MANONMANIAM SUNDARANAR UNIVERSITY -TIRUNELVELI
UG **PROGRAMMES**

OPEN AND DISTANCE LEARNING(ODL) PROGRAMMES

(FOR THOSE WHO JOINED THE PROGRAMMES FROM THE ACADEMIC YEAR 2023–2024)

B.Sc. Chemistry

Semester	Course	Title of the Course	Course Code
II	Part I – Languages (Tamil)	தமிழ் இலக்கிய வரலாறு - II	J1TL21
	Part II – Languages (English)	General English – II	J2EN21
	Core – III	General Chemistry - II	JMCH21
	Core – IV	Qualitative Organic Analysis and Preparation of Organic Compounds (Practical)	JMCHP2
	Generic Elective – III	Allied Physics - II	JEPH21
	Generic Elective – IV	Allied Physics Practical - II	JEPHP2
	Skill Enhancement Course–II	Dairy Chemistry	JSCH21
	Skill Enhancement Course –III	Cosmetics and Personal Grooming	JSCH22

GENERAL CHEMISTRY-II

UNIT	DETAILS
I	**Acids, bases and Ionic equilibria** Concepts of Acids and Bases - Arrhenius concept, Bronsted -Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators; Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation; Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis; Solubility product - determination and applications; numerical problems involving the core concepts**.**
II	**Chemistry of s - Block Elements** Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na_2CO_3,KBr, $KClO_3$ alkaline earth metals. Anomalous behaviour of Be. **Chemistry of p- Block Elements (Group 13 & 14)** preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Aland its uses. Alloys of Al. comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structureand uses. Percarbonates, per mono carbonates and per dicarbonates.

III	**Chemistry of p- Block Elements (Group 15-18)** General characteristics of elements of Group 15; chemistry of H_2N-NH_2, NH_2OH, NH_3 and HNO_3. Chemistry of PH_3, PCl_3, PCl_5, $POCl_3$, P_2O_5 and oxy acids of phosphorous ($H_3PO_3$and H_3PO_4). General properties of elements of group16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium – Oxy acids of sulphur (Caro's and Marshall's acids). Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids ($HClO_4$). Inter-halogen compounds (ICl, ClF_3, BrF_5 and IF_7), pseudo halogens [$(CN)_2$ and $(SCN)_2$] and basic natureof Iodine. Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2, XeF_4, XeF_6 and $XeOF_4$; uses of noble gases – clathrate compounds.
IV	**Hydrocarbon Chemistry-I** **Petro products:** Fractional distillation of petroleum; cracking, isomerisation, alkylation,reforming and uses. **Alkenes**-Nomenclature, general methods of preparation – Mechanism of elimination reactions – E1 and E2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization. **Alkadienes** Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes– Diels–Alder reactions – polymerisation – polybutadiene, polyisoprene (natural rubber), vulcanisation, polychloroprene. **Alkynes** Nomenclature; general methods of preparation, properties and reactions; acidicnature of terminal alkynes and acetylene, polymerisation and isomerisation. **Cycloalkanes:** Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations. Conformational analysis of cyclohexane, mono and di substituted cyclohexanes. Geometrical isomerism in cyclohexanes.

V	**Hydrocarbon Chemistry - II** **Benzene:** Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2)□e^- rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenations. Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity. **Polynuclear Aromatic hydrocarbons**: Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation, preferential substitution at o-,p- or m- position – reduction, oxidation – uses. Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.
Recommended Text	
	1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nded, S.Chand and Company, New Delhi. 2. Sathya Prakash, Tuli G D,Basu S K and Madan R D, (2003), Advanced Inorganic Chemistry, 17th ed., S. Chand and Company, New Delhi. 3. Bahl B S, Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed., S. Chand and Company, New Delhi. 4. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi. 5. Puri B R, Sharma L R, (2002), Principles of Physical Chemistry, 38th ed., Vishal Publishing Company, Jalandhar.

QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS

UNIT	DETAILS
I	Safety rules, symbols and first-aid in chemistry laboratory Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware –basis information and uses.
II	**Qualitative Organic Analysis** Preliminary examination, detection of special elements - nitrogen, sulphur andhalogens Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests. Confirmation of functional groups • monocarboxylic acid, dicarboxylic acid • monohydric phenol, polyhydric phenol • aldehyde, ketone, ester • carbohydrate (reducing and non-reducing sugars) • primary, secondary, tertiary amine • monoamide, diamide, thioamide • anilide, nitro compound Preparation of derivatives for functional groups
III	**Preparation of Organic Compounds** i. Nitration - picric acid from Phenol ii. Halogenation - p-bromo acetanilide from acetanilide iii. Oxidation - benzoic acid from Benzaldehyde iv. Microwave assisted reactions in water: v. Methyl benzoate to Benzoic acid vi. Salicylic acid from Methyl Salicylate vii. Rearrangement - Benzil to Benzilic Acid viii.Hydrolysis of benzamide to Benzoic Acid ix. **Separation and Purification Techniques (Not for Examination)** 1. Purificationof organic compounds by crystallization (from water / alcohol)and distillation 2. Determination of melting and boiling points of organic compounds. **Steam distillation** - Extraction of essential oil from citrus fruits/eucalyptusleaves.

	4. Chromatography (any one) (Group experiment) (i) Separation of amino acids by Paper Chromatography (ii) Thin Layer Chromatography - mixture of sugars / plant pigments /permanganate dichromate. (iii) Column Chromatography - extraction of carotene, chlorophyll and xanthophyllfrom leaves / separation of anthracene - anthracene picrate. **5. Electrophoresis –** Separation of amino acids and proteins. **(Demonstration)** **6.** Isolation of casein from milk/Determination of saponification value of oil or fat/Estimation of acetic acid from commercial vinegar. (Any one Group experiment)(4,5& 6–not for ESE)
Recommended Text	
	1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principlesof PracticalChemistry*, 2nd ed.; Sultan Chand: New Delhi, 2012. 2. Manna, A.K. *Practical Organic Chemistry*, Books and Allied: India,2018. 3. Gurtu, J. N; Kapoor, R. *Advanced Experimental Chemistry (Organic)*,SultanChand: New Delhi, 1987. *4.* Furniss,B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. *Vogel'sTextbook of Practical Organic Chemistry*, 5th ed.; Pearson: India,1989.

ALLIED PHYSICS–II

UNIT	DETAILS
I	**OPTICS: i**nterference – Interference in thin films – Colors of thin films – Air wedge – Determination of diameter of a thin wire by air wedge – Diffraction – Normal incidence – Experimental determination of wavelength using diffraction grating (no theory) – Polarization – Optical activity – Application in sugar industries.
II	**ATOMICPHYSICS:** Atom models –Bohr atom model – Mass number – Atomic number – Nucleons –Pauli's exclusion principle – electronic configuration – Periodic classification of elements –Zeeman effect (elementary ideas only)–Photoelectric effect– Einstein's photoelectric equation – Applications of photo electric effect.
III	**NUCLEAR PHYSICS: N**uclear models – Liquid drop model – Magic numbers – Nuclear energy – Mass defect – Binding energy –Radioactivity–Uses–Chain reaction-Controlled and uncontrolled chain reaction – Nuclear fission – Energy released in fission —Nuclear fusion – Differences between fission and fusion.
IV	**INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES**: Frame of reference – Postulates of special theory of relativity - Lorentz transformation equations – Derivation – Length contraction – Time dilation – Mass-energy equivalence.
V	**SEMI CONDUCTOR PHYSICS:** p-n junction diode – Forward and reverse biasing – Characteristic of diode – Zener diode – characteristic of zener diode – Voltage regulator construction and working – Advantages (no mathematical treatment) –USB cell phone charger – Introduction to e-vehicles and EV charging stations.
VI	**PROFESSIONAL COMPONENTS:** Expert lectures –Seminars – Webinars – Industry inputs – Social accountability –Patriotism.
Recommended Text	
1	R. Murugesan (2005), Allied Physics, S. Chand and Co, New Delhi.
2	K.Thangaraj and D.Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai.
3	Brijlal and N.Subramanyam (2002), Text book of Optics, S.Chand and Co, New Delhi.
4	R. Murugesan (2005), Modern Physics, S.Chand and Co, New Delhi.
5	A. Subramaniyam Applied Electronics, 2nd Edn., National Publishing Co., Chennai.

ALLIED PHYSICS PRACTICAL – II

Minimum of Eight Experiments from the list:

1. Radius of curvature of lens by forming Newton's rings
2. Thickness of a wire using air wedge
3. Wavelength of mercury lines using spectrometer and grating
4. Refractive index of material of the lens by minimum deviation
5. Refractive index of liquid using liquid prism
6. Determination of AC frequency using sonometer
7. Specific resistance of a wire using PO box
8. Thermal conductivity of poor conductor using Lee's disc
9. Determination of figure of merit table galvanometer
10. Determination of Earth's magnetic field using field along the axis of a coil
11. Characterisation of Zener diode
12. Construction of Zerner / IC regulated power supply
13. Construction of AND, OR, NOT gates using diodes and transistor
14. NORgateasa universal building block

DAIRY CHEMISTRY

UNIT	DETAILS
I	**Composition of Milk** Milk-definition-general composition of milk- constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizer- examples and their detection- estimation of fat, acidity and total solids in milk.
II	**Processing of Milk** Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization - Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.
III	**Major Milk Products** Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream - estimation of fatin cream. Butter – definition - composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common adulterants added to ghee and their detection – rancidity - definition - prevention - antioxidants and synergists - natural and synthetic.
IV	**Special Milk** Standardised milk - definition - merits - reconstituted milk - definition - flowdiagram of manufacture - Homogenised milk - flavoured milk – vitaminised milk - toned milk - Incitation milk - Vegetable toned milk - humanized milk - condensed milk - definition, composition and nutritive value.
V	**Fermented and other Milk Products** Fermented milk products – fermentation of milk - definition, conditions, cultured milk - definition of culture - example, conditions - cultured cream, butter milk - Bulgarious milk -acido philous milk – Yoheer Indigeneous products- khoa and chhena definition - Ice cream -definition-percentage composition-types-ingredients-manufacture of ice–cream, stabilizers – emulsifiers and their role – milk powder - definition-need form a king milk powder- drying process-types of drying.

RecommendedText	
	1. K. Bagavathi Sundari, Applied Chemistry, MJP Publishers, first edition,2006. 2. K. S. Rangappa and K.T. Acharya, Indian Dairy Products, Asia Publishing HouseNew Delhi, 1974. 3. Text book of dairy chemistry, M.P. Mathur, D. Datta Roy, P. Dinakar, Indian Councilof Agricultural Research, 1 st edition, 2008. 4. A Text book of dairy chemistry, Saurav Singh, Daya Publishing house, 1 stedition,2013. 5. Text book of dairy chemistry, P. L. Choudhary, Bio-Green book publishers,2021.

COSMETICS AND PERSONAL GROOMING

UNIT	Details
I	**Skin care** Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shaving and sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics – key ingredients, skin lightness, depilatories.
II	**Hair care** Shampoos – types – powder, cream, liquid, gel – ingredients; conditioner –types – ingredients **Dental care** Tooth pastes – ingredients – mouth wash
III	**Make up** Base – foundation – types – ingredients; lipstick, eyeliner, mascara, eye shadow,concealers, rouge
IV	**Perfumes** Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civet one from civet cat, musk from musk deer; synthetic – classification emphasizing- characteristics – esters – alcohols – aldehydes – ketones

V	**Beauty treatments** Facials - types – advantages – disadvantages; face masks – types; bleach -types – advantages– disadvantages; shaping the brows; eyelash tinting; perming – types; hair colouring and dyeing ; permanent waving – hair straightening; wax types – waxing; pedicure, manicure - advantages – disadvantages
RecommendedText	
1	Thankamma Jacob, (1997) Foods, drugs and cometics – A consumer guide,Macmillan publication, London.