

Department of Chemistry

Semester – II

Physical Chemistry – I

Sub. Code: CC1721

Teaching Plan

Unit	Module	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/Evaluation
I.	Gaseous State					
	1.	Kinetic molecular theory of gases, Derivation	2	To understand the importance of kinetic theory of gases	Lecture, Discussion	Evaluation through short test,
	2.	Types of molecular velocities	3	To define and differentiate various types of molecular velocities	Lecture, Discussion	Formative assessment
	3.	Heat capacities of ideal gases	2	To gain knowledge about molar heat capacities	Lecture	Formative assessment
	4.	Principle of equipartition of energy	3	To get idea about the distribution of energy	Lecture	Formative assessment, Short test
	5.	Real gases , Vanderwaal's equation of state	2	To differentiate real and ideal gases	Question answer session Lecture	Formative assessment, Assignment
II.	Liquid State					
	1.	Structure and properties of liquids	2	To know the structure and properties of various liquids	Lecture with PPT Illustration	Formative assessment
	2.	Surface tension, effects	2	To know the effects of surface tension	Lecture, Illustration	Formative assessment
	3.	Co-efficient of viscosity, effect of temperature and pressure.	2	To understand the effect of various factors on viscosity	Lecture, Discussion	Formative assessment, Short test
	4.	Additive and constitutive properties	4	To correlate molar volume and viscosity with chemical constitution	Lecture, Discussion	Formative assessment, Online Quiz
III	Solid State					
	1.	Symmetry in crystal systems	2	To know about different types of crystals	Lecture, Illustration	Formative assessment, Assignment

	2.	Space lattice and unit cell, Bragg's equation	3	To derive Bragg's equation	Lecture, Illustration	Formative assessment
	3.	X-ray diffraction, analysis of crystal structures	4	To analyse the diffraction patterns of crystals	Lecture	Formative assessment Short test
	4.	Types of crystals	3	To recognise the various types of crystals	Lecture with PPT Illustration	Seminar, Formative assessment
IV	Ionic Equilibria					
	1.	Electrolytes, Types	2	To know about different electrolytes	Lecture	Formative assessment
	2.	Ionic product of water, common ion effect.	1	To understand and differentiate ionic product and common ion effect.	Lecture, Discussion	Formative assessment, Short test
	3.	pH scale – buffer solutions, Henderson equation	2	To acquire knowledge about various pH ranges and buffer.	Lecture	Short test
	4.	Hydrolysis of various salts	3	To evaluate the hydrolysis constants.	Lecture, Discussion	Formative assessment
	5.	Acid base indicators-Types	2	To know different acid base indicators	Lecture	Formative assessment
V	Colloids					
	1.	Classification and types of colloids	4	To classify different colloids	Lecture, Discussion	Formative assessment
	2.	Preparation and properties of colloids	3	To gather knowledge regarding the preparation of colloids	Lecture	Formative assessment
	3.	Surfactants-actions and applications	1	To understand the action of surfactants and applications	Lecture, Illustration	Formative assessment, Short test
	4	Emulsions, emulsifiers	4	To classify emulsions and assess the action of emulsifiers	Lecture, Discussion	Formative assessment, Seminar

Course Instructor: Sr. K. Francy

HOD: G. Leema Rose

Semester II & IV
Allied Chemistry – Inorganic & Physical Chemistry
Sub. Code: CA1721
Teaching Plan

Unit	Module	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	Hydrogen and water					
	1	Types of hydrogen – nascent hydrogen, active hydrogen, atomic hydrogen, ortho and para hydrogen Hydrogen as a future fuel	3	Know the types and importance of Hydrogen	Lecture	Group discussion
	2	Dueterium and tritium – preparation, properties and uses.	2	Explain the physical and chemical properties of deuterium and tritium	Lecture, quiz	Group discussion
	3	Water: Hardness – types, determination of degree of hardness by EDTA method	3	Determine the hardness of water	Lecture with ppt	Formative assessment - I
	4	Heavy water: Preparation, properties and uses DO, BOD and COD (definition only).	4	Detect water pollution	Lecture with ppt	Formative assessment - I
II	Metallurgy					
	1.	Minerals and ores – difference between them	2	Differentiate between minerals and ores	Lecture	Multiple choice questions
	2.	Methods of dressing – roasting, calcinations, reduction by aluminothermic process, smelting, purification by electrolysis, zone refining, Kroll's process and Van Arkel de-Boer method.	4	Explain the methods of processing of ores	Lecture with ppt	Multiple choice questions

	3.	Extraction, properties and uses of titanium, molybdenum and tungsten	3	Know the process of extraction of Ti and W	Lecture	Group discussion
	4.	Preparation and uses - TiO_2 and TiCl_4 , preparation and properties of MoO_2 .	3	Explain the preparation and uses of TiO_2 and TiCl_4	Illustration Lecture	Group discussion
III	Thermodynamics					
	1.	Exothermic and endothermic reactions with examples, change of enthalpy in a chemical reaction – sign of ΔH	3	Differentiate exothermic and endothermic reactions	Lecture with ppt	Formative assessment - II
	2.	Hess's law of constant heat summation, first law of thermodynamics – definition and mathematical statement	4	Define the laws of thermodynamics	Illustration	Formative assessment - II
	3.	Reversible and irreversible processes – difference between them. Isothermal and adiabatic processes – expression for q, w, ΔE & ΔH for reversible and irreversible isothermal expansion of an ideal gas.	4	Derive the expression for q, w, ΔE & ΔH for reversible and irreversible isothermal expansion of an ideal gas.	Lecture	Illustration, Seminar
IV	Electrochemistry					
	1.	Strong and weak electrolytes with examples – degree of ionization	2	Explain strong and weak electrolytes	Lecture with ppt	Quiz
	2.	Factors affecting degree of ionization – ionization constant – ionic product of	3	Understand the factors affecting ionisation	Lecture	Quiz

		water – pH scale – common ion effect and its applications				
	3.	Salt hydrolysis – types of salts with examples, derivation of hydrolysis constant and degree of hydrolysis of a salt formed from weak acid and strong base	3	Explain the types of salts	Lecture	Short test
	4.	Buffer solutions with examples. Solubility, solubility product and its applications.	3	Define buffer solutions, solubility and solubility product	Lecture with ppt	Short test
V	Nuclear Chemistry					
	1.	Radioactivity – properties of α , β and γ rays	2	Explain the properties of α , β and γ rays	Lecture	Assignment
	2.	Soddy's group displacement law – radioactive decay, derivation of decay constant, half life period- derivation from decay constant	4	Derive expression for radioactive decay constant	Lecture with ppt	Assignment
	3.	Average life, radioactive series. Nuclear reactions - nuclear fission and fusion – Stellar energy.	3	Distinguish between different types of nuclear reactions	Lecture	Formative assessment - III
	4.	Applications of radioactivity – in medicine, agriculture, industry and radio carbon dating.	2	Know the applications of radioactivity	Group discussion	Formative assessment - III

Course Instructor: R. Gladis Latha

HOD: G. Leema Rose

NMEC
Semester II
Fuel Chemistry
Sub. Code: CNM172
Teaching Plan

Unit	Module	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	Energy sources					
	1.	Renewable energy sources-Types of energy, definition and examples	2	To know the different types of renewable energy sources	Lecture, Discussion	Evaluation through short test, Online Quiz, Assignment,
	2.	Non-renewable energy sources, Types and examples.	2	To identify the different types of non renewable energy sources	Lecture, Discussion	Formative assessment
	3.	Types of fuels, determination of calorific value	2	To determine the calorific value of a fuel.	Lecture	Formative assessment
	4.	Classification of fuels, criterion for the selection of a fuel, properties of fuels	3	Analyse various factors to select a good fuel	Lecture Question answer session	Formative assessment, Short test
II	Solid fuels					
	1.	Natural, artificial and industrial solid fuels.	2	Identify the sources, and types of solid fuels.	Lecture with PPT Illustration	Formative assessment
	2.	Formation of coal, properties and classification	3	To classify different types of coal.	Lecture, Illustration	Formative assessment
	3.	Role of Sulphur and ash in coal, Advantages and disadvantages of solid fuels	2	To impart knowledge on the impurities in coal	Lecture, Discussion	Formative assessment, Short test
	4.	Preparation, composition and uses of coal gas, Fractionation of coal tar, liquefaction of coal.	2	To know the composition and uses of coal gas and fractionation of coal tar	Lecture, Discussion	Formative assessment, Online Quiz

III	Liquid fuel					
	1.	Petroleum and petrochemicals, Refining of petroleum	2	To attain knowledge on petrochemicals and refining of petroleum.	Lecture	Formative assessment, Assignment
	2.	Composition and uses of main petroleum fractions, Cracking-types, advantages.	3	To clarify various petroleum fractions and the formation of different compounds.	Lecture, Discussion	Formative assessment
	3.	Octane rating, cetane rating, Petrochemicals	2	To get a clear idea about octane and cetane number	Lecture	Formative assessment Short test
4.	Catalysts used in petroleum industry, methods involved in the manufacture of petrochemicals.	3	To have an exposure about the catalysts and methods used in petroleum industry.	Lecture, Discussion	Seminar, Formative assessment	
IV	Gaseous fuel					
	1.	Gaseous fuel – Classification, examples and their importance.	3	To classify gaseous fuels	Lecture	Formative assessment
	2.	Natural gasoline – aviation gasoline – artificial gaseous fuels	2	To learn about the types of gasoline	Lecture, Discussion	Formative assessment, Short test
	3.	Water gas and producer gas - manufacture, composition and uses	2	To focus on the manufacture and nature of water and producer gases.	Lecture, Discussion	Short test
4.	Semi water gas and LPG – composition and uses. Bio gas generation	2	To learn the generation of bio gas.	Lecture with PPT Illustration	Formative assessment	
V	Rocket and Nuclear fuels					
	1.	Solid and liquid propellants , Homogeneous and heterogeneous	2	To classify the different fuels.	Lecture, Discussion	Formative assessment

		propellants				
	2.	Propellants used in rocket and guided missiles.	2	To identify the propellants used in rockets.	Lecture	Formative assessment
	3.	Nuclear propellants, fertile materials, Nuclear fuel cycle in India	2	To impart knowledge on nuclear processes.	Lecture with PPT Illustration	Formative assessment, Short test
	4.	Heavy water reactor and fast breeder reactors	3	To focus on various reactors.	Lecture with PPT Illustration	Formative assessment, Seminar

Course Instructor: Sr.Francy

HOD: G. Leema Rose

Semester IV
Organic Chemistry – II
Sub. Code : CC1741
Teaching Plan

Unit	Module	Description	Hours	Learning outcome	Pedagogy	Assessment / evaluation
I	Carbonyl Compounds					
	1	Structure, reactivity and general methods of preparation of aldehydes and ketones	2	Interpret the structure of aldehydes and ketones	Lecture method	Short test, MCQ, Assignment
	2	Nucleophilic addition and condensation reactions	1	Differentiate addition and condensation reactions	Lecture method	Evaluation through short test, Online Quiz, Assignment,
	3	Mechanisms of Aldol condensation	1	Apply the mechanism to other condensation	Seminar	Formative assessment
	4	Benzoin condensation, Knoevenagel condensation	2	Evaluate the condensation reactions	Seminar	Formative assessment
	5	Perkin & Cannizzaro reaction and Benzil-Benzilic acid rearrangement.	2	Recognise rearrangements	Lecture method	Formative assessment, Short test
	6	Baeyer-Villiger - oxidation	1	Describe oxidation	Power point	Formative assessment, Short test
	7	Reductions - Clemmensen, Wolff-	2	Relate the reduction process of various	Lecture method	Formative assessment,

		Kishner, LiAlH ₄ and NaBH ₄ reductions.		reducing agents		Short test
II	Carboxylic Acids and their Derivatives					
	1	Preparation and reactions of monocarboxylic acids	2	Learn the various methods of preparation	Lecture method	Short test, MCQ, Assignment
	2	Typical reactions of dicarboxylic acids, hydroxy acids	2	Understand the different reactions of acids	Seminar	Evaluation through short test, Online Quiz, Assignment,
	3	Typical reactions of unsaturated acids - succinic, phthalic, malic, tartaric, maleic and fumaric acids.	3	Compare the reactions of various unsaturated acids	Power point	Formative assessment
	4	Preparation and reactions of acid chlorides, anhydrides, esters and amides	2	Know the various methods of preparation	Lecture method	Formative assessment
	5	Mechanism of Claisen condensation and Hofmann rearrangement	2	Apply the mechanism in rearrangements	Lecture method	Formative assessment, Short test
III	Functional Groups Containing Nitrogen					
	1	Preparation and important reactions of nitro compounds, nitriles and iso nitriles	2	Interpret the structure and reactions of nitro compounds	Lecture method	Short test, MCQ, Assignment
	2	Preparation of amines - Gabriel phthalimide synthesis, properties	1	Learn the various methods of preparation	Lecture method	Evaluation through short test, Online Quiz, Assignment,
	3	Carbylamine reaction, Hoffmann's exhaustive methylation	2	Interpret the mechanisms	Lecture - discussion	Formative assessment
	4	Hofmann-elimination reaction; distinction among 1°, 2° and 3° amines with Hinsberg reagent and nitrous acid.	3	Differentiate 1°, 2° and 3° amines	Lecture method	Formative assessment
	5	Preparation of diazonium Salts and synthetic applications	2	Learn the various methods of preparation	Lecture method	Formative assessment, Short test
	6	Curtius rearrangement	1	Apply the mechanism in	Power point	Formative assessment,

				rearrangement		Short test
IV	Active methylene compounds					
	1	Reactivity of active methylene group.	1	Know the importance of active methylene group	Lecture method	Short test, MCQ, Assignment
	2	Preparation and properties of acetoacetic ester	1	Understand the various methods of preparation	Lecture method	Evaluation through short test, Online Quiz, Assignment,
	3	Acid hydrolysis and ketonic hydrolysis	1	Differentiate acid and ketonic hydrolysis	Seminar	Formative assessment
	4	Synthetic applications of acetoacetic ester - synthesis of mono alkyl acetone	1	Recognize the advantage of acetoacetic ester	Power point	Formative assessment
	5	Synthesis of butanoic acid, 2 - pentanone, acetyl acetone,	1	Learn the various synthesis	Lecture method	Formative assessment, Short test
	6	Synthesis of succinic acid, α,β unsaturated acid, 2,5 - diketone, 1,3 - diol, γ - keto acid and 4 - methyl uracil Preparation of Malonic ester and its synthetic applications	2	Know the importance of synthesis	Lecture method	Formative assessment, Short test
	7	Synthesis of pentanoic acid, succinic acid, pentanedioic acid, adipic acid synthesis of β - keto acid, α,β - unsaturated acid, cyclo alkane carboxylic acid and barbituric acid	2	Explain the various synthesis	Lecture method	Formative assessment, Short test
	8	Preparation, and synthetic applications of cyano acetic ester	1	Know the importance of cyano acetic ester	seminar	Formative assessment, Short test
	9	Synthesis of malonic acid, propionic acid, α,β unsaturated acid, succinic acid and β -amino ester, cycloalkanes. Relative stability - Baeyer's strain theory and modification.	2	Learn the various synthesis	Lecture method	Formative assessment, Short test

V	Aromatic hydrocarbons					
	1	Concept of Aromaticity and characteristics of aromatic compounds, Huckel's rule.	2	Know the difference between aromatic and non aromatic compounds	Lecture method	Formative assessment, Short test
	2	Aromatic character of cyclic hydrocarbons	1	Understand the aromatic character	Seminar	Formative assessment, Short test
	3	Benzene - isolation, preparation and structure	2	Learn the preparation and structure	Lecture method	Formative assessment, Short test
	4	Electrophilic aromatic substitution, halogenation, nitration	2	Differentiate substitution reactions	Seminar	Formative assessment, Short test
	5	Mechanisms of sulphonation, Friedel-Craft's alkylation and acylation.	2	Interpret mechanisms	Power point	Formative assessment, Short test
	6	Ortho, para and meta Directing effects of the groups	2	Predict the Ortho, para and meta Directing effects of the groups	Lecture method	Formative assessment, Short test

Course Instructor: Dr.M.Anitha Malbi

HOD: G. Leema Rose

Semester – IV
Paper VI- Elective II –Industrial Chemistry – II
Sub. Code: CC1743
Teaching Plan

Unit	Module	Topics	Lecture hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	Petroleum Industry					
	1	Petroleum and petrochemicals, refining of petroleum, composition and uses of main petroleum fractions	1	Understand the refining process of petroleum its composition and uses	Lecture with PPT	Short test
	2	Cracking, thermal and catalytic cracking, advantages of catalytic cracking and Octane number.	2	Gain knowledge on Cracking process	Lecture	Multiple choice questions
	3	Cetane number, ignition and flash points, anti knock agents, unleaded	2	Know the different characteristic of	Lecture and Question answer	Assignment Formative assessment -I

		petrol, anti-diesel knock agents and hydrocarbons from petroleum.		petroleum	session	
	4	Petrochemicals, direct and indirect petrochemicals, Methods involved in manufacture of petrochemicals, alkylation, pyrolysis, halogenation, hydration and polymerization.	2	Learn the catalysts used in petroleum industry and the manufacture process of petrochemicals	Lecture, Seminar	Short test
	5	Classification of petrochemicals, examples. Manufacture of synthetic petrol by Bergius process and Fischer – Tropsh process.	2	Classify the petrochemicals	Lecture with PPT and Question answer session	Assignment, Formative assessment
	6	Manufacture and uses of petrochemicals, Methanol, Ethanol, Isopropyl alcohol, formaldehyde, Ethylene glycol, Glycerol, Phenol and Acetone .	2	Know the manufacture and uses of petrochemicals	Lecture	Quiz
	7	Catalysts used in petroleum industry. Petrochemical Industries in India.	1	Know the Catalysts used and Petrochemical Industries in India	Group discussion	Assignment, Formative assessment
II	Fertilizers and agro chemicals					
	1	Plant nutrients, Macronutrients, Micronutrients. Need for fertilizers, characteristics of a good fertilizer. Role of N, P and K in plant growth , Classification of fertilizers, Natural fertilizers and artificial fertilizers.	2	Understand the need for fertilizers and characteristics of a good fertilizer.	Lecture, Seminar	Short test
	2	Classification, manufacture and uses of artificial fertilizers such as Urea, Calcium cyanamide, Calcium	2	Know the classification and manufacture of artificial	Lecture with PPT and Question answer session	Assignment, Formative assessment

		ammonium nitrate, Superphosphate of lime-Triple superphosphate, Potassium chloride and DAP.		fertilizers		
	3	NPK fertilizers, Biofertilizers and its advantages. Agro chemicals and its Classification. Preparation and Uses of Lead arsenate	3	Understand the advantages of Biofertilizers	Group discussion	Quiz
	4	Preparation and Uses of Calcium arsenate, DDT, Methoxychlor, BHC, Chlordane, Parathion, Malathion and Baygon	2	Know the Preparation and Uses of Insecticides	Group discussion	Short test
	5	Preparation and Uses of Fungicides like Lime, Sulphur, Bordeaux mixture, Sodium sulphate and Thallium Sulphate.	1	Know the Preparation and Uses of Fungicides	Lecture with PPT	Assignment ,Formative assessment
	6	Preparation and uses of Weedicides like Butachor, Eptam (EPTC) and DNOC.	1	Learn the Preparation and Uses of weedicides	Lecture with PPT	Quiz
	7	Preparation and uses of Rodenticides like Zinc phosphide, Aluminium phosphide, Coumachlor and Warfarin	1	Know the Preparation and Uses of Rodenticides	Group discussion	Multiple choice questions
III	Rubber					
	1	Importance of rubber Latex , Coagulation of rubber, Refining of Crude rubber and Drawbacks of raw rubber	3	Understand the Importance and Refining of rubber	Lecture with PPT	Short test
	2	Rubber fabrication, Vulcanisation, Techniques of vulcanisation and Properties of vulcanised rubber	2	Learn the fabrication and Vulcanisation Techniques	Lecture with PPT	Assignment, Formative assessment
	3	Physical and chemical properties of rubber, Solvents for natural rubber and its	2	Learn the properties of rubber	Group discussion	Quiz

		Classification				
	4	Synthetic rubber and its classification. Manufacture, Properties and uses of Buna-S	1	Know the Manufacture and Properties of rubber	Lecture with PPT and Question answer session	Multiple choice questions
	5	Properties and uses of Neoprene, Buna-S, Thiokol, Silicon rubber, Polyurethane and Spandex	1	Understand the Properties and uses of Neoprene, Buna-S and Thiokol	Group discussion	Quiz
	6	Properties and uses of Reclaimed, Spong, foam, laminates, rubber cement and thermocole .Applications of rubber.	1	Know the applications of rubber.	Lecture with PPT and Question answer session	Assignment
IV	Matches and explosives					
	1	Safety matches, classification and its composition. Manufacture of Safety matches. Pyrotechnology and composition of fireworks.	2	Learn the classification, composition and Manufacture of Safety matches.	Lecture with PPT and Question answer session	Short test
	2	Explosives and its Characteristics. Characteristics of Low explosives, Gun powder and Smokeless powder. Preparation and uses of Primary explosive like Lead azide	3	Know the Characteristics of explosives and its preparation.	Lecture with PPT	Assignment
	3	Preparation and uses of Primary explosives like Mercury fulminate, Diazodinitrophenol, Tetryl, Ethylene dinitramine. High explosives, Trinitrotoluene, Picric acid and Ammonium picrate	2	Know the Preparation and uses of Primary explosives	Lecture with PPT	Quiz
	4	Glyceryl trinitrate, Dynamite, PETN, Cyclonite and HMX. Toxic chemicals	1	Understand the effect of Toxic chemicals	Group discussion	Multiple choice questions
	5	Preparation and properties of Mustard,	2	Understand the Preparation and	Lecture with PPT and	Quiz

		Phosgene, Nerve gases, Adamsite, Chloroacetophenone and Chloropicrin.		properties of Toxic chemicals	Question answer session	
	6	Screening of smokes, Incendiaries and Explosives in India.	2	Know the Explosives in India.	Lecture with PPT	Short test
V	Protective coatings and silicates					
	1	Definition, Classification and Composition of Paints Manufacture and Process of setting of paint, Requirements of a good paint and Importance of pigment volume concentration-.	2	Learn the Classification and Composition of paints	Lecture with PPT and Question answer session	Short test
	2	Applications. Emulsion paints, Constituents, advantages , methods of manufacture, chemical action and paint removers.	3	Learn the Applications and chemical action of paints	Group discussion	Assignment
	3	Definition, Classification and manufacture of Varnishes. Raw materials and composition of Varnishes. Definition, Composition and importance lacquers	2	Know the Classification and manufacture of Varnishes and Lacquers	Lecture with PPT and Question answer session	Quiz
	4	Definition of Cement, Raw materials used in the Manufacture of cement and Setting of cement.	1	Understand the Manufacture process of cement	Lecture with PPT	Multiple choice questions
	5	Properties, Quality test and uses of cement. Manufacture, Physical and Chemical properties of Glass. Preparation and uses of Special glasses like fused silica glass, Vycor glass, optical glass, lead glass, coloured glass, opal glass, safety glass, fibre glass laminates, glass wool and flint glass.	2	Understand the Physical and Chemical properties of glasses	Lecture with PPT	Quiz

	6	Pyrex and jena glasses, Definition and classification of Refractories. Definition, uses, classification of Abrasives. Natural abrasives and Synthetic abrasives.	2	Know the uses and classification of Refractories and abrasives.	Lecture with PPT	Short test
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Course Instructor: L. Deva Vijila

HOD: G. Leema Rose