



# **KONGU ARTS AND SCIENCE COLLEGE**

**(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore)**

**ERODE – 638 107**

**B.Sc (Biotechnology)**



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**ERODE – 638 107**

**2021-2022**



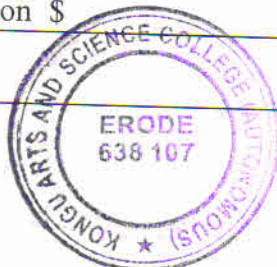
**KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)**  
**ERODE – 638 107**  
**DEPARTMENT OF BIOTECHNOLOGY**  
**B.Sc BIOTECHNOLOGY**



**SCHEME OF EXAMINATION – CBCS PATTERN**

(For the candidates admitted during the Academic year 2021 – 2022 and onwards)

Part	Course Code	Course Title	Inst. Hrs /Week	T/P	Examination Details				Credits
					Durati on in Hours	CIA	ESE	Total Marks	
<b>SEMESTER I</b>									
I	21T01/21H01/ 21F01/21S01/21M01	Language I	6	T	3	50	50	100	4
II	21E01	English I	6	T	3	50	50	100	4
III	21UAQCT101	Core Paper I - Professional English I	4	T	3	50	50	100	4
	21UAQCT102	Core Paper II - Cell Biology and Genetics	4	T	3	50	50	100	4
	-	Core Practicals I – Lab in Cell Biology and Biochemistry	2	P	-	-	-	-	-
	21UAQAT103	Allied I - Chemistry Paper I	4	T	3	30	45	75	3
	-	Allied Practical I – Chemistry Practicals	2	P	-	-	-	-	-
IV	21ES01	Foundation Course I : Environmental Studies \$	2	T	100 mins	-	50	50	2
<b>Total</b>			<b>30</b>					<b>525</b>	<b>21</b>
<b>SEMESTER II</b>									
I	21T02/21H02/ 21F02/21S02/21M02	Language II	6	T	3	50	50	100	4
II	21E02	English II	6	T	3	50	50	100	4
III	21UAQCT201	Core Paper III – Professional English II	4	T	3	50	50	100	4
	21UAQCT202	Core Paper IV - Biochemistry	4	T	3	50	50	100	4
	21UAQCP203	Core Practical I – Lab in Cell Biology and Biochemistry	2	P	3	30	45	75	3
	21UAQAT204	Allied II - Chemistry Paper II	4	T	3	30	45	75	3
	21UAQAP205	Allied Practical I - Chemistry Practicals	2	P	3	25	25	50	2
IV	21VE01	Foundation Course II : Value Education \$	2	T	100 mins	-	50	50	2
<b>Total</b>			<b>30</b>					<b>650</b>	<b>26</b>





SEMESTER III									
I	21T03/21H03/ 21F03/21S03/21M03	Language III	6	T	3	50	50	100	4
II	21E03	English III	6	T	3	50	50	100	4
III	21UAQCT301	Core Paper V - Microbiology	5	T	3	50	50	100	4
	21UAQCT302	Core Paper VI - Bioanalytical Techniques	4	T	3	50	50	100	4
	21UAQAT303	Allied III – Basic mathematics	4	T	3	30	45	75	3
IV	21UAQSP304	Skill Based Subject I – Lab in Quality Control Techniques	3	P	3	30	45	75	3
	21BT01	Basic Tamil @	2	T	-	75	-	75	2
	21AT01	Advanced Tamil #			3	-	75		
	21UAQNT305	Non Major Elective I ##			3	-	75		
	21SS01	Gender Studies	SS*	T	-	-	50	50	2
<b>Total</b>			<b>30</b>					<b>675</b>	<b>26</b>

SEMESTER IV									
I	21T04/21H04/ 21F04/21S04/21M04	Language IV	6	T	3	50	50	100	4
II	21E04	English IV	6	T	3	50	50	100	4
III	21UAQCT401	Core Paper VII – Molecular Biology	4	T	3	50	50	100	4
	21UAQCP402	Core Practical II – Lab in Microbiology	3	P	3	30	45	75	3
	21UAQAT403	Allied IV- Python Programming	3	T	3	30	45	75	3
	21UAQAP404	Allied Practical II - Python Programming Lab	3	P	3	25	25	50	2
IV	21UAQST405	Skill Based Subject II – Physiopathology for Medical Transcription	3	T	3	30	45	75	3
	21BT02	Basic Tamil @	2	T	-	75	-	75	2
	21AT02	Advanced Tamil #			3	-	75		
	21UAQNT406	Non Major Elective II ##			3	-	75		
	21SS02	Yoga	SS*	T	-	-	50	50	2
<b>Total</b>			<b>30</b>					<b>675</b>	<b>27</b>





SEMESTER V									
III	21UAQCT501	Core Paper VIII – Immunology	6	T	3	50	50	100	4
	21UAQCT502	Core Paper IX – rDNA Technology	5	T	3	50	50	100	4
	21UAQCT503	Core Paper X – Industrial Biotechnology	5	T	3	50	50	100	4
	21UAQCP504	Core Practical III – Lab in rDNA Technology and Industrial Biotechnology	6	P	6	30	45	75	3
	21UAQET505-507	Elective I/SWAYAM	5	T	3	50	50	100	4
IV	21UAQST508	Skill Based Subject III – Entrepreneurship in Life Sciences	3	T	3	30	45	75	3
	21UAQIT01	Institutional Training *	-	-	Grade System				-
<b>Total</b>			<b>30</b>					<b>550</b>	<b>22</b>
SEMESTER VI									
III	21UAQCT601	Core Paper XI - Animal Biotechnology, Bioethics and IPR	4	T	3	50	50	100	4
	21UAQCT602	Core Paper XII – Plant Biotechnology	4	T	3	50	50	100	4
	21UAQCP603	Core Paper XIII - Project	4	P	3	50	50	100	3
	21UAQCP604	Core Practical IV – Lab in Immunology and Plant Tissue Culture	6	P	3	30	45	75	3
	21UAQET605-607	Elective II	4	T	3	50	50	100	4
	21UAQEV608	Elective III	5	T	-	50	50	100	4
IV	21UAQST609	Skill Based Subject IV – Medical Biotechnology	3	T	3	30	45	75	3
	21NS01	Extension Activity						50	1
<b>Total</b>			<b>30</b>					<b>700</b>	<b>26</b>
<b>TOTAL</b>			<b>180</b>					<b>3800</b>	<b>148</b>

\$ No Continuous Internal Assessment (CIA). Only Online End Semester Examination

@ No End Semester Examination. Only Continuous Internal Assessment (CIA)

# No Continuous Internal Assessment (CIA). Only End Semester Examination

## Offered to other Department students. No Continuous Internal Assessment (CIA). Only End Semester Examination.

\* Students should undergo Institutional training at the end of II year (IV<sup>th</sup> semester) and have to submit the report in III year (V<sup>th</sup> semester)

SS\* self-study paper




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LIST OF ALLIED COURSES			
Allied – I	21UAQAT103	Chemistry Paper I	
Allied – II	21UAQAT204	Chemistry Paper II	
Allied Practical I	21UAQAP205	Chemistry Practicals	
Allied – III	21UAQAT303	Allied III – Biomathematics	
Allied – IV	21UAQAT403	Allied IV – Python Programming	
Allied Practical II	21UAQAP404	Python Programming Lab	
LIST OF NON-MAJOR ELECTIVE			
	Course Code	Course Name	Offered to
NME - I	21UAQNT305	Basics of Human Health and Nutrition	BA English Literature
NME –II	21UAQNT406	Health Management and Fitness	BA English Literature
LIST OF SKILL BASED COURSES			
Skill Based - I	21UAQSP304	Lab in Quality Control Techniques	
Skill Based - II	21UAQSP405	Physiopathology for Medical Transcription	
Skill Based - III	21UAQST508	Entrepreneurship in Life Sciences	
Skill Based - IV	21UAQST609	Medical Biotechnology	
LIST OF ELECTIVE COURSES			
Elective-I	21UAQET505	Environmental Biotechnology	
	21UAQET506	Marine Biotechnology	
	21UAQET507	Virology and Vaccinology	
Elective-II	21UAQET605	Food Biotechnology	
	21UAQET606	Enzyme Technology	
	21UAQET607	Genomics and Proteomics	
Elective-III	21UAQET608	Bioinformatics	
	21UAQET609	Pharmaceutical Biotechnology	
	21UAQET610	BioNanotechnology	




  
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LIST OF EXTRA CREDIT COURSES		
Advanced Learners Course I	21UAQAL407	Developmental Biology
	21UAQAL408	Stem Cell Biology
Advanced Learners Course II	21UAQAL509	Cancer Biology
	21UAQAL510	Research Methodology

  
Dr. D. Saravanan  
Chairperson

Board of Studies Biotechnology  
Kongu Arts and Science College (Autonomous), Erode



  
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Sem.	Course Code	<b>Core Paper I: Professional English I</b>	Total Marks: 100		Hours Per Week	Credits
I	21UAQCT101		CIA: 50	ESE: 50	4	4

**Course Objectives:**

1. To develop the language skills of students
2. To enhance the lexical, grammatical and socio-linguistic and communicative competence
3. To focus on developing students' knowledge of domain specific registers and the required language skills

**Course Outcomes (CO): On completion of the course, students should be able to**

CO 1	Identify the correct usage of vocabulary and grammar in speaking and writing	<b>K1 - K4</b>
CO 2	Demonstrate the language skills through academic writing	
CO 3	Apply the communicative skills by responding to given situations	
CO 4	Communicate leadership quality and team building	
CO 5	Analyze the information in various circumstances	

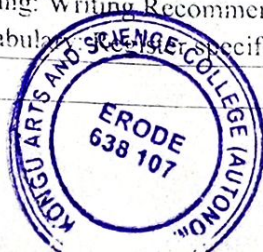
**K1: Remember; K2:Understand; K3:Apply; K4:Analyze; K5: Evaluate; K6:Create**


<b>Unit - I</b>	<b>Communication</b>
Listening: Listening to audio text and answering questions -Listening to Instructions	
Speaking: Pair work and small group work.	
Reading: Comprehension passages –Differentiate between facts and opinion	
Writing: Developing a story with pictures.	
Vocabulary: Register specific - Incorporated into the LSRW tasks	

<b>Unit - II</b>	<b>Description</b>
Listening: Listening to process description.-Drawing a flow chart.	
Speaking: Role play (formal context)	
Reading: Skimming/Scanning-	
Reading passages on products, equipment and gadgets.	
Writing: Process Description –Compare and Contrast	
Paragraph-Sentence Definition and Extended definition- Free Writing.	
Vocabulary: Register specific -Incorporated into the LSRW tasks.	

<b>Unit - III</b>	<b>Negotiation Strategies</b>
Listening: Listening to interviews of specialists / Inventors in fields (Subject specific)	
Speaking: Brainstorming. (Mind mapping).	
Small group discussions (Subject- Specific)	
Reading: Longer Reading text.	
Writing: Essay Writing (250 words)	
Vocabulary: Register specific - Incorporated into the LSRW tasks	

<b>Unit - IV</b>	<b>Presentation Skills</b>
Listening: Listening to lectures.	
Speaking: Short talks.	
Reading: Reading Comprehension passages	
Writing: Writing Recommendations Interpreting Visuals inputs	
Vocabulary: Register specific - Incorporated into the LSRW tasks	



  
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Unit - V		Critical Thinking Skills										
Listening: Listening comprehension- Listening for information.												
Speaking: Making presentations (with PPT- practice).												
Reading: Comprehension passages –Note making.												
Comprehension: Motivational article on Professional Competence, Professional Ethics and Life Skills)												
Writing: Problem and Solution essay– Creative writing –Summary writing												
Vocabulary: Register specific - Incorporated into the LSRW tasks.												
SKILL ORIENTED ACTIVITIES												
1. Creation of a Mindmap												
2. Narrating and Reporting on an Interview of an Expert/ Inventors in their Subject Domain												
3. Summarize on a Subject related Research Article and												
TEXT BOOK												
1	Professional English for Life Sciences - TANSCHÉ											
REFERENCE BOOK												
1	A Handbook of English for Engineers and Technologists, BS Publications, Eliah P, 2003.											
2	English for Professionals, Vayu Education of India, Dr.Sheema Miglani & Shikha Goyal. 2010.											
3	Business English, Tata McGraw-Hill Edition, Dona J.Young, 2012											
WEB RESOURCES												
1	<a href="https://www.classcentral.com/course/swayam-business-english-communication-10097">https://www.classcentral.com/course/swayam-business-english-communication-10097</a>											
Course Designed By				Verified By				Approved By HOD				
R.S. Cindhu Ms.R.S.Cindhu				Dr.N. Sangeetha				Dr.C.Deepa				
QUESTION PAPER PATTERN												
Time: 3 hours						Max. Marks: 50						
SECTION-A (10 X 1 = 10 Marks) (Vocabulary) (MCQ, Info-gap questions –domain specific vocabulary)						SECTION-B (4 X 10 = 40 Marks) (Reading :Two long domain-specific comprehension passages with questions pertaining to understanding and analysis – 20 Marks) (Writing: Descriptive/narrative/persuasive writing questions pertaining to domain-specific vocabulary – 20 Marks)						
Mapping of COs with POs and PSOs:												
CO \ PO/PSO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	M	M	S	M	S	S	S	S
CO 2	S	S	S	M	M	M	S	M	S	S	S	M
CO 3	S	S	S	S	M	M	S	M	S	S	S	M
CO 4	S	S	S	S	M	M	S	M	S	S	M	M
CO 5			S	S	M	M	S	S	S	S	S	S
S-Strong, M-Medium, L-Low						Dr. N. RAMAN PRINCIPAL, KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS) NANJANAPURAM, ERODE - 638 107						





Sem.	Course Code	Core Paper I: Cell Biology and Genetics	Total Marks: 100		Hours Per Week	Credits
1	21UAQCT102		CIA: 50	ESE: 50	4	4

**Course Objectives:**

1. To obtain an adequate knowledge about cell, organelles and their functions
2. To gain high knowledge in the field of Genetics.
3. To understand, analyze and develop their skills on basic concepts for technical development

**Course Outcomes (CO): On completion of the course, students should be able to**

CO 1	Recall the basic concepts about cell, its classification and the membrane architecture	K1 - K4
CO 2	Precise the ideas regarding the function and cellular organization of intracellular organelles	
CO 3	Understand cell cycle, cell division and various techniques used in Cell Biology	
CO 4	Summarize the basic concepts of Genetics, Genetic interactions and Crossing over	
CO 5	Have a deep insight on various chromosomal variations and approaching idea in population genetics	

**K1: Remember; K2:Understand; K3:Apply; K4:Analyze; K5: Evaluate; K6:Create**

**Unit - I** **Cell Structure and Organization**  
Introduction to Cell and Cell theory. Classification of Cell - Prokaryotic and Eukaryotic cells. Membrane models - Bilayer (Lipid membrane, Danielli Davson model, Unit membrane and Greater membrane) and Micellar model. Ultra structure of plasma membrane. Transport of molecules across membrane – Active and Passive transport (diffusion and osmosis).

**Unit - II** **Intracellular Characteristics**  
Cell-cell signaling, Cell adhesions, Cell junctions (occluding, anchoring and communicating junctions). Structural organization and function of intracellular organelles – Cell wall, Mitochondria, Endoplasmic reticulum, Golgi complex, Ribosomes, Lysosomes, Microbodies, Plastids, Vacuoles, Cytoskeleton architecture and Nucleus. Ultrastructure of Chromosome and Specialized chromosomes. Extracellular matrix. Diseases caused by malfunctioning of cell organelles – Mitochondria, Endoplasmic Reticulum, Lysosomes.

**Unit - III** **Cellular Functions and Cell Techniques**  
Cell division and cell cycle: Cell division in prokaryotes. cell cycle in eukaryotes, mitosis, meiosis and crossing over. Apoptosis and cancer.  
Specialized cells: Nerve cell and synaptic transmission, sperm cell, muscle cells, cells of vision.  
Techniques in Cell Biology: Histochemistry of tissues, Karyotyping, Comet assay and Flow Cytometry.

**Unit - IV** **Mendelian Genetics and Linkage**  
Mendelian Principles: History, scope and areas of Genetics. Mendel's Law: Monohybrid cross, Dihybrid cross, Trihybrid cross, Test cross and Back cross. Allelic gene interaction: Dominance, Multiple alleles, Lethal alleles, Penetrance and Expressivity, Pleiotropism.  
Non allelic gene interaction: Epistasis, complementation, polygeny. Patterns of Sex determination (chromosomal, genetic and environmental).  
Linkage groups and mechanism of crossing over, Bateson & Punnet's Coupling and Repulsion hypothesis. Chromosome theory of Linkage. Introduction to map distance and gene order.

**Unit - V** **Chromosomal Variations and Population Genetics**



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Chromosomal variation in Number (Euploidy and Aneuploidy) Chromosomal Abberations (Deletion, Duplication, Inversion and Translocation). Single gene disorders – Autosomal dominant (Huntington), Autosomal recessive (Cystic fibrosis), X linked trait (Muscular dystrophy).  
Population Genetics: Genetic variation – Genotypic frequency, Allelic frequency, Random and Non-random mating, Hardy Weinberg law, calculating gene frequencies, changes in allelic frequency (Mutation, Migration, Genetic drift and Natural Selection).

**SKILL ORIENTED ACTIVITIES**

1. Model/Chart work explaining different organelles and their functions
2. ABO inheritance pattern in a family and its interpretation
3. Report on any genetic disorder obtained from a published database

**TEXT BOOK**

- |   |  |
|---|--|
| 1 | Ajoy Paul, Text Book of Cell and Molecular Biology, III Edition. Books and Allied Ltd, Kolkata, 2015.  |
| 2 | Dr. P.S. Verma and Dr. V.K. Agarwal, Cell Biology, Genetics, Molecular Biology, Evolution and Ecology I Multi colour Edition, S.Chand and Company, New Delhi, 2014 |

**REFERENCE BOOK**

- |   |   |
|---|---|
| 1 | Lodish et al., (2016), "Molecular Cell Biology", VIII Edition, W.H. Freeman & Company, New York           |
| 2 | Benjamin A.Pierce (2005), Genetics- A conceptual Approach, II Edition, W.H.Freeman and Company, New York. |

**WEB RESOURCES**

- |   |   |
|---|---|
| 1 | <a href="https://nptel.ac.in/courses/102/103/102103012/">https://nptel.ac.in/courses/102/103/102103012/</a>   |
| 2 | <a href="https://www.classcentral.com/course/swayam-genetics-and-genomics-17623">https://www.classcentral.com/course/swayam-genetics-and-genomics-17623</a> |

**Course Designed By**

*R.S. Cindhu*  
Ms.R.S.Cindhu

**Verified By**

*Sanu*  
Ms.K.Sanu

**Approved By HOD**

*Dr.C.Deepa*  
Dr.C.Deepa

**QUESTION PAPER PATTERN**

**Time: 3 hours**

**Max. Marks: 50**

**SECTION-A (10 X 1 = 10 Marks)**

Answer ALL questions  
Choose the correct answer  
Two questions from each unit

**SECTION-B (5 X 3 = 15 Marks)**

Answer ALL questions  
Either or type  
Two questions from each unit

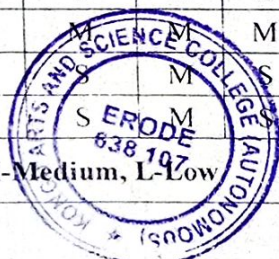
**SECTION-C(5 X 5 = 25 Marks)**

Answer ALL questions  
Either or type  
Two questions from each unit

**Mapping of COs with POs and PSOs:**

PO/PSO CO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	M	M	S	S	S	S	S	M	S	S
CO 2	S	M	M	M	S	M	S	S	S	S	S	S
CO 3			M	M	S	S	S	S	S	S	S	S
CO 4		M		M	S	S	S	S	S	S	M	M
CO 5				M	S	S	S	S	S	S	S	S

S-Strong, M-Medium, L-Low



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Sem.	Course Code	Allied I: Chemistry - I	Total Marks: 75		Hours Per Week	Credits
			CIA: 30	ESE: 45		
1	21UAQAT103				4	3

**Course Objectives:**

- To understand the importance of Atomic structure and chemical bonding
- To know the basic concepts of isomerism and facts of solutions & chemical kinetics.
- To gain the knowledge about Phytochemistry and Industrial Chemistry

**Course Outcomes (CO): On completion of the course, students should be able to**

CO 1	Illustrate the structural elucidation of organic compounds.	K1 - K4
CO 2	Summarize the fundamentals of physical chemistry	
CO 3	Recall the bonding mechanisms and theories of inorganic compounds	
CO 4	Establish the knowledge in polymer chemistry	
CO 5	Classify the different laws of physical chemistry	

**K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create**

Unit - I	Nuclear Chemistry and Molecular orbital Theory
<p><b>Laboratory principles:</b> Safety and Hygiene in the Chemistry Lab: Storage and Handling of Chemicals. Antidotes and First Aid procedures in chemistry lab.</p> <p><b>Nuclear Chemistry:</b> Definition of Atoms, Molecules, Proton, Neutron, Electron, Atomic weight, Atomic number, Isotopes, Isobars, Isotones, Nuclear Fusion and Nuclear Fission.</p> <p><b>Chemical bond:</b> Definition of Covalent bond, Ionic bond, Coordinate covalent bond, Hydrogen bond and Vander Waal's Forces.</p> <p><b>Molecular Orbital Theory:</b> Concepts of M.O. Theory – Comparison of Bonding and Anti-bonding molecular orbitals, Bond order, Diamagnetism and Para magnetism. Applications of M.O Theory – H<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub> and F<sub>2</sub>.</p>	

Unit - II	Plastics, Silicones, Dyes and Fertilizers
<p><b>Plastics:</b> Preparation, Properties and Uses of Poly Vinyl Chloride, Teflon, Polythene and Epoxy Resins. Difference between thermoplastic and Thermosetting polymers.</p> <p><b>Silicones:</b> Preparation, Properties and Uses.</p> <p><b>Dye:</b> Definition of Chromophore and Auxochrome. Preparation, Properties and Uses of Azo dye (Methyl orange) and Vat dye (Indigo).</p> <p><b>Fertilizers:</b> Preparation and uses of Ammonium Sulphate, Ammonium Nitrate, Urea and Triple Super Phosphate.</p>	

Unit - III	Covalent bond, Polar effects and Stereoisomerism
<p><b>Covalent Bond:</b> Orbital Overlap, Hybridization, Geometry of organic molecules - CH<sub>4</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>4</sub> and C<sub>6</sub>H<sub>6</sub>.</p> <p><b>Polar Effects:</b> Inductive effect, Electromeric, Mesomeric and Steric effects.</p> <p><b>Stereoisomerism:</b> Optical isomerism - Elements of symmetry. Isomerism in Tartaric acid. Racemisation and Resolution. Geometric isomerism - Maleic acid and Fumaric acid.</p>	

Unit - IV	Solutions and Chemical kinetics
<p><b>Solutions:</b> Definition of Normality, Molality and Molarity. Types of Solutions. Raoult's law: Statement, Ideal solution - Deviation from ideal behavior. Binary liquid mixtures. Fractional Distillation.</p> <p><b>Chemical Kinetics:</b> Introduction, Difference between the Order and Molecularity of the reaction, Methods of Determination of Order of reaction. Effect of Temperature on the reaction rate.</p>	

Unit - V	Photochemistry and Metallic chemistry
<p><b>Photochemistry:</b> Definition of Photochemical reaction, Comparison of Thermal and Photochemical reaction. Laws of Photochemistry - Grothus Drapers law and Strak Einstein's Law. Quantum yield; Photosensitization - Fluorescence, Phosphorescence and Chemiluminescence.</p> <p><b>Metallic Bond:</b> Crystal Structure of Metals, Gas. Pauling and Band Theories, Semiconductors - Extrinsic and Intrinsic.</p>	

**SKILL ORIENTED ACTIVITIES**

- Chart/Model preparation on atomic structure of elements
- Report on different types of fertilizers and dyes used in industries around your locality.



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## 3. Summary on any one Noble Laureate and his contribution in Chemistry

**TEXT BOOK**

- |   |  |
|---|--|
| 1 | R. D. Madan, Advanced Inorganic Chemistry, S. Chand & Company. 5 <sup>th</sup> Edition, 2005                                   |
| 2 | B. S. Bahl and Arun Bahl, Advanced Organic Chemistry, S. Chand and Company Ltd, 1 <sup>st</sup> Edition, 2017                  |
| 3 | B. S. Bahl, G. D. Tuli and Arun Bahl, Essential of Physical Chemistry, S. Chand and Company Ltd, 3 <sup>rd</sup> Edition, 2007 |
| 4 | Dr. V. Veeraiyan, Allied Chemistry Paper I & II, 2 <sup>nd</sup> Edition, HpH publications, Chennai                            |

**REFERENCE BOOK**

- |   |   |
|---|---|
| 1 | B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 33 <sup>rd</sup> Edition, Vishal Publication, 2017      |
| 2 | B. R. Puri, L.R. Sharma and Madan S.P athania, Elements of Physical chemistry, 30 <sup>th</sup> Edition, Vishal Publication, 2017 |
| 3 | R.Gopalan, Analytical chemistry: S.Chand & Co., 2007.   |

**WEB RESOURCES**

- |   |   |
|---|---|
| 1 | <a href="https://epgp.inflibnet.ac.in/">https://epgp.inflibnet.ac.in/</a>   |
| 2 | <a href="http://chemed.chem.purdue.edu/genchem/beginners.html">http://chemed.chem.purdue.edu/genchem/beginners.html</a> |

**Course Designed By****Verified By****Approved By HOD**


Mr. G. KARTHIKEYAN



Mr. R. RASU



Dr. C. DEEPA

**QUESTION PAPER PATTERN**

Time: 3 hours

Max. Marks: 45

**SECTION-A (5 X 1 = 05 Marks)**

Answer ALL questions  
Choose the correct answer  
Two questions from each unit

**SECTION-B (5 X 3 = 15 Marks)**

Answer ALL questions  
Either or type  
Two questions from each unit

**SECTION- C (5 X 5 = 25 Marks)**

Answer ALL questions  
Either or type  
Two questions from each unit

**Mapping of COs with POs and PSOs:**

PO/PSO CO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	S	M	M	M	M	S	S	S	S	S	S
CO 2	M	S	M	M	M	M	S	M	S	S	M	S
CO 3	M	S	M	M	M	M	S	S	S	M	S	S
CO 4	M	S	M	M	M	S	S	S	S	S	S	S
CO 5	S	S	M	M	S	M	S	M	S	S	S	M

S-Strong, M-Medium, L-Low



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Sem.	Course Code	Core Paper III Professional English II	Total Marks: 100		Hours Per Week	Credits
			CIA : 50	ESE :50	2	2
II	21UAQCT201					

**Course Objectives:**

1. To develop the language skills of students
2. To enhance the lexical, grammatical and socio-linguistic and communicative competence
3. To focus on developing students' knowledge of domain specific registers and the required language skills.

**Course Outcomes (CO): On completion of the course, students should be able to**

CO	Description	Level
CO 1	Identify the correct usage of vocabulary and grammar in speaking and writing	K1 - K4
CO 2	Demonstrate the language skills through academic writing	
CO 3	Apply the communicative skills by responding to given situations	
CO 4	Communicate leadership quality and team building	
CO 5	Analyze the information in various circumstances	

**K1: Remember; K2:Understand; K3:Apply; K4:Analyze; K5: Evaluate; K6:Create**

**Unit – I Communicative Competence**

**Listening** – Listening to two talks/lectures by specialists on selected subject specific topics - (TED Talks) and answering comprehension exercises (inferential questions)  
**Speaking:** Small group discussions (the discussions could be based on the listening and reading passages- open ended questions)  
**Reading:** Two subject-based reading texts followed by comprehension activities/exercises  
**Writing:** Summary writing based on the reading passages

**Unit – II Persuasive Communication**

**Listening:** listening to a product launch- sensitizing learners to the nuances of persuasive communication  
**Speaking:** debates – Just-A Minute Activities  
**Reading:** reading texts on advertisements ( on products relevant to the subject areas) and answering inferential questions  
**Writing:** dialogue writing- writing an argumentative /persuasive essay.

**Unit – III Digital Competence**

**Listening** to interviews (subject related)  
**Speaking:** Interviews with subject specialists (using video conferencing skills)  
**Creating Vlogs** (How to become a vlogger and use vlogging to nurture interests – subject related)  
**Reading:** Selected sample of Web Page (subject area) **Writing:** Creating Web Pages  
**Reading Comprehension:** Essay on Digital Competence for Academic and Professional Life.  
 The essay will address all aspects of digital competence in relation to MS Office and how they can be utilized in relation to work in the subject area.

**Unit – IV Creativity and Imagination**

**Listening** to short (2 to 5 minutes) academic videos (prepared by EMRC/ other MOOC videos on Indian academic sites – E.g. <https://www.youtube.com/watch?v=tpvicScuDy0>)  
**Speaking:** Making oral presentations through short films – subject based **Reading :** Essay on Creativity and Imagination (subject based)  
**Writing** Basic Script Writing for short films (subject based)  
 - Creating blogs, flyers and brochures (subject based)  
 - Poster making, writing slogans/captions (subject based)

**Unit – V Workplace Communication & Basics of Academic Writing**

**Speaking:** Presentation using PowerPoint  
**Reading & Writing:** Notices, Circulars, Minutes of Meeting. Writing an introduction, paragraph, letter.  
**Punctuation:** period, question mark, exclamation point, comma, semicolon, colon, dash, inverted parentheses.



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brackets, braces, apostrophe, quotation marks, and ellipsis)  
Capitalization (use of upper case)

**SKILL ORIENTED ACTIVITIES**

1. Debate – Argumentation on a given topic
2. Slogan Preparation for a specific theme
3. Report Preparation on a Lecture Video by Subject Specific Expert/ Noble Laureate

**TEXT BOOKS**

- 1 Professional English For Life Sciences II-TANSCHÉ

**REFERENCE BOOK**

- 1 A Handbook of English for Engineers and Technologists, BS Publications, Elijah P, 2003.
- 2 English for Professionals, Vayu Education of India, Dr.Sheema Miglani & Shikha Goyal, 2010.
- 3 Business English, Tata McGraw-Hill Edition, Dona J.Young, 2012

**WEB SOURCES**

- 1 <https://www.classcentral.com/course/swayam-business-english-communication-10097>

**Course Designed By**

R.S. Cindhu  
Ms.R.S.Cindhu

**Verified By**

Dr.N.Sangeetha

**Approved By HOD**

Dr.C.Deepa

**QUESTION PAPER PATTERN**

Time: 3 hours

Max. Marks: 50

**SECTION-A (10 X 1 = 10 Marks)**

**SECTION-B (4 X 10 = 40 Marks)**

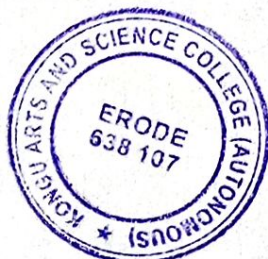
(Vocabulary)  
(MCQ, Info-gap questions –domain specific vocabulary)

(Reading :Two long domain-specific comprehension passages with questions pertaining to understanding and analysis – 20 Marks)  
(Writing: Descriptive/narrative/persuasive writing questions pertaining to domain-specific vocabulary – 20 Marks)

**Mapping of COs with POs and PSOs:**

PO/PSO CO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	M	M	S	M	S	S	S	S
CO 2	S	S	S	M	M	M	S	M	S	S	S	M
CO 3	S	S	S	S	M	M	S	M	S	S	S	M
CO 4	S	S	S	S	M	M	S	M	S	S	M	M
CO 5	S	S	S	S	M	M	S	S	S	S	S	S

S-Strong, M-Medium, L-Low



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Sem.	Course Code	Core Paper IV Biochemistry	Total Marks: 100		Hours Per Week	Credits
II	21UAQCT202		CIA : 50	ESE :50	4	4

**Course Objectives:**

- To obtain an adequate knowledge about biomolecules
- To gain high knowledge in properties and metabolism for biomolecules
- To understand and analyze the significance of biomolecules

**Course Outcomes (CO): On completion of the course, students should be able to**

CO 1	Acquire the basic knowledge in structure and classification of biomolecules	K1 - K4
CO 2	Conceptualize the properties of biomolecules	
CO 3	Strengthen their knowledge in biomolecular metabolism and significance	
CO 4	Relate their ideas with respect to enzyme classification, kinetics, regulation and inhibition of enzyme activity	
CO 5	Understand the utilities of macro and micro nutrients and their physiochemical properties	

**K1: Remember; K2:Understand; K3:Apply; K4:Analyze; K5: Evaluate; K6:Create**

**Unit –I****Carbohydrates and its Metabolism**

Carbohydrates: Classification, structure and functions of monosaccharides (trioses, tetroses, pentoses and hexoses), disaccharides (lactose, sucrose, maltose, cellobiose), polysaccharides (starch, glycogen, cellulose, hemicellulose, heparin and chondroitin sulphate).

Carbohydrate Metabolism: Glycolysis (including aerobic and anaerobic fermentation), TCA cycle, gluconeogenesis, glycogen breakdown, ETC and oxidative phosphorylation, Pentose-phosphate pathway (sequence of reactions & regulation).

**Unit – II****Lipids and its Metabolism**

Lipids: Structure, nomenclature and functions of fatty acids (saturated and unsaturated) Classification (simple, derived and compound) and uses of lipids, physical and chemical properties of lipids

Lipid Metabolism: Oxidation of fatty acids (alpha and beta oxidation), Biosynthesis of cholesterol.

**Unit – III****Amino acids, Proteins and their Metabolism**

Amino acids and Proteins: Structure, classification and properties of amino acids. Peptides, oligopeptides and polypeptides. Classification of proteins based on structure, function and composition. Levels of organization of proteins - primary, secondary, tertiary and quaternary structures.

Amino acid metabolism: Amino acid deamination, Urea cycle, Outline scheme for amino acid breakdown and synthesis.

**Unit – IV****Enzymes**

Enzymes: General properties, IUB classification of enzymes, active site - Lock and Key model, Koshland's induced fit hypothesis. Factors affecting enzyme activity (temp, pH, substrate concentration). Enzyme kinetics: Michaelis - Menton equation, Line Weaver - Burke Plot. Regulation of enzyme activity: allosteric enzymes-positive and negative cooperativity. Enzyme inhibition - reversible (competitive, noncompetitive and uncompetitive) and irreversible. Co-enzymes, cofactors functions of vitamins.

**Unit – V****Nucleic acid and its Metabolism**

Nucleic acids: Composition and structure of nucleic acids.

Nucleotide Metabolism: Biosynthesis of purine and pyrimidine (de novo and salvage pathway), degradation of purine and pyrimidine.

Minerals: Source, distribution, daily requirements, physiological functions and absorption of macronutrients (sodium, potassium, calcium, phosphorus) and micronutrients (iron and iodine).

**SKILL ORIENTED ACTIVITIES**

- Report on different nutritional value of food products
- Poster Preparation of Urea Cycle
- Give a report on different types of metabolic disorders

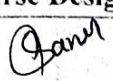
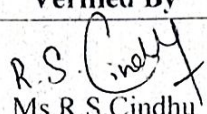
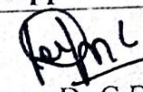
**TEXT BOOKS**

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1	U.Satyanarayana and U.Chakrapani, Biochemistry, V Edition. Books and Allied, 2017.											
<b>REFERENCE BOOK</b>												
1	A.C.Deb (2008). "Fundamentals of Biochemistry", IX Edition. New Central Book Agency, Kolkata											
2	Nelson and Cox (2012). "Lehninger Principles of Biochemistry", VI Edition. W.H.Freeman and Company											
<b>WEB SOURCES</b>												
1	<a href="https://ocw.mit.edu/courses/biology/7-01sc-fundamentals-of-biology-fall-2011/biochemistry/macromolecules-lipids-carbohydrates-nucleic-acid/">https://ocw.mit.edu/courses/biology/7-01sc-fundamentals-of-biology-fall-2011/biochemistry/macromolecules-lipids-carbohydrates-nucleic-acid/</a>											
2	<a href="https://ocw.mit.edu/courses/biology/7-01sc-fundamentals-of-biology-fall-2011/biochemistry/proteins-levels-of-structure-non-covalent-forces/">https://ocw.mit.edu/courses/biology/7-01sc-fundamentals-of-biology-fall-2011/biochemistry/proteins-levels-of-structure-non-covalent-forces/</a>											
<b>Course Designed By</b>				<b>Verified By</b>				<b>Approved By HOD</b>				
 Ms.K.Sanu				 Ms.R.S.Cindhu				 Dr.C.Deepa				
<b>QUESTION PAPER PATTERN</b>												
<b>Time: 3 hours</b>						<b>Max. Marks: 50</b>						
<b>SECTION-A (10 X 1 = 10 Marks)</b> Answer ALL questions Choose the correct answer Two questions from each unit				<b>SECTION-B (5 X 3 = 15 Marks)</b> Answer ALL questions Either or type Two questions from each unit				<b>SECTION-C(5 X 5 = 25 Marks)</b> Answer ALL questions Either or type Two questions from each unit				
<b>Mapping of COs with POs and PSOs:</b>												
<b>PO/PSO</b>	<b>PO</b>							<b>PSO</b>				
<b>CO</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	S	M	M	M	S	S	S	S	S	S	S	M
<b>CO 2</b>	S	M	M	M	S	M	S	S	S	S	S	M
<b>CO 3</b>	M	M	M	M	S	S	S	S	S	S	S	S
<b>CO 4</b>	S	M	S	M	S	S	S	S	S	S	S	S
<b>CO 5</b>	S	M	S	M	S	S	S	S	S	S	S	S
<b>S-Strong, M-Medium, L-Low</b>												



  
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Sem.	Course Code	Core Practical I Lab in Cell Biology and Biochemistry	Total Marks: 75		Hours Per Week	Credits
			CIA : 30	ESE :45		
II	21UAQCP203				2	3

**Course Objectives:**

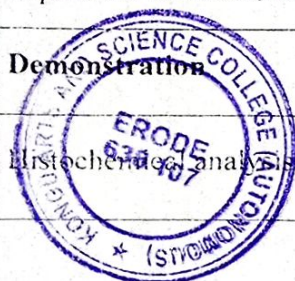
- To obtain basic skills in identifying cell types with morphological differentiation
- To gain enriched knowledge in estimation of biomolecules

**Course Outcomes (CO): On completion of the course, students should be able to**

CO 1	Explore the different morphological characteristics of cell types	K1 - K4
CO 2	Acquire the fundamental knowledge in smear preparation	
CO 3	Recognize the process of cell cycle	
CO 4	Analyze the biomolecules from unknown sources	
CO 5	Differentiate biomolecules based on their properties	

**K1: Remember; K2:Understand; K3:Apply; K4:Analyze; K5: Evaluate; K6:Create**

S.No	Experiments
1	Identification of Plant Cells Monocot Stem Dicot Stem
2	Identification of Animal Cells Blood Smear Buccal Smear
3	Simple Staining of Bacteria
4	Enumeration of Cell Size – Micrometer
5	Cell Counting using Hemocytometer
6	Mitotic Preparation of Onion Root Tip
7	Karyotyping
8	Estimation of Sugars – Anthrone Method
9	Estimation of Amino Acids – Ninhydrin Method
10	Estimation of Proteins – Lowry’s Method
11	Estimation of DNA – DPA Method
12	Estimation of RNA – Orcinol Method
13	Estimation of Cholesterol – Zak’s Method
14	Estimation of Vitamin C
15	Separation of Sugars – Paper Chromatography
16	Separation of Aminoacids – Thin layer Chromatography



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17 Biochemical analysis of Biological Samples



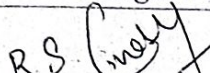
## REFERENCE BOOK

- 1 William H Heidcamp, Cell Biology – Laboratory Manual, CSHL Press, 2016
- 2 Sadasivam and Manickam, Biochemical Methods, III Edition New Age Inc Publications, 2018

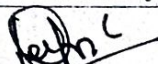
## WEB SOURCES

- 1 <https://vlab.amrita.edu/?sub=3>

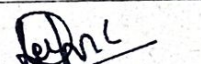
Course Designed By

  
 Ms.R.S.Cindhu

Verified By

  
 Dr.C.Deepa

Approved By HOD

  
 Dr.C.Deepa

## QUESTION PAPER PATTERN


Parameters	Maximum Marks
Major Experiment	12
Minor Experiment	8
Setup	6
Spotters	10
Viva Voce	4
Record Note Book	5
<b>Total</b>	<b>45</b>

## Mapping of COs with POs and PSOs:

PO/PSO CO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	L	S	S	M	S	S	S	S	S	S
CO 2	S	L	M	L	S	S	S	S	S	S	S	S
CO 3	S	L	M	M	S	M	S	S	S	S	M	S
CO 4	S	M	M	L	M	M	S	S	S	S	S	S
CO 5	S	M	S	L	M	S	S	S	S	S	S	S

S-Strong, M-Medium, L-Low



  
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Sem.	Course Code	Allied II: Chemistry - II	Total Marks: 75		Hours Per Week	Credits
			CIA: 30	ESE: 45		
II	21UAQAT204				4	3

**Course Objectives:**

- To understand the concepts of metallurgy
- To know the structural elucidation of Coordination compounds
- To obtain the knowledge about chemistry of Aromatic compounds, Thermodynamics and Electrochemistry.

**Course Outcomes (CO): On completion of the course, students should be able to**

CO 1	Identify the basic concepts of organic and inorganic chemistry.	K1 - K4
CO 2	Summarize the fundamentals of physical chemistry	
CO 3	Describe the theories of coordination compounds and laws of thermodynamics.	
CO 4	Develop basic knowledge with the synthesis of organic compounds	
CO 5	Recall the properties of organic compounds and extraction method of different metals	

**K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create**

**Unit - I Metallurgy**

Definition of Ores and its types, Mineral, Mining, Flux, Slag and Poling.

**General methods of extraction of metals:** Ore dressing (Physical and Chemical), Reduction methods, Refining methods - Zone refining and Van Arkel Zones refining, Extraction process of Uranium.

**Furnaces:** Blast and Reverberatory furnaces.

**Unit - II Coordination Chemistry**

Definition of Complex ion, Central ion, Ligand, Coordination bond, Coordination number, Coordination sphere. Chelate complex, Unidentate and Bidentate Ligands. Nomenclature of Mononuclear complexes.

**Theories:** Werner, Sidgwick Effective Atomic Number and Pauling's Valence bond theory.

**Chelation:** EDTA - Structure and uses, Determination of Hardness of water using EDTA, Structure of Hemoglobin and Chlorophyll.

**Unit - III Aromatic and Heterocyclic Compounds**

**Aromatic Compounds:** Definition of Aromaticity, Huckel's rule. Mechanism of Nitration, Halogenation, Alkylation, Acylation and Sulphonation.

**Naphthalene:** Structural elucidation, Preparation, Properties and Uses.

**Heterocyclic Compounds:** Preparation and Properties of Pyrrole and Furan.

**Unit - IV Energetics**

**Energetics:** System (Open, Closed & Isolated), Surroundings. Difference between the Reversible, Irreversible process and Comparison of Isothermal and Adiabatic Process.

First law of Thermodynamics (Definition only), Carnot cycle, Carnot theorem, Joule Thomson Effect, Definitions of Enthalpy, Bond energy, Entropy, Free energy

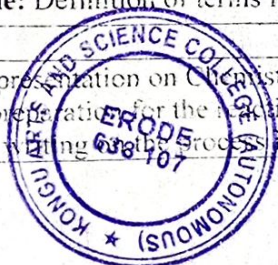
**Unit - V Electrochemistry and Phase rule**

**Electrochemistry:** Kohlraush's law and its application. Conductometric titration. pH determination - Galvanic cells, EMF Standard electrode potentials, Reference electrodes (Calomel Electrode). Electrochemical series and its applications. Principles of Electroplating.

**Phase Rule:** Definition of terms in Phase rule. Study of a simple Eutectic system: Pb-Ag.

**SKILL ORIENTED ACTIVITIES**

- Poster presentation on Chemistry in everyday life
- Chart preparation for the reaction mechanism
- Report writing on the process involved in the extraction of metals



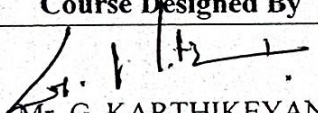
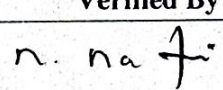
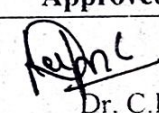
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TEXT BOOK	
1	R. D. Madan, Advanced Inorganic Chemistry, S. Chand & Company, 5 <sup>th</sup> Edition, 2005
2	B. S. Bahl and Arun Bahl, Advanced Organic Chemistry, S. Chand and Company Ltd, 1 <sup>st</sup> Edition, 2017
3	B. S. Bahl, G. D. Tuli and Arun Bahl, Essential of Physical Chemistry, S. Chand and Company Ltd, 3 <sup>rd</sup> Edition, 2007
4	Dr. V. Veeraiyan, Allied Chemistry Paper I & II, 2 <sup>nd</sup> Edition. HpH publications, Chennai
5	Dr. S. Rajan, Manual for Medical Laboratory Technology, 1 <sup>st</sup> edition, Anjanaa Book House, Chennai, 2012

REFERENCE BOOK	
1	B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 33 <sup>rd</sup> Edition. Vishal Publication, 2017
2	B. R. Puri, L.R. Sharma and Madan S.P athania, Elements of Physical chemistry, 30 <sup>th</sup> Edition, Vishal Publication, 2017
3	R.Gopalan, Analytical chemistry: S.Chand & Co., 2007.

WEB RESOURCES	
1	<a href="https://epgp.inflibnet.ac.in/">https://epgp.inflibnet.ac.in/</a>
2	<a href="http://chemed.chem.purdue.edu/genchem/beginners.html">http://chemed.chem.purdue.edu/genchem/beginners.html</a>

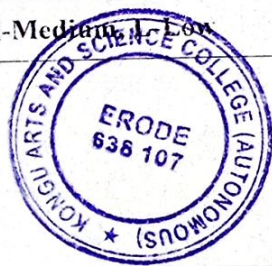
Course Designed By	Verified By	Approved By HOD
 Mr. G. KARTHIKEYAN	 Mr. R. RASU	 Dr. C. DEEPA


QUESTION PAPER PATTERN		
Time: 3 hours	Max. Marks: 45	
<b>SECTION-A (5 X 1 = 5 Marks)</b> Answer ALL questions Choose the correct answer Two questions from each unit	<b>SECTION-B (5 X 3 = 15 Marks)</b> Answer ALL questions Either or type Two questions from each unit	<b>SECTION- C (5 X 5 = 25 Marks)</b> Answer ALL questions Either or type Two questions from each unit

## Mapping of COs with POs and PSOs:

PO/PSO CO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	S	M	M	M	M	S	S	S	S	S	M
CO 2	M	S	M	M	M	M	S	S	S	S	M	M
CO 3	M	S	M	M	M	M	S	S	S	M	M	M
CO 4	M	S	M	M	M	S	S	S	S	S	S	S
CO 5	S	S	M	M	S	M	S	S	S	S	M	S

S-Strong, M-Medium, L-Low



  
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Sem.	Course Code	Allied Practicals - I Chemistry	Total Marks: 50		Hours Per Week	Credits
I & II	21UAQAP205		CIA: 25	ESE: 25	2	2

(Examination at the end of Second Semester)

**Course Objectives:**

- To understand the principles of volumetric analysis.
- To analyse the hardness of water from different sources
- To know about the analysis of organic compounds

**Course Outcomes (CO): On completion of the course, students should be able to**

CO 1	Practice the preparation procedure of normal and molar solutions.	K1 - K5
CO 2	Develop the experience in handling of glass wares and accurate chemical laboratory skill.	
CO 3	Estimate the acid and base solutions by volumetric analysis	
CO 4	Examine the methods of organic analysis	
CO 5	Distinguish the various organic compounds.	

**K1:Remember; K2:Understand; K3:Apply; K4:Analyze; K5: Evaluate; K6:Create**

Unit I - III	Volumetric Analysis
	<ol style="list-style-type: none"> <li>1. Estimation of Sodium hydroxide using Standard Sodium carbonate.</li> <li>2. Estimation of Hydrochloric acid using Standard Oxalic acid.</li> <li>3. Estimation of Oxalic acid using Standard Sulphuric acid.</li> <li>4. Estimation of Ferrous sulphate using Standard Mohr salt solution.</li> <li>5. Estimation of Calcium</li> <li>6. Estimation of Magnesium</li> <li>7. Determination of Hardness of Water using EDTA</li> </ol>
Unit IV - V	Qualitative Organic Analysis: Systematic Analysis
	<ol style="list-style-type: none"> <li>1. Detection of Element - Nitrogen compounds only.</li> <li>2. To distinguish between Aliphatic and Aromatic compounds.</li> <li>3. To distinguish between Saturated and Unsaturated compounds.</li> <li>4. Functional group tests for Phenols, Acids (mono and di), Aromatic primary amine, Carbohydrates, Monoamide and Diamide, - Functional groups characterized by Confirmatory test</li> </ol>

**TEXT BOOK**

1. A. O. Thomas, Practical Chemistry, Scientific Book Centre, Cannanore, 2003

**REFERENCE BOOK**

1. A. Venkateshwaran, R. Veeraswamy and A. R. Kulanthaivelu, S. Chand & Company Limited, 1<sup>st</sup> Edition, 2001

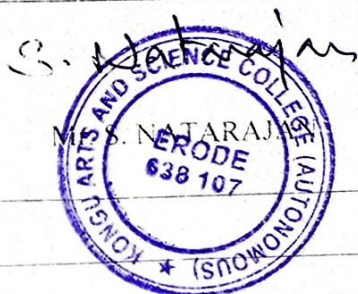
**WEB RESOURICES**

1. <https://vlab.amrita.edu/index.php?sub=2&brch=193>
2. [http://www.iscnagpur.ac.in/study\\_material/dept\\_chemistry/3.1\\_MIS\\_and\\_NJS\\_Manual\\_for\\_Organic\\_Qualitative\\_Analysis](http://www.iscnagpur.ac.in/study_material/dept_chemistry/3.1_MIS_and_NJS_Manual_for_Organic_Qualitative_Analysis)

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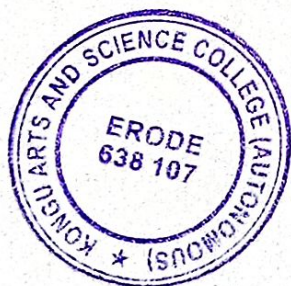
## QUESTION PAPER PATTERN


Volumetric Analysis	Organic Analysis	Record
08	12	05

Mapping of COs with POs and PSOs:

CO \ PO/PSO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	M	M	S	M	S	S	S	S	M	M
CO 2	S	M	M	M	S	M	S	S	S	S	M	M
CO 3	S	M	M	M	S	M	S	S	S	S	M	M
CO 4	S	M	M	M	S	S	S	S	S	S	M	M
CO 5	S	M	M	M	S	M	S	S	S	S	S	S

S-Strong, M-Medium, L-Low



  
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