2	E
CO 6.	Differentiate the types of organic reactions, cleavage of bonds and reagents.	**PSO** 3	An
CO 7.	Discuss the preparation structure and stability of hydrocarbons, aliphatic hydrocarbons	**PSO** 5	C

Teaching Plan

Total Contact hours : 60 (Including lectures, assignments and tests)

Unit	Module	Topics	Lecture hours	Learning	Pedagogy	Assessment/ Evaluation
I	**Atomic Structure**					
	1.	Dual nature of electron − de Broglie equation Davisson and Germer experiment - Heisenberg's uncertainity principle and its significance Schrodinger's wave equation and its significance	3	Distinguish between particle and wave. Understand Davisson and Germer's Experiment Recall Schrodinger wave	Lecture discussion	Short test
	2.	Eigen value and eigen functions Quantum numbers and their significance. Atomic orbitals - significance - shapes.	3	Know the characteristic of Eigen values and Eigen functions. Realize the importance of quantum numbers Gain	Lecture	Multiple choice questions Assignment Formative assessment -I
	3.	Difference between orbit and orbital Rules for filling up of orbitals − Pauli's exclusion principle − Aufbau principle − Hund's rule Electronic configuration of elements with atomic number up to 20.	5	To understand the rules followed in filling up of electrons. Write the electronic configuration of atoms	Question answer session	
II	**Chemical Bonding**					
	1.	Formation of ionic compound with examples General characteristics of ionic compounds Lattice energy − Born Haber cycle and its applications	4	Understand the formation of ionic bond. Recall the general characteristic of ionic compounds. Calculate ionic compounds	Lecture discussion	Assignment

	2.	Factors affecting dissolution of ionic compounds. Fajan's rules – ionic character in covalent compounds	3	Gain knowledge on the factors affecting dissolution of ionic compounds. Recognize ionic character in covalent bonds.	Lecture	Formative assessment -I
	3.	Percentage of ionic character, Bond moment Dipole moment – applications of dipolemoment	2	Calculate the amount of ionic character in covalent bonds. List the applications of dipolemoment.	Lecture discussion	
	4.	Structure of CO_2, H_2O, SO_2, BF_3, NH_3, CH_4 and cis-trans isomerism.	3	Predict the structures of compounds.	Lecture with PPT illustration	Short test
III	**Covalent Bonding**					
	1.	VB approach – postulates Formation of single, double and triple bond with examples Characteristics of covalent compounds	3	Understand the postulates of VB Theory Gain knowledge about the formation of bonds. Recall the characteristics of covalent bonds.	Lecture	Seminar
	2.	VSEPR theory – shapes of inorganic molecules Hybridisation with suitable examples of linear ($BeCl_2$) Trigonal planar(BCl_3) and tetrahedral molecules (CH_4)	4	Predict the shapes of inorganic molecules. Find out the types of hybridisation.	Lecture with PPT illustration	Formative assessment -II .
	3.	Hydrogen bonding – types with examples Effects of hydrogen bonding	2	Gain knowledge about hydrogen bonding. Understand the effects of hydrogen bonding	Lecture discussion	Quiz
IV	**Fundamentals of Organic Chemistry**					
	1.	Cleavage of bonds – homolysis and heterolysis Nucleophiles and electrophiles with examples Reaction intermediates	3	Gain knowledge about cleavage of bonds. Find out nucleophiles and electrophiles Gain knowledge about reaction intermediate	Lecture discussion	Seminar
	2.	Carbocations, carbanions	5	Know about reaction	Lecture	

		and free radicals (preparation, structure and stability) Types of reactions – substitution, addition, elimination and polymerization Aromaticity: General characteristics of aromatic compounds		intermediate. To explain the types of reactions List the characteristics of covalent bonds	wirh PPT illustration	Quiz Multiple choice questions
	3.	Huckel's rule – benzenoid compounds.	2	Predict aromaticity using Huckel's rule.	Group discussion	
V	**Aliphatic Hydrocarbons**					
	1.	Alkanes (upto five carbons) – preparation – catalytic hydrogenation Wurtz reaction, Kolbe's Reactions - free radical substitution – halogenations	4	Gain knowledge about the preparation and properties of alkanes. Recall Wurtz reaction and Kolbe's synthesis Know about free radical substituition	Lecture discussion	Assignment
	2.	Alkenes (upto five carbons) – preparation – dehydration of alcohols and dehydrogenation of alkyl halides Saytzeff's rule Reactions – hydration, ozonolysis, and oxidation MarkowniKoff's and anti MarkowniKoff's addition	5	Gain knowledge about alkenes. Apply Saytzeff 's rule. Recall the reactions of alkenes. State and	Lecture wirh PPT illustration	Formative assessment -III
	3.	Alkynes: Preparation – acetylene from calcium carbide Dehalogenation of tetrahalides of metal acetylides, addition of Br_2 and alkaline $KMnO_4$	3	Gain knowledge about the preparation of alkynes. Gain Knowledge about dehalogenation reaction. Recall the	Lecture	

HOD: G. Leema Rose

Course Instructor: Sheeba Daniel

Semester – V

Name of the Course : Organic Chemistry III

Course code : CC1751

CO - No.	Course Outcome Upon completion of course students will be able to	PSO	CL
CO - 1	identify the methods of preparation, properties and reaction mechanism of phenols.	PSO - 4	U
CO - 2	prepare and analyze the reactions of poly nuclear hydrocarbons	PSO - 4	C
CO - 3	recognize the classification, preparation and properties of heterocyclic compounds	PSO - 1	R
CO - 4	evaluate the importance and structure of carbohydrates	PSO - 6	E
CO - 5	understand the inter conversions of carbohydrates	PSO - 1	U
CO - 6	pharmacological activities of drugs	PSO - 8	C
CO - 7.	synthesise various drugs	PSO - 4	C
CO - 8.	evaluate the synthetic uses of drugs	PSO - 5	E

Unit	Module	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Phenols**					
	1.	Preparation and properties of phenol	2	To understand the importance of phenol and its methods of preparation	Lecture, Discussion	Evaluation through short test
	2.	Rearrangement reactions with mechanisms	3	To differentiate various reaction mechanisms	Lecture, Discussion	Formative assessment
	3.	Preparation and properties of Nitro phenol, picric acid and amino phenols.	2	To gain knowledge about monohydric phenols	Lecture	Formative assessment
	4.	Preparation, properties and uses of catechol, resorcinol and quinol	3	To get idea about dihydric alcohols	Lecture	Formative assessment, Short test
	5.	Preparation, properties and uses of phloroglucinol.	2	To differentiate trihydric alcohols	Question answer session, Lecture	Formative assessment, Assignment
II	**Polynuclear Hydrocarbons**					
	1.	Preparation and properties of diphenyl and diphenyl methane.	2	To know about poly nuclear hydrocarbons	Lecture with PPT Illustration	Formative assessment
	2.	Preparation and properties of triphenyl methane and stilbene.	2	To know the properties of aromatic compounds	Lecture, Illustration	Formative assessment
	3.	Haworth synthesis, reactions and structural elucidation of naphthalene and derivatives of naphthalene.	2	To understand clearly about naphthalene.	Lecture, Discussion	Formative assessment, Short test
	4.	Structural elucidation, reactions and uses	4	To study about poly nuclear hydrocarbons	Lecture, Discussion	Formative assessment, Online Quiz

		of anthracene and phenanthrene				
III	**Heterocyclic Compounds**					
	1.	Preparation and chemical properties of furan	2	To know about different properties of furan	Lecture, Illustration	Formative assessment, Assignment
	2.	Preparation and chemical properties of pyrrole	3	To learn about pyrrole	Lecture, Illustration	Formative assessment
	3.	Preparation and chemical properties of pyridine	4	To analyse the properties of pyridine	Lecture	Formative assessment Short test
	4.	Preparation and chemical properties of quinoline, isoquinoline and indole	3	To recognise the various types of heterocyclic Compounds	Lecture with PPT Illustration	Seminar, Formative assessment
IV	**Carbohydrates**					
	1.	Preparation and chemical reactions of glucose and fructose	2	To know about different electrolytes	Lecture	Formative assessment
	2.	Epimerization and, mutarotation	1	To understand and differentiate between epimerization and, mutarotation.	Lecture, Discussion	Formative assessment, Short test
	3.	Intercoversion between aldoses and ketoses.	2	To acquire knowledge about interconversions.	Lecture	Short test
	4.	Structural elucidation of maltose and sucrose.	3	To evaluate the structure of disaccharides	Lecture, Discussion	Formative assessment
	5..	Structure of starch and cellulose	2	To know about polysaccharides	Lecture	Formative assessment

V	**Drugs and Pharmaceuticals**					
	1.	Procedures followed in drug design. Lead components and modification.	4	To know about drug design and modification	Lecture, Discussion	Formative assessment
	2.	Pharmacological activities of drugs , receptors , metabolites and antimetabolites	3	To gather knowledge regarding the Pharmacological activities of drugs	Lecture	Formative assessment
	3.	Synthesis of chloramphenicol, benadryl and paracetamol, anti-inflammatory drugs	1	To understand the synthesis and application of drugs	Lecture, Illustration	Formative assessment, Short test
	4	Synthesisof cardiovasculardrugs,antileprosy drug, HIV related drugs.	4	To learn the synthesis and application of various drugs.	Lecture, Discussion	Formative assessment, Seminar

Course Instructor: R.Gladis Latha HOD: G. Leema Rose

Name of the Course : Inorganic Chemistry II
Course code : CC1752

CO - No.	Course Outcome Upon completion of course students will be able to	PSO	CL
CO - 1	identify the p-block elements in the periodic table.	` PSO - 1	R
CO - 2	analyze the properties of p- block elements	PSO - 2	An
CO - 3	compare inorganic and organic polymers	PSO - 2	U
CO - 4	explain the different metallurgical processes	PSO - 8	Ap
CO - 5	compare the stability of different atomic nuclei.	PSO - 7	E
CO - 6	illustrate principle of atom bomb and nuclear reactor.	PSO - 1	Ap

Unit	Module	Topics	Lecture hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
Chemistry of p-block elements - I						
I	1	General characteristics of Boron family with special reference to inert pair effect - extraction of boron – properties and uses.	3	Explain the characteristics of Boron family elements	Lecture	Evaluation through short test Assignment
	2	Boron trifluoride and boron trichloride – aluminiumtrichloride-preparation, properties and structure.	2	Gain idea about the compounds.	Lecture	
	3	Hydrides of boron – preparation, properties and structure of diborane and carboranes. Preparation, properties and structure of boron nitride and borazine.	2	Know the characteristics of Boron and its compounds.	Lecture with ppt	
	4	General characteristics– comparison of carbon and silicon – structure of diamond and graphite – Fullerenes (definition and examples).	3	Clear idea about allotropes of carbon	Lecture, showing examples of allotropes	

	5	Metal carbides – classification with examples – their applications in industry. Preparation and uses of silica, silicic acid and silica gel. Silicones – preparation and uses. Silicon carbide – preparation, properties and uses.	2	Know the importance of silica and metal carbides	Lecture with ppt	Evaluation through short test

	Chemistry of p-block elements - II					
II	1	General characteristics – allotropes of phosphorous and arsenic. Structure of oxides of nitrogen, structure of oxy acids of phosphorous.	4	Draw the structure of oxides of nitrogen and oxy acids of phosphorus.	Question answer session	Multiple choice questions
	2	Preparation, properties and uses of hydrazine, hydrazoic acid and hydroxyl amine.	3	Understand the characteristics of hydrazine, hydrazoic acid and hydroxylamine.	Lecture.	
	3	Anomalous behaviour of oxygen, allotropes of sulphur, oxyacids of sulphur- Caro's acid and Marshall's acid – preparation, properties and structure.	4	Explain the anamolousbehaviour of Oxygen and sulphur.	Lecture with ppt, Group discussion	Short test Formative assessment - I
		General characteristics of halogens, peculiarities of fluorine, inter halogen compounds – definition, preparation, types and structure of XY, XY_3, XY_5 and XY_7. Pseudohalogens- preparation and properties of cyanogens, thiocyanogen, selenium cyanogen and azido carbondisulphide, interpseudohalogen compounds.	2	Understand the characteristics of halogens and pseudohalogens	Group discussion	Multiple choice questions
	Noble gases:					
III	1	Occurrence, electronic configuration and rationalization of	2	Get idea about noble gases.	Seminar	

		inertness of noble gases. Isolation of noble gases from the atmosphere-Rayleigh's and Dewar's method. Hydrates of noble gases.				Short test
	2	Clathrates compounds – preparation, properties and uses. Preparation , properties and structure of XeF_2, XeF_4, XeF_6,$XeOF_2$,$XeOF_4$and XeO_3.	4	Explain clathrate compounds.	Lecture using ppt	Assignment
	3	Definition – properties, types of inorganic polymers, comparison with organic polymers, synthesis, structural aspects and applications of siloxanes. Preparation and properties of silicates, phosphazenes and polysulphates.	5	Compare inorganic and organic polymers.	Lecture	
	Metallurgy and Alloys					
IV	1	. Minerals and ores – difference between minerals and ores, metallurgical processes – gravity separation, magnetic separation, froth floatation, roasting, calcination and smelting. Purification by electrolysis, oxidative refining, zone refining, Mond's process, Van - Arkel de-Boer process and Kroll's process.	3	Differentiate ores and minerals and understand the methods of purification of ores.	Illustration, Seminar	Multiple choice questions Formative assessment - II

	2	Extraction, properties and uses of V, W, Mo and Ti. Poly valency of vanadium.	3	Know the extraction of metals.	Lecture, Group discussion with ppt	
	3	Definition, purpose of making alloys. Types of alloys – ferrous alloys and non ferrous alloys with examples.	3	List the applications of alloys.	Lecture	Quiz
	4	Preparation of alloys- heat treatment of alloys – composition and uses– bronze, german silver, nichrome, monel metal, stainless steel, gun metal and bell metal.	3	Know the composition of different alloys.	Lecture, Illustration	
	Nuclear Chemistry					
V	1	Nuclear forces- nuclear size- atomic mass unit and N/P ratio. Packing fraction - mass defect- binding energy. Nuclear models- shell and liquid drop. Radioactivity - α, β, γ radiations-their properties. Soddy's group displacement law. Natural radioactivity- detection and measurement of radioactivity by Geiger-Muller method	2	Explain the phenomenon of radioactivity.	Lecture, Quiz	Short test Assignment
	2	Rate of radioactive disintegration- decay constant-half life period- average life period. Radioactive equilibrium, artificial radioactivity- artificial transmutation of elements.	3	Calculate decay constant and half life period.	Lecture with ppt	
	3	Nuclear reactions- nuclear fission – principle of atom bomb. Nuclear reactor – thermal and fast breeder	3	Gain knowledge about the types of nuclear	Lecture, Group discussion	Formative assessment - III

		reactor. Radioactive hazards- disposal of radioactive waste from nuclear reactors Nuclear fusion – principle of hydrogen bomb and stellar energy. Principle and working of cyclotron.		reactions.		
	4	Applications of radio activity - radioactive tracers in agriculture, medicine and industry. Radiocarbon dating.	4	Apply radioactivity in different branches of science.	Lecture with ppt	

Course Instructor: L. Deva Vijila HOD: G. Leema Rose

Name of the Course : Physical Chemistry II
Course code : CC1753

CO - No.	Course Outcome Upon completion of course students will be able to	PSO	CL
CO - 1	list out various types of dilute solutions	PSO - 1	R
CO - 2	determine the various colligative properties	PSO - 2	R
CO - 3	calculate the molar mass using colligative properties	PSO - 4	An
CO - 4	illustrate the different types of systems using thermodynamics	PSO - 2	Ap
CO - 5	interpret and correlate the laws of thermodynamics	PSO - 2	AP
CO - 6	calculate the various kinds of energy	PSO - 5	An
CO - 7	compare the entropy change of difficult processes	PSO - 2	E
CO - 8	assess the absolute entropy of solids, liquids and gases	PSO - 5	E
CO - 9	create the group multiplication table	PSO - 3	C

CO - 10	assign point groups to simple molecules	PSO - 4	C

Unit	Module	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Solutions and Colligative Properties**					
	1.	Solutions of non-electrolytes, solutions of liquids in liquids	1	Know the various types of solutions	Lecture, Discussion	Evaluation through short test, Formative assessment, assignment and MCQs
	2.	vapour pressure of non-ideal solutions, type I, type II and type III	1	Know the vapour pressure of solutions	Lecture	
	3.	Vapourpressure,composition and boiling point Composition curves	1	Understand vapour pressure – composition and boiling point - composition curves	Lecture, Discussion	
	4.	Composition curves of completely miscible binary solutions , type I, type II and type III.	2	Draw curves of completely miscible binary solutions - type I, type II and type III.	Lecture	
	5.	Theory of fractional, azeotropic and steam distillations. Solubility of partially miscible liquid systems.	2	Knowfractional, azeotropic and steam distillations.	Lecture	
	6.	Phenol-water system, triethylamine -water system and nicotine-water system.	2	Differentiate upper and lower CST	Lecture, Discussion	
	7.	Colligative properties, definition and examples	1	Understand Colligative properties	Lecture	
	8.	Thermodynamic derivation of relation between concentration and elevation of boiling point	1	Derive the correlation between concentration and elevation of boiling point	Lecture, Discussion	

	9.	Osmosis , reverse osmosis , osmotic pressure and determination of molar mass by depression of freezing point.	3	Derive the correlation between concentration, freezing point and osmotic pressure	Question answer session Lecture	
	10.	Van't Hoff factor degree of association and dissociation.	1	Know Van't Hoff factor	Lecture, Discussion	
II	**Thermodynamics - I**					
	1.	Chemical thermodynamics, importance of system, boundary and surroundings.	2	Know fundamentals of thermodynamics	Lecture with PPT Illustration	Formative assessment, Short test, MCQs Assignment
	2.	Types of systems - open, closed and isolated. Types of processes - isothermal, adiabatic, isobaric and isochoric, reversible and irreversible process.	2	Differentiate isothermal, adiabatic, isobaric and isochoric, reversible and irreversible process.	Lecture, Illustration	
	3.	Difference between reversible and irreversible process.First law of thermodynamics – different statements.	1	Differentiate reversible and irreversible process	Lecture - Discussion	
	4.	Internal energy and first law , mathematical derivation of first law of thermodynamics. State and path functions	2	Drive first law of thermodynamics	Lecture	
	5.	Heat capacity of a system - heat capacity at constant volume (Cv) and heat capacity at constant pressure (Cp)	1	Relate Cp and Cv	Lecture - Discussion	

		relationship between Cp and Cv				
	6.	. Joule Thomson effect ,Joule Thomson Coefficient of ideal, real gases and real gases obeying Vanderwaal'sequation definition of .Inversion temperature .	2	Derive Joule Thomson Coefficient of ideal, real gases and real gases and Vanderwaal's equation	Lecture - Discussion	
	7.	Derivation of .Zeroth law of thermodynamics ,calculation of ΔE, q, ΔH and w for an ideal and real gas. Enthalpy of a system	1	Calculate of ΔE, q, ΔH and w for an ideal and real gas	Lecture - Discussion	
	8.	Enthalpy of combustion, enthalpy of neutralization and enthalpy of formation.	1	Know enthalpy of combustion, enthalpy of neutralization and enthalpy of formation	Lecture - Discussion	
	9.	Variation of enthalpy of a reaction with temperature (Kirchoff's equation).	1	Drive Kirchoff's equation	Lecture	
	10.	Hess's law of constant heat summation and its applications.	1	Know Hess's law of constant heat summation and its applications.	Lecture	
III	**Thermodynamics – II**					
	1.	Limitation of first law and need for second law of thermodynamics, second law of thermodynamics and spontaneous process	2	Know second law of thermodynamics and spontaneous process	Lecture, Illustration	Formative assessment, Seminar, Short test,
	2.	Carnot's cycle,	1	Know Carnot's	Lecture,	

		efficiency of heat engine andCarnot's theorem.		cycle , Carnot's theorem	Illustration	MCQs Assignment
	3.	Third law of thermodynamics, concept of entropy,entropy changes in reversible and irreversible processes.	2	Know Third law of thermodynamics	Lecture	
	4.	Isothermal, isobaric and Isochoric processes. Entropy of mixing and physical significances of entropy.	2	Give thesignificance of entropy.	Lecture with PPT Illustration	
	5.	Work function (A) , Gibb's Free Energy Function (G) and their significances.	1	Understand Work function (A) , Gibb's Free Energy Function (G) and their significances	Lecture - Discussion	
	6.	Derivation of Gibb's Helmholtz equation and its applications.	1	Derive Gibb's Helmholtz equation and its applications.	Lecture	
	7.	Partial molar quantities, partial molar free energyand Gibb's Duhem equation – applications	2	Derive Gibb's Duhem equation and its applications.	Lecture - Discussion	
	8.	Clapeyron equation its applications, .ClausiusClapeyron equation and its applications	2	Derive Clausius – Clapeyron equation and applications	Lecture - Discussion	
IV	**Thermodynamics – III**					
	1.	Thermodynamic treatment of law of mass action Van't Hoff reaction	2	To know Van't Hoff reaction isotherm and its significance.	Lecture	

		isotherm and its significance.				Formative assessment, Short test, MCQs Assignment
	2.	Van't Hoff isochore and significance. Fugacity concept determination of fugacity of real gases	2	Understand the concept of Fugacity and its determination	Lecture, Discussion	
	3.	variation of fugacity with temperature and pressure	1	Know the variation of fugacity with temperature and pressure	Lecture	
	4.	Physical significance of fugacity, Activity and Activity coefficient.	1	To gather knowledge regarding activity and activity coefficient	Lecture, Discussion	
	5.	Nernst Heat theorem and its applications.	1	Derive Nernst heat theorem and its applications	Lecture - Discussion	
	6.	Determination of absolute entropy of solids, liquids and gases, exceptions to the third law of thermodynamics	2	Gather knowledge in the determination of absolute entropy of solids liquids and gases	Lecture	
	7.	Thermodynamic interpretation of Le-chatelier principle statement	2	Able to interpret Le-chatelier principle	Lecture - Discussion	
	8.	Effect of change of temperature and pressure on chemical equilibria.	2	Know the Effect of change of temperature and pressure on chemical equilibria.	Lecture - Discussion	
V	**Group Theory**					
	1.	Symmetry elements and symmetry	2	To know different	Lecture, Discussion	

		operations. Definition of identity (E) and proper rotational axis.		symmetry operations		
	2.	Mirror plane (σ),inversioncentre (i) and rotation reflection axis (Sn).	2	To gather knowledge regarding the inversion centre (i) and rotation reflection axis	Lecture	Short test, Formative assessment, Seminar
	3.	Symmetry operations generated by symmetry elements- H_2O, NH_3, BF_3, $[PtCl_4]^{2-}$, H_2O_2 (Planar, cis and trans) and CH_4 as examples.	3	To understand Symmetry operations generated by symmetry elements- H_2O, NH_3, BF_3, $[PtCl_4]^{2-}$, H_2O_2	Lecture, Illustration	
	4	Group postulates ,abelian , non-abelian and cyclic group	2	Differentiate abelian and non abelian	Lecture, Discussion	
	5.	Group multiplication table	1	Construct Group multiplication table	Lecture	
	6.	Molecular point groups , assignment of point groups to simple molecules like H_2O, NH_3 and CO_2	2	To assign point groups to simple molecules like H_2O, NH_3 and CO_2	Lecture - Discussion	
	7.	Determination of a point group.	1	To determine point groups for simple molecules.	Lecture - Discussion	

Course Instructor: M. Anitha Malbi HOD: G. Leema Rose

Name of the Course : Green Chemistry
Course code : CC1754

CO - No.	Course Outcome Upon completion of course students will be able to	PSO	CL
CO - 1	know the principles of green chemistry	PSO - 1	R
CO - 2	design green synthesis	PSO - 5	C
CO - 3	interpret green method for organic synthesis	PSO - 3	E
CO - 4	synthesize various compounds by microwave and ultrasound assisted methods	PSO - 4	C
CO - 5	analyze the important techniques and directions in practicing green chemistry	PSO - 2	An
CO - 6	identify the importance of green chemistry in day to day life	PSO - 8	Ap

Unit	Module	Topics	Lecture hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
Introduction to green chemistry						
I	1	Definition , need for green chemistry and scope of green chemistry.	2	Know the need for green chemistry	Lecture with ppt, Group discussion	Short test
	2	Concept of atom economy , yield , mass intensity and atom economy. Calculation of atom economy, mass intensity, mass productivity and carbon efficiency.	4	Calculate the atom economy, mass intensity, mass productivity and carbon efficiency	Seminar	Multiple choice questions
	3	Different types of reactions and atom economy , addition, substitution, elimination and rearrangements.	2	Differentiate the types of reactions	Illustration, Seminar	Short test
	4	Concept of selectivity, enantioselectivity and chemoselectivity	2	Understand the concept of selectivity	Lecture with ppt	Assignment
	5	Regioselectivity and diastereoselectivity.	2	Know the different types of selectivity	Lecture, Group discussion	Short test Formative assessment - I
Green solvent						
II	1	Super critical fluids, Introduction , extraction of super critical fluids, solvents of super critical fluid , advantages and applications Carbon dioxide as a super critical fluid	4	Learn the extractionand advantages of super critical fluids .	Question answer session	Short test
	2	Features of technique	3		Lecture	

		for using super critical carbon dioxide, advantages and application. Chemical reaction in supercritical water and Near, Critical Water (NCW) , Region		Understand the features of technique for using super critical carbondioxide		Multiple choice questions
	3	Extraction natural products, dry cleaning, supercritical polymerization, hydrogenation and hydroformylation. Ionic liquid as green solvent: Introduction , synthesis of ionic liquids, acidic ionic liquid and neutral ionic liquids , applications in organic synthesis.	4	Know the process of extraction of natural products and applications	Lecture with PPT, Group discussion	Short test Formative assessment - I
Green catalyst						
III	1	Catalysis over view, acid catalyst , basic catalyst, oxidation catalyst,, polymer supported catalyst , photosensitized super acid catalyst and Tetra AmidoMacrocylic Ligand(TAML) catalyst.	3	Understand the different types of catalyst	Seminar	Short test
	2	Biocatalyst, microbial oxidation, microbial reduction, enzyme catalyzed hydrolytic process, per fluorinated catalyst and modified biocatalyst.	4	Know the action of Biocatalyst	Assignment	Assignment on MO diagrams Quiz
	3	Development of mesoporous supports by liquid crystal templating, neutral templatingmethods , heterogeneous catalyst , solid supported catalyst.	5	Compare the Development of mesoporous supports by various methods	Lecture with PPT, Group discussion	Formative assessment - II

	Green synthesis					
IV	1	Green synthesis of the following compounds,Adipic acid, Catechol, Benzoyl bromide, Acetaldehyde, Citral, Ibruprofen and Paracetamol	3	Synthesize different compounds by Green synthesis method	Illustration, Seminar	Multiple choice questions
	2	Microwave assisted reactions in water , Hoffmann Elimination, Hydrolysis of benzyl chloride and methyl benzoate , oxidation of toluene and alcohols.	3	Learn the different microwave assisted reactions in water	Lecture, Group discussion	Formative assessment - II
	3	Microwave assisted reactions in organic solvents , Esterification, Fries rearrangement, Clasien Rearrangement ,Diels – Alder Reaction and Decarboxylation.	3	Understand the different microwave assisted reactions in organic solvents	Lecture with ppt	Quiz
	4	Ultra sound assisted reactions ,Esterification, Saponification, alkylation, oxidation, reduction, coupling reactions and Cannizaro reactions	3	Learn the different Ultra sound assisted reactions	Lecture, Illustration	Short test
	Green reactions involving basic principle of green chemistry					
V	1	Twelve principles of green chemistry – choice of starting materials – biomimitic, multifunctional reagents , materials reagents.	3	Know the twelve principles of green chemistry	Lecture, Quiz	Short test
	2	Combinatorial green chemistry, Green Chemistry in sustainable developments.	3	Understand the importance of Green Chemistry in sustainable developments	Lecture with PPT	Quiz

	3	Importance of Green chemistry in day to day life, versatile bleaching agents and analgesic drugs	4	Learn the Importance of Green chemistry in day to day life	Lecture, Group discussion	Assignment Formative assessment - III

Course Instructor: .S.Ajith Sinthuja HOD: G. Leema Rose

Name of the Course : Chemistry for competitive examination

Course code : CSK175

CO - No.	Course Outcome Upon completion of course students will be able to	PSO	CL
CO - 1	recognize and remember theories of atoms	PSO - 1	U
CO - 2	predict chemical bonding	PSO - 2	C
CO - 3	analyse the composition and constituents of atmospheric air	PSO - 8	An
CO - 4	measure the hardness of water	PSO - 5	E
CO - 5	differentiate between metals and non metals	PSO - 2	U
CO - 6	analyse the chemical compounds present in polymers, drugs and fertilizers	PSO - 11	An

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
Matter						
I	1	Definition of matter, physical classification, properties of solids, liquids and gases, changes of physical state.	1	Differentiate between physical properties of solids, liquids and gases,	Lecture discussion	Short test Multiple choice questions Assignment
	2	Chemical classifications of elements, compounds, mixtures.	1	Know the classifications of elements, compounds, mixtures	Question answer session	
	3	Classifications of metals, non metal and metalloids with example. physical states of some important elements.	1	Evaluate the properties of metal and non metal	Illustration lecture method	
	4	Compounds, definition, classifications of inorganic and organic compounds with examples, Some important compounds and their common names and uses. Characteristics of compounds.	1	Differentiate between inorganic and organic compounds	seminar	
	5	Mixtures, definitions- classifications homogenous and heterogeneous examples properties of	1	Evaluate properties of compounds and mixtures.	Lecture with PPT	

		mixtures, differences between compounds and mixtures.				
	6	Separation of mixtures – techniques, principles and examples; Handpicking, sieving, magnetic separation, sublimation, sedimentation, Decantation, filtration, evaporation, Distillation, Crystallization	2	Learn the different techniques ofseparation of mixtures	demonstration	
Structure of Atoms						
II	1	Atoms, definition, Dalton's atomic theory, atom models, Rutherford, J.J. Thomson and Bohr	1	Understand the atom models	Group discussion	Assignment,
	2	Sub-atomic particles, charges of sub- atomic particles, discoveries of subatomic particles.	1	Know the sub atomic particles	Illustration lecture method	Short test Multiple choice questions
	3	Atomic and mass number isotopes, symbols for elements	1	Remember the symbols for elements	Question answer session	
	4	Principles governing filling up of electrons in the orbitals. Electronic configurations of first twenty	1	Learn filling up of atomic orbitals	lecture method	

		elements.				
Classification of Elements and Periodicity of Properties						
III	1	Classification of elements of Doberiner, Newlands, Mendeleev and modern Perioidc tables	1	Remember the different forms of periodic tables	Group discussion	Short test, Multiple choice questions, Online assignment
	2	Group and Periods – classification of elements into s,p,d and f block with examples	2	Learn the classification of the elements	Lecture method	
	3	Periodicity of properties –atomic – ionic radii - ionization potential energy	1	Analyse the variation in periodic properties.	Group discussion	
	4	Electron affinityand electronegativity.	1	Evaluate the variation in Electron affinity and electronegativity	Question answer session	
Chemical Bonding and Non-Metals						
IV	1	Need for the chemical bond formation- introduction to ionic bond, covalent bond, co-ordinate bond and metallic bond- ionic bond formation, lattice energy- formation with example as NaCl	2	Differentiate the types of bonds	Lecture with PPT	Short test, Multiple choice questions
	2	Covalent bond – definition and explanation using H_2, O_2, N_2 and CH_4	1	Identify covalent bond	Lecture method	
	3	Properties of ionic and covalent compounds Noble gases and their applications	1	Learn the properties of covalent bond	Seminar	
	4	Halogens and their applications preparation and uses of Hydrogen, phosphorus and sulphur	1	Know the uses of H, P and S	Group discussion	
	5	Allotropes of Carbon - graphite, diamond and fullerene.	1	Diffferentiate the allotropes of carbon	Question answer session	

Air and Water						
V	1	Atmosphere, different layers of atmosphere and their compositions, composition of air, uses of various components of air	1	Analyse the components of air	Lecture with PPT	
	2	Air pollution, sources, effects and control measures	1	Evaluate the sources of air pollution	Group discussion	Multiple choice questions, Formative assesment
	3	Water, abnormal properties of water and its explanation using H-bonding- Hard and soft water, temporary and permanent hardness	1	Compare the different water sources and analyse its hardness	Demonstration	
	4	Removal of hardness – Boiling, Clarks process, Zeolite process and washing soda process, Reverse osmosis	1	Learn the methods of removal of hardness	Illustration lecture method	
	5	preparation and uses of distilled water	1	Understand the uses of distilled water	Group discussion	

Course Instructor *:* K. Francy HOD: G. Leema Rose