

(Affiliated Colleges) 204 - B.Sc. Chemistry

Programme Structure and Scheme of Examination (under CBCS) (Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

	(Applicable)	to the candidates admitted from the acaden	nic year 20	23 -2024 (,			
Dowt	Course Code	Course Code Study Components & Course Title		House	Maximum Marks			
Part	Course Code	Study Components & Course Title	Credit	Hours	CI A	ES E	Total	
		SEMESTER – I						
		Language – I:						
	23UTAML11/	பொதுதமிழ் – I/					400	
I	23UHINL11/	Hindi – I/	3	6	25	75	100	
	23UFREL11	French – I						
II	23UENGL12	General English – I	3	6	25	75	100	
	23UCHEC13	Core – I: General Chemistry-I	5	5	25	75	100	
		Core –II : Practical - I			25	7.5	100	
	23UCHEP14	Quantitative Inorganic Estimation	5	4	25	75	100	
		(Titrimetry) and Inorganic Preparations						
		Elective - I						
		(Generic / Discipline Specific)						
III	23UMATE15	Mathematics-1 (or)	3/2	5/3	25	75	100	
	23UBOTE15	Botany – I (or)	5/2	3/3	25		100	
	23UZOOE15	Zoology – I (or)						
	23UBIOE15	Biochemistry – I						
	23UBOTEP1 23UZOOEP1	Botany Practical – I (or)	1	2	25	75	100	
	23UBIOEP1	Zoology Practical – I (or) Biochemistry Practical–I	1		25	73	100	
	250DIOLI I	Skill Enhancement Course – 1 (NME-						
		D COURSE TOWNER	2	2	25	75	100	
IV	20110110110	Foundation Course : Introductory			25		400	
	23UCHEF17	Chemistry	2	2	25	75	100	
		Total	23	30			700/80 0	
		SEMESTER – II						
		Language – II:						
_	23UTAML21/	பொது தமிழ் –II/	_	_				
I	23UHINL21/	Hindi – II/	3	6	25	75	100	
	23UFREL21	French –II						
II	23UENGL22	General English – II	3	6	25	75	100	
		-	<u>5</u>	5	25	75	100	
	23UCHEC23	Core – III: General Chemistry-II Core –IV: Practical– II	<u> </u>) 3	25	/3	100	
	23UCHEP24	Qualitative Organic Analysis and	5	4	25	75	100	
	250CHLI 24	Preparation of Organic Compounds	J	•	25	75	100	
		Elective - II						
		(Generic / Discipline Specific)						
III	23UMATE25	Mathematics-II (or)	3/2	5/3	25	75	100	
***		1 1			1 /5	75	100	
111	23UBOTE25	Botany-II (or)	3/2	3/3				
111	23UZOOE25	Zoology-II (or)	3/2	3/3				
***	23UZOOE25 23UBIOE25	Zoology-II (or) Biochemistry -II	3/2	3/3				
111	23UZOOE25 23UBIOE25 23UBOTEP2	Zoology-II (or) Biochemistry -II Botany Practical – II (or)					400	
	23UZOOE25 23UBIOE25 23UBOTEP2 23UZOOEP2	Zoology-II (or) Biochemistry -II Botany Practical – II (or) Zoology Practical – II (or)	1	2	25	75	100	
	23UZOOE25 23UBIOE25 23UBOTEP2	Zoology-II (or) Biochemistry -II Botany Practical – II (or) Zoology Practical – II (or) Biochemistry Practical –II				75	100	
IV	23UZOOE25 23UBIOE25 23UBOTEP2 23UZOOEP2	Zoology-II (or) Biochemistry -II Botany Practical – II (or) Zoology Practical – II (or) Biochemistry Practical –II Skill Enhancement Course – 2 (NME-				75 75	100	
	23UZOOE25 23UBIOE25 23UBOTEP2 23UZOOEP2	Zoology-II (or) Biochemistry -II Botany Practical – II (or) Zoology Practical – II (or) Biochemistry Practical –II	1	2	25			

(Common Paper)				
Total	23	30		700/80 0

Non-major (NME) Electives offered to other Departments

11/	23UCHEN1 6	Role of Chemistry in Daily Life	2	2	25	75	100
IV	23UCHEN2 6	Dairy Chemistry	2	2	25	75	100

SEMESTER: I PART: III Core - I	23UCHEC13 GENERAL CHEMISTRY-I	Credit: 5 Hours: 5
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Objectives of the course of the course aims at giving an overall view of the • various atomic models and atomic structure • wave particle duality of matter • periodic table, periodicity in properties and its application in explaining the chemical behaviour • nature of chemical bonding, and • fundamental concepts of organic chemistry Course Outline UNIT I

Atomic structure and Periodic trends

History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of Hspectrum; Photoelectric effect, Compton effect; Dual nature of Matter- DeBroglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli'exclusion principle and Aufbau principle;

Numerical problems involving the core concepts.

Unit II

Introduction to Quantum mechanics

Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wavefunctions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of Ψ and Ψ^2 .

Modern Periodic Table

Cause of periodicity; Features of the periodic table; classification of elements Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity.

Problems involving the core concepts

UNIT-III: Structure and bonding - I

Ionic bond

Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation – polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts.

Covalent bond

Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency hybridization; VSEPR theory - shapes of molecules of the type AB_2 , AB_3 , AB_4 , AB_5 , AB_6 and AB_7

Partial ionic character of covalent bond-dipole moment, application to molecules of the type A₂, AB, AB₂, AB₃, AB₄; percentage ionic characternumerical problems based on calculation of percentage ionic character.

UNIT-IV: Structure and bonding - II

VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO_2 , NO_2 , CO_3^{2-} , NO_3^- ; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2 , C_2 , O_2 , O_2^+ , O_2^{2-} , O_2^{2-} N₂, NO, HF, CO; magnetic characteristics, comparison of VB and MO theories.

Coordinate bond: Definition, Formation of BF₃, NH₃, NH₄⁺, H₃O⁺ properties

Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors

Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding — Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.

UNIT-V:

Basic concepts in Organic Chemistry and Electronic effects

Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes, arynes and nitrynes.

Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects.

Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free

	radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance.
	Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane
	Types of organic reactions- addition, substitution, elimination and rearrangements
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	 Madan, R. D. and Sathya Prakash, Modern Inorganic Chemistry, 2nded.; S. Chand and Company: New Delhi, 2003. Rao, C.N. R. University General Chemistry, Macmillan Publication: New Delhi, 2000. Puri, B. R. and Sharma, L. R. Principles of Physical Chemistry, 38thed.; Vishal Publishing Company: Jalandhar, 2002. Bruce, P. Y. and PrasadK. J. R. Essential Organic Chemistry, Pearson Education: New Delhi, 2008. Dash UN, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi, 2016
Reference Books	 Maron, S. H. and Prutton C. P. Principles of Physical Chemistry,4thed.; The Macmillan Company: Newyork,1972. Lee, J. D. Concise Inorganic Chemistry, 4th ed.; ELBS William Heinemann: London,1991. Gurudeep Raj, Advanced Inorganic Chemistry, 26thed.; Goel Publishing House: Meerut, 2001. Atkins, P.W. & Paula, J. Physical Chemistry, 10th ed.; Oxford University Press:New York, 2014. Huheey, J. E. Inorganic Chemistry: Principles of Structure and Reactivity, 4thed.; Addison, Wesley Publishing Company: India,1993.
Website and e- learning source	1) https://onlinecourses.nptel.ac.in 2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm 3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html 4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding 5) https://www.chemtube3d.com/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

- CO1: explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.
- CO2: classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.
- CO3: apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx , Δp electronegativity, percentage ionic character and bond order.
- CO4: evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects
- CO5: construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H bonding and organic reaction mechanisms.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO'

	23UCHEP14	
SEMESTER:	Quantitative Inorganic Estimation	Credit: 5

I PART: III Core - II	(titrimetry) and Inorganic Preparations	Hours: 4
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Objectives of This course aims at providing knowledge on the course laboratory safety handling glasswares Quantitative estimation preparation of inorganic compounds To develop the skill in finding out the end points of various types of indicators Course Outline Unit I Chemical Laboratory Safety in Academic Institutions Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal. Common Apparatus Used in Quantitative Estimation (Volumetric) Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand. Principle of Quantitative Estimation (Volumetric) Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators - types, theory of acid-base, redox, metal ion and adsorption indicators, choice of indicators. Dichrometry Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferric alum using standard dichromate (internal indicator) Iodometry Estimation of copper in copper sulphate using standard dichromate Argentimetry Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method) Complexometry Estimation of hardness of water using EDTA

	Estimation of iron in iron tablets Estimation of ascorbic acid Preparation of Inorganic compounds- Potash alum Tetraammine copper (II) sulphate Hexamminecobalt (III) chloride Mohr's Salt
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	Reference Books: 1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. Basic Principles of Practical Chemistry, 2 nd ed.; Sultan Chand & Sons: New Delhi, 1997. 2. Nad, A. K.; Mahapatra, B.; Ghoshal, A.; An advanced course in Practical Chemistry, 3 rd ed.; New Central Book Agency: Kolkata, 2007.
Reference Books	1. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; Vogel's Textbook of Quantitative Chemical Analysis, 6 th ed.; Pearson Education Ltd: New Delhi, 2000.
Website and e- learning source	Web References: 1) http://www.federica.unina.it/agraria/analytical-chemistry/volumetricanalysis 2)https://chemdictionary.org/titration-indicator/

Course Learning Outcomes (for Mapping with POs and PSOs)

On successful completion of the course the students should be able to

CO1: explain the basic principles involved in titrimetric analysis and inorganic preparations.

CO2: compare the methodologies of different titrimetric analysis.

CO3: calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.

CO4.Indetify the end point of various titrations

CO5 acquire knowledge on the systematic analysis of Mixture of salts., identify the cations and anions in the unknown substance.

CO5: handle the common apparatus used in volumetric estimation.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	S	S	M	S	S	S	M	S	M

CO-PO Mapping (Course Articulation Matrix)

60 /700	7001	DCOD	7000	7001	700 -
CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3

CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Note: Scheme for Practical Evaluation

Inorganic Preparation:15 marks

Record:10 marks Procedure-10 marks

Volumetric Estimation – 40 marks

Results

< 2% - 40 marks

2-3% - 30 marks

3-4% - 20 marks

> 4% - 10 marks

SEMESTER:	23UMATE15 MATHEMATICS - I	Credit: 3 Hours: 5
PART: III		

UNIT-I: SOLUTIONS OF TRANSCENDENTAL AND ALGEBRAIC EQUATIONS

Iteration method, Bisection method, Newton's method - Regula Falsi method, (without proof) (Simple problems only)

Unit-II: SOLUTIONS OF SIMULTANEOUS EQUATIONS

Gauss Elimination method- Gauss Jordan method-Gauss Seidel Iterative method-Gauss Jacobi method (Restricted to three variables only) (Simple problems only)

UNIT-III: MATRICES

Characteristic equation of a square matrix— Eigen values and eigen vectors — Cayley — Hamilton theorem [without proof] — Verification and computation of inverse matrix.

UNIT-IV: DIFFERENTIAL CALCULUS

n-th derivatives – Leibnitz theorem [without proof] and applications – Jacobians–Curvature and radius of curvature in Cartesian co-ordinates

UNIT-V: APPLICATION OF INTEGRATION

Evaluation of double – Simple applications to area,

TEXT BOOKS:

1. A.Singaravelu "Numerical Methods" Meenakshi Publications

Unit-I: Chapter 2 Unit-II: Chapter 2

2. P. Duraipandian and Dr. S. Udayabaskaran. 1997, "Allied Mathematics", Vol I & II. Chennai: Muhil Publishers.

Unit-III: Sec(4.5, 4.5.1 to 4.5.3)Vol I

Unit-IV: Sec(1.1.1, 1.1.2, 1.2, 1.4.3)vol II

Unit-V: Chap:3(3.2, 3.4, 3.4.1) vol II

REFERENCE BOOKS:

- 1. P. Balasubramanian and K. G. Subramanian. 1997, "Ancillary Mathematics", Vol I & II. New Delhi: Tata McGraw Hill.
- 2. S.P.Rajagopalan and R.Sattanathan(2005), "Allied Mathematics", Vol I & II. New Delhi: Vikas Publications.
- 3. P. R. Vittal (2003), "Allied Mathematics", Chennai: Marghan Publications.

Course Outcomes:

On successful completion of the course, the students will be able to

CO1: Attain knowledge on finding Approximate root for polynomial equations using Numerical methods.

CO2: Develop the skills of finding solutions of Simultaneous Linear equations.

CO3: Adopt techniques in solving problems involving Matrices

CO4: Provide skills on finding curvature and radius of curvature in Cartesian and polar co-ordinates.

CO5:Understand the applications of double and Triple integration in real life situation.

Outcome Mapping:

	11 0				
CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

SEMESTER:	23UBOTE15 BOTANY- I	Credit: 2 Hours: 3	
PART: III			

Learning Objective (LO):

LO1	To study morphological and anatomical adaptations of plants of various habitats.
LO2	To demonstrate techniques of plant tissue culture.
LP3	To familiarize with the structure of DNA, RNA.
LO4	To carryout experiments related with plant physiology.
LO5	To perform biochemistry experiments.

Unit - 1: Algae:

General characters of algae - Structure, reproduction and life cycle of the following genera - *Anabaena* and *Sargassum* and economic importance of algae.

Unit – 2 : Fungi, Bacteria and Virus:

General characters of fungi, structure, reproduction and life cycle of the following genera - *Penicillium* and *Agaricus* and economic importance of fungi.

Bacteria - general characters, structure and reproduction of *Escherichia coli* and economic importance of bacteria. Virus - general characters, structure of TMV, structure of bacteriophage.

Unit − 3 : Bryophytes, Pteridophytes and Gymnosperms:

General characters of Bryophytes, Structure and life cycle of Funaria.

General characters of Pteridophytes, Structure and life cycle of *Lycopodium*.

General characters of Gymnosperms, Structure and life cycle of *Cycas*.

Unit – 4: Cell Biology:

Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.

Unit – 5: Genetics and Plant Biotechnology:

Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - *In vitro* culture methods. Plant tissue culture and its application in biotechnology.

Course Outcomes (CO)

At the end of the course, the student will be able to

CO1	Increase the awareness and appreciation of human friendly algae and their economic importance.
CO2	Develop an understanding of microbes and fungi and appreciate their adaptive strategies.
CO3	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.
CO4	Compare the structure and function of cells and explain the development of cells.
CO5	Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.

Recommended Texts

- 1. Singh, V., Pande, P.C and Jain, D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut.
- 2. Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.
- 3. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd. Delhi.
- 4. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.
- 5. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany, S. Viswanathan Pvt. Ltd., Madras.

Reference books:

- 1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes Surjeet Publications, Delhi.
- 2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
- 3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.
- 4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.
- 5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.
- 6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi.
- 7. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.

SEMESTER:	23UZOOE15 Zoology - I	Credit: 2 Hours: 3
PART: III		

Course Objectives

The main objectives of this course are:

1	To acquire a basic knowledge of diversity and organization of Protozoa, Coelenterata, Helminthes and Annelida
2	To acquire a basic knowledge of diversity and organization of Arthropoda, Mollusca and Echinodermata
3	To comprehend the taxonomic position and diversity among Protochordata, Pisces and Amphibia
4	To comprehend the taxonomic position and diversity among Reptilia, Aves and Mammalia
5	To acquire detailed knowledge of selected invertebrate and chordate forms

Unit - I: Diversity of Invertebrates-I

Principles of taxonomy. Criteria for classification—Symmetry and Coelom —Binomial nomenclature. Classification of Protozoa, Coelenterata, Helminthes and Annelida upto classes with two examples.

Unit - II: Diversity of Invertebrates-II

Classification of Arthropoda, Mollusca and Echinodermata upto class level with examples.

Unit - III: Diversity of Chordates-I

Classification of Prochordata, Pisces and Amphibia upto orders giving two examples.

Unit - IV: Diversity of Chordates-II

Classification of Reptilia, Aves and Mammalia upto orders giving two examples.

Unit -V: Animal organization

Structure and organization of (i) Earthworm, (ii) Rabbit/Rat, (iii) Prawn/Fish

Expected Course Outcomes

On completion of this course, students will:

1	Recall the characteristic features invertebrates and chordates.					
2	Classify invertebrates up to class level and chordates up to order level					

3	Explain and discuss the structural and functional organisation of some invertebrates and chordates
4	Relate the adaptations and habits of animals to their habitat
5	Analyse the taxonomic position of animals.

Text Books (Latest Editions)

1. Ekambaranatha Iyer, - Outlines of Zoology, Viswanathan Publication.

References Books

(Latest editions, and the style as given below must be strictly adhered to)

- 1. Ekambaranatha Iyar and T.N.Ananthakrishnian A Manual of Zoology Invertebrata–Vol. I: Viswanathan Publishers.
- 2. Ekambaranatha Iyar and T.N. Ananthakrishnan, A Manual of Zoology -Invertebrata–Vol. II: Viswanathan Publishers.
- 3. Ekambaranatha Iyar and T.N.Ananthakrishnan, A Manual of Zoology: Chordata Viswanathan Publishers.
- 4. Jordan E.L. and P.S. Verma-Invertebrate Zoology, S. Chand & Co.

Web Resources

- 1. www.sanctuaryasia.com
- 2. <u>www.iaszoology.com</u>

Outcome Maping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong M-Medium L-Low

SEMESTER: I PART: III	23UBIOE15 Biochemistry- I	Credit: 2 Hours: 3
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Learning objectives

The objectives of this course are to

- Introduce the structure and classification of carbohydrates
- Comprehend the metabolism of carbohydrates
- Study the classification and properties of amino acids
- Elucidate the various levels of organization of Proteins
- Study functions and deficiency diseases of vitamins

Module I:Definition and classification of carbohydrates, linear and cyclic forms (Haworth projection) for glucose, fructose and mannose and disaccharides (maltose, lactose, sucrose).General properties of monosaccharides and disaccharides. Occurrence and significance of polysaccharides.12Hrs

Module II:Metabolism- Catabolism and Anabolism.Carbohydrate metabolism-Glycolysis, TCA cycle, HMP shunt and glycogen metabolism and energetics 12Hrs **Module III**:Amino acids -Classifications, physical properties -amphoteric nature, isoelectric point and chemicalreactions of carboxyl ,amino and both groups. Amino acid metabolism- transamination, deamination and decarboxylation.12Hrs

Module IV: Proteins- classification - biological functions ,physical properties- ampholytes, iso electric point, salting in and salting out, denaturation, nature of peptide bond. Secondary structure, α -helix and β -pleated sheet, tertiary structure, various forces involved- quaternary structure. 12Hrs

Module V: Vitamins- Fat(A,D,E and K) and water soluble vitamins(B complex and C)-sources, RDA, biological functions and deficiency diseases12 Hrs

Course Outcome

CO	On completion of this course, students will be able to	Programme Outcome
CO1	Classify the structure of carbohydrates and its properties	PO1
CO1		DO1
CO2	Explain the metabolism of carbohydrates and its significance	PO1

CO3	Classify amino acids and its properties	PO1
CO4	Explain the classification and elucidate the different levels of structural organization of proteins	PO1
CO5	Identify the disease caused by the deficiency of vitamins	PO1

Text Books

- 1 Satyanarayan,U (2014) Biochemistry (4th ed), Arunabha Sen Books & Allied (P) Ltd, Kolkata.
- 2.Jain J.L.(2007) Fundamentals of Biochemistry, S. Chand publishers 311

Reference books

- **1.** David L.Nelson and Michael M.Cox (2012) Lehninger Principles of Biochemistry (6th ed) W.H. Freeman.
- $\boldsymbol{2.}\ Voet.D\&Voet.\ J.G\ (2010)\ Biochemistry$, (4th ed), John Wiley & Sons, Inc.
- **3.** Lubert Stryer (2010) Biochemistry, (7th ed), W.H.Freeman
- **4.** Satyanarayan,U (2014) Biochemistry (4th ed), Arunabha Sen Books & Allied (P) Ltd, Kolkata.
- 5.Jain J.L.(2007) Fundamentals of Biochemistry, S. Chand publishers 31

Web sources

- 1.onlinecourses.swayam2.ac.in/cec20_bt12
- 2 onlinecourses.swayam2.ac.in/cec20_bt19

Mapping with Program Outcome

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3						3			3
CO 2	3						3			3
CO 3	3						3			3
CO 4	3						3			3
CO5	3						3	3		3

S - Strong (3) M - Medium (2) L -Low(1)

SEMESTER -I	Elective	CREDITS: 1
PART – III	23UBOTEP1: Botany Practical I	HOURS: 30

Course Objectives

- **1.** To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi
- **2.** To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.
- **3.** To be familiar with the basic concepts and principles of cell biology.
- **4.** Understanding of laws of inheritance, genetic basis of loci and alleles.
- **5.** To learn about the principles and applications of Biotechnology

EXPERIMENTS

- 1. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
- 2. Micro photographs of the cell organelles ultra structure.
- 3. Simple genetic problems.
- 4. Spotters Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms Cell biology and Biotechnology.

Bonafide record of practical work done should be submitted for the practical examination

Course outcomes:

On completion of this course, the students will be able to:

- 1. To study the internal organization of algae.
- 2. To study the structure and organization of fungi, bacteria and viruses
- 3. Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.
- 4. To study the cell structure and function.
- **5.** Understand the fundamental concepts of genetics and Biotechnology

Recommended texts

- 1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.
- 2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi.
- 3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi.
- 4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England.
- 5.Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.

Reference books

- 1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
- 2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
- 3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual

- for Bryophytes and Pteridophytes. Lambert Academic Publishing.
- 4. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
- 5. Steward, F.C. 2012. Plant Physiology Academic Press, US

Web Resources

- 1. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883
- 2. https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C? hl=en&gbpv=1&dq=gy mnosperms&printsec=frontcover
- 3. https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	1	3	2
CO2	2	3	2	2	3
CO3	2	1	3	2	3
CO4	1	3	3	2	2
CO5	2	2	3	1	3

BOTANY PRACTICAL I

Time: 3 Hours Max.

Marks: 75

PRACTICAL QUESTION PAPER

1. Make suitable micro preparations of the given specimens A, B and ${\rm C.}$

Submit the slides for valuation. Identify the specimens, draw diagrams and give reasons.

2. Make suitable micro preparations of the given specimens D. Submit the slides for valuation. Identify the specimens, draw diagrams and give reasons.

3. Identify the given electron micrograph $\,$ -E, describe and draw diagrams

4. Spotters - F, G, H, I, J, K and L. (Identification - 1, diagram - 1, Reasons - 2) (7 X 4) (28)

$$Total = 65$$

 $Record = 10$

Grand Total = 75

BOTANY PRACTICAL I KEY & SCHEME OF VALUATION

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1. A - Algae / Fungi : Sargassum/Agaricus
   B - Bryophytes: Funaria
   C - Pteridophytes : Lycopodium
(Identification - 1, diagram - 2, Reasons - 2, Slide -2) (7 X 3)
     (21)
2. Gymnopserms - D : Cycas - rachis and leaflet
(Identification - 1, diagram - 2, Reasons - 2, Slide -3)
     (80)
3. Cell biology - E - Electron Micrograph of organelles- Chloroplast,
Mitochondria, Nucleus, Mitosis, Giant Chromosomes
- (Identification - 2, Diagram - 3, description - 3)
     (80)
4. Spotters - F, G, H, I, J and L(any seven of the following)
(Algae, Fungi, Bacteria, Virus, Bryophytes, Pteridophytes and
Gymnosperms -permanent slides, book diagrams or wet preserved jar
specimens, mentioned in the syllabus)
Cytology - photographs of cell organelles
Genetics - simple genetics problems
Plant biotechnology - tissue culture techniques : explants, callus,
hardening
(Identification - 1, diagram - 1, Reasons - 2) (7 X 4)
     (28)
                                                           Total
                                                           65
                                                           Record =
                                                           10
                                                     Grand Total
75
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SEMESTER: I PART: III	23UZOOEP1 Zoology Practical- I	Credit: 1 Hours: 2
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Course Objectives

4	To identify the different groups of invertebrate animals by observing their
1	external characteristics.
2	To understand the organs, organ system and their functions in lower animals.
2	To get knowledge about the different modes of life and their adaptation based on
3	the environment.
4	Able to dissect and display the internal organs and mount the mouthparts and
4	scales of invertebrates.

UNIT – I: Major Dissection:

Cockroach: Circulatory system, Nervous system, Reproductive system. Leech: Nervous System, Reproductive system. Earthworm: Nervous System, Reproductive system. *Pila globosa*: Nervous system. Prawn: Nervous system (including Appendages).

UNIT – II: Minor Dissection:

Cockroach: Digestive system. Earthworm: Viscera, Lateral hearts.

Pila globosa: Digestive system (Including radula). Freshwater Mussel: Digestive system.

UNIT – III: Mounting:

Earthworm: Body setae; Pineal setae. *Pila globosa*: Radula. Freshwater muscle: Pedal ganglia.

UNIT - IV: Mounting:

Cockroach: Salivary apparatus, Mouth parts - Honey Bee, House fly and Mosquito mouth parts.

UNIT - V: Spotters :(i).

Protozoa: Amoeba, Paramoecium, Paramoecium Binary fission and Conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax (ii). Porifera: Sycon, Spongilla, Euspongia, Sycon - T.S & L.S, Spicules, Gemmule (iii). Coelenterata: Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatula (iv). Platyhelminthes: Planaria, Fasciola hepatica, Fasciola larval forms – Miracidium, Redia, Cercaria, Echinococcus granulosus, Taenia solium, Schistosoma haematobium (v). Nemathelminthes: Ascaris(Male & Female), Drancunculus, Ancylostoma, Wuchereria (vi). Annelida: Nereis, Aphrodite, Chaetopteurs, Hirudinaria, Trochophore larva (vii).

Arthropoda: Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female Anopheles and Culex, Mouthparts of Housefly and Butterfly. **(viii). Mollusca:** Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium larva **(ix). Echinodermata:** Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Bipinnaria larva

Expected Course Outcomes

On completion of this course, students will;

4	Identify and label the external features of different groups of invertebrate
l I	animals.
0	Illustrate and examine the circulatory system, nervous system and
2	reproductive system of invertebrate animals.
2	Differentiate and compare the structure, function and mode of life of
3	various groups of animals.
4	To compare and distinguish the dissected internal organs of lower animals.
5	Prepare and develop the mounting procedure of economically important
	invertebrates.

Text Books

(Latest Editions)

- 1. Ekambaranatha Iyyar and T. N. Ananthakrishnan, 1995 A manual of Zoology Vol.I (Part 1, 2) S. Viswanathan, Chennai.
- 2. Ganguly, Sinha and A dhikari, 2 0 11. Biology of Animals: Volume I, New Central Book Agency; 3rd revised edition. 1008 pp.
- 3. Sinha, Chatterjee and Chattopadhyay, 2 0 1 4. Advanced Practical Zoology, Books & Allied Ltd; 3rd Revised edition, 1 07 0 pp.
- **4.** Lal ,S. S, 2016. Practical Zoology Invertebrate, Rastogi Publications.
- **5.** Verma, P. S. 2010. A Manual of Practical Zoology: Invertebates, S Chand, 4 97pp.

References Books

- 1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science.
- 2. Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition. Holt Saunders International Edition.
- 3. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
- **4.** Boradale, L.A. and Potts, E.A. (1961). *Invertebrates: A Manual for the use of Students*. Asia Publishing Home.
- 5. Lal, S.S. 2005. A text Book of Practical Zoology: Invertebrate, Rastogi, Meerut

Web Resources

- 1. https://nbb.gov.in/
- 2. http://www.agshoney.com/training.htm
- 3. https://icar.org.in/
- 4. http://www.csrtimys.res.in/
- 5. http://csb.gov.in/
- 6. https://iinrg.icar.gov.in/
- 7. https://www.nationalgeographic.com/animals/invertebrates/

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S			S	S	S	M	
CO 2	M	S			M		L	
CO3			M	S		S		
CO 4	S			S	S	M	S	
CO 5			S			S		S

S-Strong(3) M-Medium (2) L-Low (1)

SEMESTER: 23UBIOEP1 Credit: 1 Biochemistry Practical - I Hours: 2 PART: III

Learning objectives

- Identify carbohydrates by qualitative test
- Estimate biomolecules volumetrically
- Estimate protein quantitatively

I Qualitative analysis of carbohydrates- 25Hrs

- a) Monosaccharides-Glucose, Fructose
- b) Disaccharides- Lactose, Maltose, Sucrose
- c) Polysaccharides-Starch

II Volumetric analysis 15 Hrs

- a) Estimation of ascorbic acid using 2,6dichlorophenolindophenol as link solution
- b) Estimation of Glucose by Benedicts method
- c)Estimation of Glycine by Sorenson Formal titration

III Quantitative analysis(Demonstration Expt)5 hrs

a)Colorimetric estimation of protein by Biuret method

Course Outcome

CO	On completion of this course, students will be able	Program	
	to	Outcomes	
CO1	Qualitatively analyze and report the type of	PO1,PO2.PO3	
COI	carbohydrate based on specific tests		
CO2	Quantitatively estimate the carbohydrates, amino	PO1,PO2,PO3	
CO2	acids and ascorbic acid		
CO3	Estimate protein by colorimetric method	PO1,PO2,PO3	

Text books

1.Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, New Age International Publishers, 2011,

2. An Introduction to Practical Biochemistry, David T. Plummer, 3 rd edition, Tata McGraw-

Hill Publishing Company Limited, 2001.

3. Biochemical Methods, Sadasivam S and Manickam A, 4h edition, New Age International Publishers, 2016

Mapping with Program Outcomes

	PO	PO	PO	PO	PO	PO	PSO1	PSO	PSO3	PSO4
	1	2	3	4	5	6		2		
CO	2	3	3				3	3	3	3
1		3	J							
CO	2	3	3				3	3	3	3
2			5							
CO	2	3	3				3	3	3	3
3		<u> </u>	J							

S - Strong (3) M - Medi) L -Low(1)

SEMESTER: I PART: III	22UCHEF17 INTRODUCTORY CHEMISTRY	Credit: 2 Hours: 2
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Objectives of the Course	To give insights into chemistry experiments for a beginner in
	 Lab safety and Nature of chemicals. Types of titrations and Concentration terms. Semi micro analysis and precipitation techniques. Organic analysis Gravimetric Principles
Course Outline	UNIT-I: LAB SAFETY, CHEMICALS AND GLASSWARE
	 1.1 laboratory hygiene and safety – first–aid techniques – general work culture inside the chemistry lab. 1.2 Nature of chemicals – toxic, corrosive, explosive, inflammable, carcinogenic, other hazardous chemicals – safe storing and handling of chemicals – disposal of chemical wastes. 1.3. Handling of glass wares- Calibration of pipette, standard measuring flask and burette.
	UNIT-II: TITRIMETRIC METHODS OF ANALYSIS
	 2.1 Definitions of Molarity and Normality. Primary and secondary standards, Criteria for primary standards-Preparation of standard solutions. 2.2 Concepts of Acids & Bases - pH of strong and weak acid solutions. Indicators-Theory and their choice 2.3 Types of titrations- Acid-base Titrations, Redox Titrations, Precipitation Titrations and Complexometric Titrations- Principles and theory.
	UNIT-III: SEMIMICRO METHODS
	3.1. Identification of interfering & non-interfering acid radicals - removal of interfering radicals (any one test for each).3.2 Separation of cations into groups-Reagents involved and their principle3.3 Spot test analysis for ammonium, Pb, Cu, Mg, Mn and Ni.
	UNIT-IV: BASICS OF ORGANIC ANALYSIS
	4.1 Preliminary and solubility tests for identifying organic compounds. Test for Aliphatic/Aromatic – Saturated/ Unsaturated compounds 4.2 Detection of Nitrogen, Sulphur and halogens 4.3— Test for functional groups: phenol, aldehyde, ketone, ester, carbohydrate, amine, amide & carboxylic acid (any one test for each).
	UNIT V: GRAVIMETRIC METHODS

	 5.1 Gravimetric analysis- principle, theory and calculation. 5.2 Steps of a gravimetric analysis: precipitation, digestion, filtration, washing, drying and weighing. 5.2 Conditions for precipitation-choice of precipitants-advantages and disadvantages of using organic precipitants.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	 U.N. Dash, 2005, Analytical Chemistry: Theory and Practice, Sultan Chand and sons. Educational Publishers, 2nd Edition, New Delhi, J.Bassett, R.C.Denney, G.H.Jerrey and J.Mendham, 1994,Vogel's Text Book Of Inorganic Quantitative Analysis, ELBS, 5th Edition, London. Gopalan R., Rangarajan K., Subramanian P.S. Elements of Analytical Chemistry, Sultan Chand & Sons, 2003 Svehla, 2012, Vogel's Qualitative Analysis, Pearson Education, 7thEdition,New Delhi. Venkateswaran V, Veeraswamy R, Kulandaivelu A R,1997,Basic Principles Of Practical Chemistry, Sultan Chand and Sons, 2nd Edition, New Delhi. D.A. Skoog, D.M. West and F. J.Holler, 1990, Analytical chemistry,Saunders college publishing, 5th Edition, Philadelphia.
Reference Books	 Svehla, 2012, Vogel's Qualitative Analysis, Pearson Education, 7thEdition,New Delhi. Venkateswaran V, Veeraswamy R, Kulandaivelu A R,1997,Basic Principles Of Practical Chemistry, Sultan Chand and Sons, 2nd Edition, New Delhi

		edge, Problem solving, Analytical ability, Professional Competency, sional Communication and Transferable skills.
Website and	1.	https://www.tees.ac.uk/parttime_courses/
e-learning source		engineering & construction/
		certificate of credit foundation process chemistry (by flexible op
		en learning).cfm
	2.	https://le.ac.uk/courses/chemistry-with-foundation-year-bsc/2023
	3.	https://www.researchgate.net/publication/
		345381808 Foundations for Teaching Chemistry Chemical Know
		ledge for Teaching
	4.	https://yuli-elearning.com/mod/resource/view.php?id=738
	5.	https://pubs.acs.org/doi/10.1021/acs.jchemed.1c00666

Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to

CO1: to understand laboratory safety and hygiene.

CO2: to understand principle of titrations. CO3: to understand semi micro analysis.

CO4: to understand basics of organic compound analysis.

CO5: to understand about gravimetric analysis

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	2	2	2
CO2	2	2	2	2	2
CO3	2	2	2	2	2
CO4	2	2	2	2	2
CO5	2	2	2	2	2
Weightage	10	10	10	10	10
Weighted percentage of Course Contribution to Pos	2.0	2.0	2.0	2.0	2.0

Level of Correlation between PSO's and CO's

SEMESTER: 23UCHEC23 I GENERAL CHEMISTRY-II PART: II Core III	Credit: 4 Hours: 4
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Objectives of the course	 This course aims at providing an overall view of the chemistry of acids, bases and ionic equilibrium properties of s and p-block elements chemistry of hydrocarbons applications of acids and bases compounds of main block elements and hydrocarbons
Course Outline	UNIT-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. Unit-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 ₂ CO 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 Al and its uses. Alloys of Al. comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates.
	UNIT-III

Chemistry of p- Block Elements (Group 15-18)

General characteristics of elementsof Group 15; chemistry of H₂N-NH₂, NH₂OH, HN₃ and HNO₃. Chemistry of PH₃, PCl₃, PCl₅, POCl₃, P₂O₅ and oxy acids of phosphorous (H₃PO₃ and H₃PO₄).

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 (HClO₄). Inter-halogen compounds (ICl, ClF₃, BrF₅ and IF₇), pseudo halogens [(CN)₂ and (SCN)₂] and basic nature of 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.

UNIT-IV

Hydrocarbon Chemistry-I

Petroproducts: Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses

Alkenes-Nomenclature, general methods of preparation – Mechanism of elimination reactions – E_1 and E_2 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; acidic nature 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.

UNIT-V Hydrocarbon Chemistry - II Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, 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 acviation & alkylation, preferential substitution at - 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. Extended Questions related to the above topics, from various competitive examinations Professional UPSC/JAM /TNPSC others to be solved Component (is a (To be discussed during the Tutorial hours) part of internal component only, Not to be included in the external examination question paper) Skills acquired Knowledge, Problem solving, Analytical ability, Professional Competency, from this course Professional Communication and Transferable skills. 1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nded, Recommended Text 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. Reference 1. Maron S H and Prutton C P, (1972), Principles of Physical Chemistry, 4th **Books** ed., The Macmillan Company, Newyork. 2. Barrow G M, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, New Delhi. 3. Lee J D, (1991), Concise Inorganic Chemistry, 4thed., ELBS William Heinemann, London. 4. Huheey J E, (1993), Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed., Addison Wesley Publishing Company, India. 5. Gurudeep Raj, (2001), Advanced Inorganic Chemistry Vol – I, 26th ed., Goel Publishing House, Meerut. 6. Agarwal O P, (1995), Reactions and Reagents in Organic Chemistry, 8thed., Goel Publishing House, Meerut.

Website and elearning source https://onlinecourses.nptel.ac.inhttp://cactus.dixie.edu/smblack/chem1010/lecture_notes/4B.html

http://www.auburn.edu/~deruija/pdareson.pdfhttps://swayam.gov.in/course/64 -atomic-structure-and-chemical-bonding

MOOC components

http://nptel.ac.in/courses/104101090/

Lecture 1: Classification of elements and periodic properties

http://nptel.ac.in/courses/104101090/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the concept of acids, bases and ionic equilibria; periodic properties of s and p-block elements, preparation and properties of aliphatic and aromatic hydrocarbons

CO2: discuss the periodic properties of sand p- block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids

CO3: classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons CO4: explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements

CO5: assess the application of hard and soft acids indicators, buffers, compounds of s and p-block elements and hydrocarbons

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	М
CO5	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO&CO

SEMESTER: II PART: II Core IV

23UCHEP24 QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS

Credit: 5 Hours: 4

Objectives of the course	This course aims at providing knowledge on • laboratory safety • handling glass wares • analysis of organic compounds • preparation of organic compounds
Course Outline	UNIT 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
	Unit II Qualitative Organic Analysis Preliminary examination, detection of special elements - nitrogen, sulphur and halogens 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
	UNIT 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

water / alcohol) and distillation 2. Determination of melting and boiling points of organic compounds. 3. Steam distillation - Extraction of essential oil from of fruits/eucalyptus leaves. 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, chlorop and xanthophyll from 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) Reference Books 1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. Ba Principles of Practical Chemistry, 2 nd ed.; Sultan Chand: Ne Delhi, 2012. 2. Manna, A.K. Practical Organic Chemistry, Books and Alliec India, 2018. 3. Gurtu, J. N; Kapoor, R. Advanced Experimental Chemistry (Organic), Sultan Chand: New Delhi, 1987. 4. Furniss, B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A Vogel's Textbook of Practical Organic Chemistry, 5 th ed.; Pearson: India, 1989. Website and e-learning source https://www.vlab.co.in/broad-area-chemical-sciences		
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		https://www.vlab.co.in/broad-area-chemical-sciences
Scheme of Valuation Max marks/51	Scheme of Valuation	Max. marks(75)
Record :10 Marks	Record	:10 Marks
Preparation :15 Marks Recrystallization :05 Marks	_	

Organic Qualitative Analysis	:45 Marks
Preliminary Test	:05 Marks
Detection of Elements	:05 Marks
Detection of Functional Group	:05 Marks
Identification of the compound	:05 Marks
Confirmatory Test	:15 Marks
Derivatives preparation and its m.pt determination	:10 Marks

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: observe the physical state, odour, colour and solubility of the given organic compound.

CO2: identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.

CO3: compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non-reducing sugars and explain the reactions behind it.

CO4: exhibit a solid derivative with respect to the identified functional group.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M

CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12

Weighted percentage of Course Contribution to	3.0	3.0	3.0	3.0	3.0
Pos					

Level of Correlation between PSO's and CO's

SEMESTER: II PART: II Core IV

23UMATE25 MATHEMATICS - II

Credit: 3 Hours: 5

UNIT-I:TRIGONOMETRY

Expansions of sin n θ , cos n θ , sinn θ ,cosn θ , tann θ – Expansions of sin θ , cos θ , tan θ in terms of θ

Unit-I: Chap: 6 (6.1,6.1.1 to 6.1.3)

UNIT-II: PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations, elimentary partial differential equations-Lagranges equations.

Unit-II: Chap:6 (6.1,6.1.1, 6.4).

UNIT-III: VECTOR DIFFRENTIATION

Vector functions- Scalar and vector point functions- Directional derivatives —Unit vector normal to a surface — angle between the surfaces-divergence, Gradient of a scalar point function- Divergence and curl of a vector point function.

Unit-III Section 8.1,8.2,8.3, 8.4).

UNIT-IV: VECTOR INTEGRATION

Green's theorem in the plane-Gauss divergence theorem- [without proofs] , Stoke's theorem

(Statement only)

Unit-IV:Section(8.6.1, to 8.6.3).

UNIT-V: FINITE DIFFERENCES

Operator E, Relation between $^{\Delta,\nabla}$ and E – Interpolation – Newton – Gregory forward & backward formulae for interpolation-Lagrange's interpolation formula for unequal intervals(without proof) .

Unit-V:Sec(5.1,5.2).

TEXT BOOK:

1.P. Duraipandian and S. Udayabaskaran(1997), "Allied Mathematics", Vol I & II. Chennai:

Muhil Publishers.

Unit-I: Chap: 6 (6.1,6.1,1 to 6.1.3), Vol I, Unit-II: Chap:6 (6.1,6.1.1,6.4), Vol II, Unit-IIISec(8.1,8.2,8.3,8.4), Vol I, Unit-IV:Sec(8.6.1, - 8.6.3), Vol I, Unit-V:Sec(5.1,5.2), Vol II.

REFERENCE BOOKS:

- 1. P. Balasubramanian and K. G. Subramanian. 1997, "Ancillary Mathematics", Vol I & II. New Delhi: Tata McGraw Hill.
- 2. S.P.Rajagopalan and R.Sattanathan(2005), "Allied Mathematics", Vol I & II. New Delhi: Vikas Publications.
- 3. P. R. Vittal (2003), "Allied Mathematics", Chennai: Marghan Publications.
- 4. P.Kandhasamy, K. Thilagavathy (2003), "Allied Mathematics" Vol I & II, New Delhi: Tata McGraw Hill.

Course Outcomes:

On successful completion of the course, the students will be able to

- **CO1**: Attain knowledge on finding the expansions of trigonometric functions and concept of hyperbolic and inverse hyperbolic functions.
- **CO2**: Provide a basic knowledge of Partial Differential equations and develops knowledge on handle practical problems.
- **CO3:** Adopt techniques in solving problems involving vector and scalar functions
- **CO4**: Provide skills on finding derivatives and gradients on vector differentiation and Integration.

CO5: Understand the applications of differentiation and integration in real life situation.

Outcome Mapping:

Oute	JIIIC 141	чррии	<u>5 </u>		
CO	PO	PO	PO	PO	PO5
/	1	2	3	4	
PO					
CO	3	3	3	2	2
1					
CO	3	2	3	3	2
2					
CO	3	3	3	3	2
3					
CO	3	3	3	3	2
4					
CO	2	3	3	3	2
5					

1-Low 2-Moderate 3- High

SEMESTER:

II

PART: III

23UBOTE25

BOTANY-II

(Elective)

Credit: 3
Hours: 4

Learning Objective (LO):

LO1	To be familiar with the basic concepts and principles of plant systematics.
LO2	Learn the importance of plant anatomy in plant production systems.
LO3	Understand the mechanism underling the shift from vegetative to reproductive phase.
LO4	To learn about the physiological processes that underlie plant metabolism.
LO5	To know the energy production and its utilization in plants.

Unit – 1: MORPHOLOGY OF FLOWERING PLANTS

Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types-simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types. Terminology with reference to flower description.

Unit - 2: TAXONOMY

Study of the range of characters and plants of economic importance in the following families: Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae

Unit - 3: ANATOMY

Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves.

Unit – 4: EMBRYOLOGY

Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination - double fertilization, structure of dicotyledonous and monocotyledonous seeds.

Unit – 5: PLANT PHYSIOLOGY

Absorption of water, photosynthesis - light reaction - Calvin cycle; respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinins and their applications.

Course Outcomes (CO)

At the end of the course, the student will be able to

CO1	Understand the fundamental concepts of plant anatomy and embryology.
CO2	Analyze and recognize the different organs of plants and secondary growth.
CO3	Understand water relation of plants with respect to various physiological processes
CO4	Classify aerobic and anaerobic respiration.
CO5	Classify plant systematics and recognize the importance of herbarium and virtual herbarium.

Recommended Texts

- 1. Sharma, O.P. 2017. Plant Taxonomy. (II Edition). The McGraw Hill Companies.
- 2. Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. 2015. The Embryology of Angiosperms (6th revised and enlarged edition). Vikas Publishing House, New Delhi.
- 3. Maheshwari, P. 1963. Recent Advances in Embryology of Angiosperms. Intl. Soc. Plant Morphologists, New Delhi.
- 4. Salisbury, F. B.C.W. Ross.1991. Plant Physiology. Wassworth Pub. Co. Belmont.
- **5.** Ting, I.P. 1982. Plant Physiology. Addison Wesley Pb. Philippines.

Reference books

- 1. Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.
- 2. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi.
- 3. Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing.
- 4. Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd.
- 5. Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. <u>Vedams (P) Ltd. New</u> Delhi.
- **6.** Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company Ltd., New Delhi.
- 7. Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand & Co., New Delhi.

Web Resources

1. https://books.google.co.in/books/about/Plant_Taxonomy.html?
id=0bYs8F0Mb9gC&redir_esc=y

- 2. https://books.google.co.in/books/about/PLANT_TAXONOMY_2E.html? id=Roi0lwSXFnUC&redir esc=y

 3. https://archive.org/EXPERIMENTS/plantanatomy031773mbp
- 4. https://www.amazon.in/Embryology-Angiosperms-6th-S-P-Bhatnagar-ebook/dp/ B00UN5KPQG
- 5. https://www.crcpress.com/Plant-Physiology/Stewart-Globig/p/book/9781926692692

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	M	S	S	S	S	L	S	S	S	S
CO 4	S	S	M	S	S	S	S	M	S	M
CO 5	S	M	M	M	M	M	M	L	M	M

S-Strong; M-Medium; L-Low

SEMESTER: II PART: III	23UZOOE25 Zoology - II	Credit: 2 Hours: 3	
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1	To enable students to learn basic concepts relating to aspects of respiratory, circulatory, excretory, nervous and sensory physiology.
2	To enable students to comprehend the processes involved during development
3	To enable students to learn basic concepts of immunity and the working of immune organs and familiarize them with the recommended vaccination schedule
4	To enable students to comprehend the basic concepts of human genetics and patterns of inheritance
5	To enable students to learn about aspects of animal behaviour such as foraging, courtship, nest construction, parental care and learning

Unit – I: Respiration- Respiratory pigments and transport of gases. Mechanism of blood clotting. Types of excretory products – Ornithine cycle. Structure of neuron –Conduction of nerve impulse, Mechanism of vision and hearing.

Unit – II: Fertilization, Cleavage, Gastrulation and Organogenesis of Frog; Placentation in mammals

Unit – III: Innate and Acquired - Active and Passive; Antigens and Antibodies; Immunological organs—responses in humans; Vaccination schedule

Unit – IV: Human Genetics: Human Chromosomes – Sex Determination in Humans; Patterns of Inheritance: Autosomal Dominant, Autosomal Recessive, X-linked , Y-linked, Mitochondrial, Multiple Allelic and Polygenic; Genetic Counseling

Unit - V: Animal Behaviour: Foraging, Courtship Behaviour, Shelter and Nest Construction, Parental Care, Learning Behaviour

Expected Course Outcomes

On completion of this course, students will be able to:

1	Recall the parts and working of body organs and developmental stages, name the patterns of inheritance and list different types of animal behaviour
2	Analyse the different developmental stages
3	Analyse the working of body and immune systems
4	Analyse the different patterns of inheritance
5	Relate the behaviour of animals to physiology. Analyse the different types of behaviour

Text Books (Latest Editions)

1. Verma P.S. & Agarwal - Developmental Biology, Chordata embryology S. Chand & Co.

References Books

(Latest editions, and the style as given below must be strictly adhered to)

- 1. Owen, J. A., Punt, J. & Stranford, S. A. Kuby Immunology. New York: W.H. Freeman & Company.
- 2. Klug, W. S., Cummings, M. R. & Spencer, C Concepts of Genetics. (12th ed.). New Jersey: Pearson Education.
- 3. Mathur, R. Animal Behaviour. Meerut: Rastogi.
- 4. Verma P.S. & Agarwal Developmental Biology, Chordata embryology. S.Chand & Co.

Outcome Maping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S		S		M		S	S
CO 2	M	S						
CO3		S	M	S		S	M	
CO 4	S			S	S	M		
CO 5			S					S

S-Strong M-Medium L-Low

SEMESTER: II PART: III	23UBIOE25 Biochemistry- II	Credit: 2 Hours: 3
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Learning objectives

The objectives of this course are to

- Impart knowledge on the classification, properties and characterization of lipids.
- Comprehend the metabolism of Lipids
- Acquaint with the structure, properties and functions of nucleic acids
- Learn about the enzyme kinetics and inhibition
- Study the importance of Hormones

Module I:Lipids–Bloor's classification of lipids- simple lipids, fatty acids (saturated and unsaturated), compound lipids, derived lipids.Properties of lipids- reduction, oxidation, halogenation,saponification and rancidity .Classification andfunctions of phospholipids, Cholesterol – structure and biological importance.12 Hrs

Module II:Lipid metabolism- Oxidation of fatty acids(Palmitic acid) – Beta oxidation-Role of carnitine, energetics, alpha oxidation and omega oxidation. Biosynthesis of saturated fatty acids. 12 Hrs

Module III: Purine and pyrimidine bases, nucleosides, nucleotides, polynucleotides, DNA structure, various types, properties- absorbance, effect of temperature. Different types of RNA, structure and function, Genetic code. 12 Hrs

Module III :Enzymes - Nomenclature, IUB system of enzyme classification, active site, specificity, isoenzymes, units of enzyme activity factors affecting enzyme activity-substrate concentration, pH, temperature. Enzyme Kinetics- Michaelis and Menten equation. Lineweaver- Burk plot. Enzyme inhibition, competitive, uncompetitive and and non competitive inhibition 12Hrs

Module V: Hormones -classification,Biological functions of Insulin, Thyroid and Reproductive hormones . 12Hr

Course Outcome

CO	On completion of this course, students will be able to	Program
		Outcomes
CO1	Elaborate on classification, structure, properties, functions and characterization of lipids	PO1
CO2	Discuss the metabolism of lipids and its importance	PO1
CO3	Explain about structure, properties and functions of nucleic acids	PO1
CO4	Derive Michaelis Menten equation and concepts of enzyme inhibition	PO1,PO3
CO5	Classify the Hormones and its biological functions	PO1,PO4

Text books

- 1.Satyanarayan,U (2014) Biochemistry (4th ed), Arunabha Sen Books & Allied (P) Ltd, Kolkata.
- 2.Jain J.L.(2007) Fundamentals of Biochemistry, S. Chand publishers

Reference books

- **1.** David L.Nelson and Michael M.Cox (2012) Lehninger Principles of Biochemistry (6th ed) W.H. Freeman.
- 2. Voet.D & Voet. J.G (2010) Biochemistry, (4th ed), John Wiley & Sons, Inc.
- 3. Lubert Stryer (2010) Biochemistry, (7th ed), W.H.Freeman

Web sources

1.onlinecourses.swayam2.ac.in/cec20_bt12

2 onlinecourses.swayam2.ac.in/cec20_bt19

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3						3			3
CO 2	3						3			3
CO 3	3		3				3			3
CO 4	3			3			3			3
CO5	3						3	3		3

S - Strong (3) M - Medium (2) L -Low(1)

SEMESTER -II	Elective	CREDITS: 1
PART – III	23UBOTEP2: Botany Practical II	HOURS: 30

Course Objectives

- **1.** To enhance information on the identification of taxonomical plant
- **2.** To be familiar with the basic concepts and principles of plant systematics.
- **3.** Understanding of reproduction and development of angiosperms
- **4.** To understand the internal organization of Angiopserms
- **5.** To learn about the physiological processes that underlie plant metabolism.

EXPERIMENTS

- 1. To identify Angiosperm root, stem, leaf, flowers and fruits based on morphology
- 2. To describe in technical terms, plants belonging to any of the family prescribes and to identify the family.
- 3. To dissect a flower, construct floral diagram and write floral formula.
- 4. Demonstration experiments
 - a. Ganong's Light screen
 - b. Ganong's respiroscope
- 5. To make suitable micro preparations of anatomy materials prescribed in the syllabus.
- 6. Spotters Angiosperm morphology, anatomy, Embryology and Physiology

Bonafide record of practical work done should be submitted for the practical examination

Course outcomes:

On completion of this course, the students will be able to:

- 1. Understand external structure of angiosperms
- 2. To study the classical taxonomy with reference to different parameters.
- 3. Understand the fundamental concepts of plant anatomy and embryology
- 4. To study the effect of various physical factors on photosynthesis.
- 5. Understand simple experiments in plant Physiology

Recommended texts

- 1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.
- 2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi.
- 3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi.
- 4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England.
- 5.Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.

Reference books

- 1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
- 2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
- 3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
- 4. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
- 5. Steward, F.C. 2012. Plant Physiology Academic Press, US

Web Resources

- 4. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883
- 5. https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C? hl=en&gbpv=1&dq=gy mnosperms&printsec=frontcover
- 6. https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	1	3	2
CO2	2	3	2	2	3
CO3	2	1	3	2	3
CO4	1	3	3	2	2
CO5	2	2	3	1	3

BOTANY PRACTICAL II

Time: 3 Hours Max. Marks: 75

PRACTICAL QUESTION PAPER

- Identify the given specimens -A to its respective family, draw
 MLS of the flower and describe it in technical terms.
 (Identification of family 2, MLS diagram 3, technical description 4)

 (09)
- Identify the given specimen -B, to its respective family, construct the floral diagram and write the floral formula.
 (Identification of family 2, floral diagram 3, floral formula 2)

 (07)
- 3. Make suitable micro preparations of the given specimens C. Submit the slides for valuation. Identify the specimens, draw diagrams and give reasons. (Identification 1, diagram 2, Reasons 2, Slide 2) (07)
- 4. Comment on the Physiology setup D Write the aim, materials required , Procedure, Results and Inference (Aim-1, Materials required -1, Procedure -2 , Results and Inference -3) (07)
- 4. Spotters E, F, G, H, I, J, K and L.
 (Identification 1, diagram 2, Reasons 2) (7 X 5)
 (35)

 Total = 65
 Record = 10

 Grand Total = 75

BOTANY PRACTICAL II KEY & SCHEME OF VALUATION

1. Taxonomy - A - MLS of the flower (from any one family mentioned in the syllabus) (Identification of family - 2, MLS diagram - 3, technical description - 4)

(09)

- 2. Taxonomy B Floral diagram and floral formula (from any one family mentioned in the syllabus) (Identification of family -2, floral diagram -3, floral formula -2) (07)
- 3.. Anatomy C : Dicot and monocot stem, root and leaf. (Identification 1, diagram 2, Reasons 2, Slide -2) (07)
- 4. Physiology Set up D Osmosis thistle funnel experiment, Photosynthesis Beaker and Funnel experiment, Ganong's light screen and Ganong's respire scope

(Aim-1, Materials required -1, Procedure -2, Results and Inference -3) (07)

5. Spotters -E, F, G, H, I, J, and K (any seven of the following) (08)

Morphology – vegetative and reproductive morphological parts Anatomy – simple and complex tissues, dicot, monocot root and leaf Embryology – ovules, anther T.S.

Physiology - Osmosis - thistle funnel experiment, Photosynthesis - Beaker and Funnel experiment, Ganong's light screen and Ganong's respire scope experimental setup.

(Identification - 1, diagram - 2, Reasons - 2) (7 X 5) (35)

65	-		Total	=
			Record	d =
10				
75			Grand Total	=

SEMESTER:

PART: III

23UBIOEP2 Biochemistry Practical - II

Credit: 2 Hours: 3

Learning objectives

The objectives of this course are to

- Identify amino acids by qualitative test
- Prepare biomolecules from its sources
- Estimate phosphorus quantitatively

I.Qualitative analysis of amino acids

a) Arginine b)Cysteine c) Tryptophan d)Tyrosine e) Histidine

II. Biochemical preparations

- a) Preparation of casein from milk.
- b)Preparation of starch from potato.
- c)Preparation of albumin from egg.

IIIGroup Experiment

Determination of Iodine/ Saponification number of an edible oil(Demonstration).

Course Outcome

CO	On completion of this course, students will be able to	Programme
		Outcome
CO1	Qualitatively analyze the amino acids and report the type of amino acids based on specific tests	PO1,PO2,PO3
CO2	Prepare the macronutrients from the rich sources.	PO1,PO2,PO3
CO3	Check the quality of edible oil	PO1,PO2,PO3

Text books

- 1.Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, NewAge International Publishers, 2011,
- 2. An Introduction to Practical Biochemistry, David T. Plummer, 3 rd edition, Tata McGraw-Hill Publishing Company Limited, 2001.

Reference books

- 1. Biochemical Methods, Sadasivam S and Manickam A, 4h edition, NewAge International Publishers, 2016
- 2. Essentials of Food and Nutrition, Vol. I & Damp; II, M.S. Swaminathan.

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2	3	3				3	3	3	3
CO 2	2	3	3				3	3	3	3
CO 3	2	3	3				3	3	3	3

S - Strong (3) M - Medium (2) L -Low

SEMESTER:

П

PART: III

23UZOOEP2 Zoology Practical - II

Credit: 1 Hours: 2

Course Objectives:

1	To learn basic concepts relating to various physiological aspects of animals.
2	To comprehend the processes involved during development
3	To learn basic concepts of immunity and familiarize on immune organs.
4	To know the basic concepts of human genetics and patterns of inheritance
5	To learn about aspects of animal behaviour.

Practicals:

- 1. Qualitative detection of excretory products (Ammonia, Urea, Uric acid).
- 2. Frog Egg, Blastula and Gastrula.
- 3. Demonstration of lymphoid organs.
- 4. Identification of ABO blood groups
- 5. Identification of human syndroms from karyotyping
- 5. Vital staining of chick blastoderm
- 7. Study of behavioural adaptations of animals

Expected Course Outcomes

On completion of this course, students will be able to:

1	Recall the parts and working of body organs
2	Analyse the different developmental stages
3	Analyse the functioning of body and immune systems
4	Analyse the different patterns of inheritance
5	Understand the different types of behaviour

Text Book(s)

- 1 Arumugam N. (2013). Developmental Zoology, Saras Publication, Nagercoil, Tamilnadu, India.
- 2 Das S. (2020). Microbiology Practical Manual, CBS Publication, Delhi.
- 3 Jayasurya, Arumugam N, Dulsy Fatima. (2013). Practical Zoology Vol 3, Saras Publication, Nagercoil, Tamilnadu, India.
- 4 Singh HR and Neerajkumar. (2014). Animal Physiology and Biochemistry, Vishal Publishing Co. Jalandhar, Delhi.

Outcome Maping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S	M		M	M	S		S
CO 2	M	S	M		S		M	
CO3	S	M		S		S		M
CO 4	S	S		S	S	M		
CO 5	S	S	S				S	S

S-Strong

M-Medium

L-Low

Non-major (NME) Electives offered to other Department

SEMESTER: I PART: III	23UCHEN16 ROLE OF CHEMISTRY IN DAILY LIFE	Credit: 2 Hours: 2
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Objectives of the This course aims at providing an overall view of the course importance of Chemistry in everyday life chemistry of building materials and food chemistry of Drugs and pharmaceuticals Course **UNIT-I** Outline General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution Unit-II Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only. **UNIT-III** Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents - balanced diet - Calories minerals and vitamins (sources and their physiological importance). Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes general formulation and preparations - possible hazards of cosmetic use. **UNIT-IV** Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses. **UNIT-V** Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.

Recommende 1. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, d Text 2010. 2. A textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand publishing, 2012. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. 4. B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014. Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group, 2019. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. 5. Chand &Co.Publishers, second edition, 2006. Reference 1. Randolph. Norris Shreve, Chemical Process Industries, McGraw-**Books** Hill, Texas, fourthedition, 1977. 2. W.A.Poucher, Joseph A.Brink, Jr. Perfumes, Cosmetics and Soaps, Springer, 2000. A.K.De, Environmental Chemistry, New Age International Public Co., 1990. Website and e-1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7044178/ learning source 2. https://byjus.com/guestion-answer/name-the-element-which-isimportant-component-of-ceramics-glass-and-cement-csialca-1/ 3. https://kids.britannica.com/students/article/food-and-nutrition/ 274373 4. https://study.com/academy/lesson/pharmaceutical-drugsdefinition-types.html

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: learn about the chemicals used in everyday life as well as air pollution and water pollution.

CO2: get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC bakelite, polyesters,

CO3: acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats Also have an awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.

CO4: discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuel classification solid, liquid and gaseous; nuclear fuel - examples and uses

CO5: have an idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

SEMESTER: 23UCHEN26 Credit: 2 II DAIRY CHEMISTRY Hours: 2 PART: III

Objectives of the This course aims at providing an overall view of the course chemistry of milk and milk products processing of milk preservation and formation of milk products. Course Outline UNIT 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 neutralizerexamples and their detection- estimation of fat, acidity and total solids in milk. Unit 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. **UNIT III** Major Milk Products Cream - definition - composition - chemistry of creaming process gravitational and centrifugal methods of separation of cream - estimation of fat in 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. **UNIT IV** Special Milk Standardised milk - definition - merits - reconstituted milk - definition - flow diagram of manufacture - Homogenised milk - flavoured milk - vitaminised

milk - toned milk - Incitation milk - Vegetable toned milk - humanized milk -

condensed milk - definition, composition and nutritive value.

UNIT 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 -acidophilous milk – YoheerIndigeneous products- khoa and chhena definition - Ice cream -definition-percentage composition-types-ingredients-manufacture of ice-cream, stabilizers emulsifiersandtheirrole-milkpowder-definition-needformakingmilkpowderdryingprocess-types of drying.