



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCES DEPARTMENT OF LIFE SCIENCES

COURSE: B.Sc.

SEMESTER: I

SUBJECT NAME: Chemical Structure & Macromolecules

SUBJECT CODE: 4SC01CSM2

Teaching & Evaluation Scheme : -

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
2	0	2	4	3	20	1	50	2	---	---	30	100	

Objectives:

- To understand the properties of different types of chemical bonding and in addition to that what are the factors which affect nature of bonding.
- To study the importance of macromolecules.

Prerequisite: Students should have knowledge of basic chemistry.

Course Content:

Sr. No.	Course contents	Teaching Hours
1	Review of atomic structure & chemical bonding: Shapes of orbitals (s, p, d & f) Electronic configuration Quantitative analysis of elements Determination of molecular weight & molecular formula. Chemical bonding: Types of chemical bond: Ionic, Covalent bond (Polar & non polar), Co-ordinate bonds, weak chemical forces: Van der waals force, dipole dipole interaction & hydrogen bonding. Effect of chemical bonds on physical properties of molecules.	09
2	Macromolecules: Carbohydrates Classification of carbohydrates, stereo isomerism and optical isomerism of sugars, anomeric form and mutarotation. Occurrence, structure and biological importance of mono, di and polysaccharide (esp. starch, glycogen and cellulose). Reaction of Carbohydrates due to the presence of hydroxyl, aldehyde and ketone groups.	07
3	Proteins: Introduction, classification based on solubility, shape, composition and function. Structure of proteins-Primary, secondary, tertiary and quaternary. Chemical synthesis of poly peptide chain and solid phase polypeptide	07



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	synthesis. Brief study of biologically important peptides-structure and functions (esp. insulin, glutathione, vasopressin).	
4	Nucleic acids: Nature of genetic material, structure of purine and pyrimidine, nucleotide. Composition of DNA and RNA-Watson crick model of DNA. Types of nucleic acid (DNA and RNA). Properties of nucleic acid.	07
Total Hours		30

Learning outcomes:

The students are expected to

- Understand basic atomic and molecular structure and factors that determine stability of inorganic compounds.
- Study about the various macromolecules and their properties.

Teaching & Learning Methodology: -

- Use of audiovisual aids.
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session

Books Recommended:

1. **P. Sykes**. A Guide to Organic Reaction Mechanism.
2. **J. D. Lee, E L. B. S.** A new Concise Inorganic Chemistry.
3. **Barrow, G. M.** Physical Chemistry Tata McGraw-Hill, India. 2007.
4. **Castellan, G. W**, Physical Chemistry 4th Ed. Narosa, India. 2004.
5. **James E. Huheey, Ellen Keiter and Richard Keiter**, Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Publication.
6. **I. L. Fina**, Organic Chemistry (vol.1&2).
7. **David L. Nelson, Michael M. Cox**, Lehninger Principles of Biochemistry- Macmillan Worth Publishers.
8. **Rober K. Murray, Daryl K. Grammer**, Harper's Biochemistry- McGraw Hill, Lange Medical Books. 25th edition.

PRACTICALS



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S.No	Experiment
1	Limit tests for Cl, SO ₄ , As, Heavy metals and Lead along with a few modifications.
2	The background and systematic qualitative analysis of Inorganic compound (solid) of up to 2 radicals.
3	Volumetric Analysis of few important compounds.
4	Qualitative analysis of Carbohydrates (Monosaccharides, Disaccharides & Polysaccharides).
5	Qualitative analysis of Lipids.
6	Qualitative analysis of Carbohydrates.
7	Qualitative analysis of Amino acids & proteins.
8	Quantitative estimation of Glucose.
9	Quantitative estimation of Proteins.



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FACULTY OF SCIENCES DEPARTMENT OF LIFE SCIENCES

COURSE: B.Sc. SEMESTER: I
SUBJECT NAME: Introduction to Microbiology and Microbial Diversity
SUBJECT CODE: 4SC01IMD1

Teaching & Evaluation Scheme: -

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	4	8	6	30	1	70	3	30	---	70	200	

Objectives: -

To provide basic knowledge of introduction to microbiology and microbial diversity

Prerequisites:- Students should have knowledge of introduction to microbiology and microbial diversity

Course content:

Sr. No.	Course contents	Teaching Hours
1	History of Development of Microbiology: Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming. Role of microorganisms in fermentation, Germ theory of disease, Development of various microbiological techniques and golden era of microbiology, Development of the field of soil microbiology: Contributions of Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A. Waksman Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner	15
2	Diversity of Microbial World: Systems of classification: Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. Difference between prokaryotic and eukaryotic microorganisms. General characteristics of different groups: Acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) with emphasis on distribution and occurrence, morphology, mode of reproduction and economic importance.	15



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3	<p>Algae History of phycology with emphasis on contributions of Indian scientists; General characteristics of algae including occurrence, thallus organization, algae cell ultra structure, pigments, flagella, eyespot food reserves and vegetative, asexual and sexual reproduction. Different types of life cycles in algae with suitable examples: Haplobiontic, Haplontic, Diplontic, Diplobiontic and Diplohaplontic life cycles. Applications of algae in agriculture, industry, environment and food.</p> <p>Fungi Historical developments in the field of Mycology including significant contributions of eminent mycologists. General characteristics of fungi including habitat, distribution, nutritional requirements, fungal cell ultra- structure, thallus organization and aggregation, fungal wall structure and synthesis, asexual reproduction, sexual reproduction, heterokaryosis, heterothallism and parasexual mechanism. Economic importance of fungi with examples in agriculture, environment, Industry, medicine, food, biodeterioration and mycotoxins.</p> <p>Protozoa General characteristics with special reference to <i>Amoeba</i>, <i>Paramecium</i>, <i>Plasmodium</i>, <i>Leishmania</i> and <i>Giardia</i></p>	25
4	An overview of Scope of Microbiology	5
Total Hours		60

Learning Outcomes: -

At the end of the course the student would have sufficient knowledge of INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

Teaching & Learning Methodology: -

- Use of audiovisual aids.
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. **GJ, Funke BR and Case CL.** (2008). Microbiology: An Introduction. 9th edition. Pearson Education
2. **Madigan MT, Martinko JM, Dunlap PV and Clark DP.** (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition.
3. **Cappucino J and Sherman N.** (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited



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4. **Wiley JM, Sherwood LM and Woolverton CJ.** (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International.
5. **Atlas RM.** (1997). Principles of Microbiology. 2nd edition. W.M.T. Brown Publishers.
6. **Pelczar MJ, Chan ECS and Krieg NR.** (1993). Microbiology. 5th edition. McGraw Hill Book Company.
7. **Stanier RY, Ingraham JL, Wheelis ML, and Painter PR.** (2005). General Microbiology. 5th edition. McMillan.



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PRACTICALS

S.No	Experiment
1	Microbiology Good Laboratory Practices and Biosafety.
2	To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter) used in the microbiology laboratory.
3	Preparation of culture media for bacterial cultivation.
4	Sterilization of medium using Autoclave and assessment for sterility
5	Sterilization of glassware using Hot Air Oven and assessment for sterility
6	Sterilization of heat sensitive material by membrane filtration and assessment for sterility
7	Demonstration of the presence of microflora in the environment by exposing nutrient agar plates to air.
8	Simple staining
9	Negative staining
10	Gram's staining



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FACULTY OF SCIENCES DEPARTMENT OF LIFE SCIENCES

COURSE: B.Sc.

SEMESTER: I

SUBJECT NAME: Cell Biology

SUBJECT CODE: 4SC01CEB1

Teaching & Evaluation Scheme: -

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			
					Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
4	0	4	8	6	30	1	70	3	30	---	70	200

Objectives :- The objective of this course is that the students can learn about basics of cell biology.

Prerequisite:- Basic knowledge of Biological Sciences.

Course content:

Sr. No.	Course contents	Teaching Hours
1	Structure and organization of Cell: Cell Organization – Eukaryotic (Plant and animal cells) and prokaryotic, Plasma membrane: Structure and transport of small molecules, Cell Wall: Eukaryotic cell wall, Extra cellular matrix and cell matrix interactions, Cell-Cell Interactions - adhesion junctions, tight junctions, gap junctions, and plasmodesmata (only structural aspects) Mitochondria, chloroplasts and peroxisomes, Cytoskeleton: Structure and organization of actin filaments, association of actin filaments with plasma membrane, cell surface protrusions, intermediate filaments, microtubules	12
2	Nucleus: Nuclear envelope, nuclear pore complex and nuclear lamina, Chromatin – Molecular organization, Nucleolus.	4
3	Protein Sorting and Transport: Ribosomes, Endoplasmic Reticulum – Structure, targeting and insertion of proteins in the ER, protein folding, processing and quality control in ER, smooth ER and lipid synthesis, export of proteins and lipids, Golgi Apparatus – Organization, protein glycosylation, protein sorting and export from Golgi Apparatus, Lysosomes.	12
4	Cell Signalling: Signalling molecules and their receptors, Function of cell surface receptors, Pathways of intra-cellular receptors – Cyclic AMP pathway, cyclic GMP and MAP kinase pathway	8



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5	Cell Cycle, Cell Death and Cell Renewal: Eukaryotic cell cycle and its regulation, Mitosis and Meiosis, Development of cancer, causes and types, Programmed cell death, Stem cells, Embryonic stem cell, induced pluripotent stem cells	12
TOTAL		60

Learning Outcomes: -

At the end of the course the student would have sufficient knowledge of CELL BIOLOGY

Teaching & Learning Methodology: -

- Use of audiovisual aids.
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. **Hardin J, Bertoni G and Kleinsmith LJ.** (2010). Becker's World of the Cell. 8th edition. Pearson.
2. **Karp G.** (2010) Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons. Inc.
3. **De Robertis, EDP and De Robertis EMF.** (2006). Cell and Molecular Biology. 8th edition. Lipincott Williams and Wilkins, Philadelphia.
4. **Cooper, G.M. and Hausman, R.E.** (2009). The Cell: A Molecular Approach. 5th Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.



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PRACTICALS

S.No	Experiment
1	Study a representative plant and animal cell by microscopy.
2	Study of the structure of cell organelles through electron micrographs
3	Cytochemical staining of DNA – Feulgen
4	Demonstration of the presence of mitochondria in striated muscle cells/ cheek epithelial cell using vital stain Janus Green B
5	Study of polyploidy in Onion root tip by colchicine treatment.
6	Identification and study of cancer cells by photomicrographs.
7	Study of different stages of Mitosis.
8	Study of different stages of Meiosis.
9	Study of mitochondria.
10	Study of nucleus.



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FACULTY OF SCIENCES DEPARTMENT OF LIFE SCIENCES

COURSE: B.Sc.

SEMESTER: I

SUBJECT NAME: Environmental Science

SUBJECT CODE: 4SC01EVS1

Teaching & Evaluation Scheme: -

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
3	0	0	3	3	30	1	70	3	---	---	---	100	

Objectives: - The primary objective of this course is to make people aware of the importance of environment on health of every individual and the society as a whole.

Prerequisites: - Basic understanding of concepts related to environment and awareness about the harmful effects of pollution are required to understand the concept better.

Course outline:-

Sr. No.	Course Contents	Hours
1	The Multidisciplinary nature of environmental studies Definition, scope and importance. Need for public awareness.	02
2	Environment Concept: Introduction, concept of biosphere-lithosphere, hydrosphere, atmosphere; Biogeochemical cycle.	10
3	Principles and scope of Ecology; concepts of ecosystem, population, community, biotic interactions, biomes, ecological succession.	06
4	Natural Resources: Renewable and non-renewable resources. • Natural resources and associated problems.	06
5	Environmental Pollution: Causes, effects and control measures of : - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution & Nuclear hazards.	12
6	Conservation of Environment: The concepts of conservation and sustainable development, why to conserve, aims and objectives of conservation, policies of conservation; conservation of life support systems-soil, water, air, wildlife, forests.	04
7	Biodiversity: What is biodiversity, levels and types of biodiversity, importance of biodiversity, causes of its loss, how to check its loss; Hotspot zones of the world and India, Biodiversity Act, 2002.	05
TOTAL		45



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Learning Outcomes: -

- The course provides knowledge regarding conservation of environment which is very crucial in the present day scenario.

Books Recommended:

1. 'Introduction to Environmental Engineering and Science', **G. M. Masters**, *Prentice Hall of India Pvt. Ltd.*
2. 'Environmental Science', **B. J. Nebel**, *Prentice Hall of India Pvt. Ltd.*
3. 'Ecology: The Link between the natural and social sciences', **E. P. Odum**, *IBH Publishing Com., Delhi.*
4. 'Environmental Studies', **Snehal Popli**, *Mahajan Publication.*
5. 'Environmental Studies', **R. Rajagopalan**, *Oxford University Press.*
6. 'Environmental Pollution: Causes, Effects and Control', **K. C. Agrawal**, *Nidhi Publishers, New Delhi.*



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FACULTY OF SCIENCES DEPARTMENT OF ENGLISH

COURSE: B.Sc. SEMESTER-I (All Sciences)

SUBJECT NAME: Functional English-I

SUBJECT CODE: 4SC01FUE1

Teaching & Evaluation Scheme:

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
2	0	0	2	2	30	1.5	70	3	--	--	--	100	

Objectives:

- To train students in/for basic fundamentals skills of Communication – LSRW in English.
- To provide them the value education for better society.
- To make them able to communicate well in the Professional world.

Prerequisites:

- Students should have basic knowledge of English Language and grammar.
- Students should have ability to speak and write correct sentences in their day to day language.
- Students should be familiar with correct usage of language.

Course outline:

Unit No.	Content In Details Including Its Sub Topics	Minimum Number of Hours		
		Theor y	Practical	Total
Section: A Linguistic Proficiencies				
01	Prerequisites	01	--	01
02	Determiners- Articles	02 01	--	02 01
03	Basic Concepts of Grammar – Parts of Speech Noun, Verb, Adverb, Adjective	04	--	04
04	Subject – Verb Agreement / Concord	02	--	02
05	Tenses (Present and Past) Simple Present, Simple Past, Present Continuous, Past Continuous, Present Perfect, Past Perfect, Present Perfect Continuous	06	--	05
06	Prepositions: time, place and movement	03	--	02
07	Conjunctions: Coordinating and Subordinating	03	--	02
Section: B Literature				
08	Selected Stories from <i>Wise and Otherwise</i> by Sudha Murthy A Lesson in Life from a Beggar Idealists at Twenty Realists at Forty Think Positive, Be Happy	08	--	08



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Crisis of Confidence			
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Resources:

1. *Wise and Otherwise*, **Sudha Murty**, Penguin Books India Pvt. Ltd. Delhi.
2. *An Intermediate English Grammar*, **Raymond Murphy**, Cambridge University Press.
3. *A High School English Grammar*, **Wren & Martin**, S. Chand Publication.
4. *Contemporary English Grammar - Structures & Composition*, **David Green**, Macmillan Publishers India.



**FACULTY OF SCIENCES
DEPARTMENT OF LIFE SCIENCES**

COURSE: B.Sc.

SEMESTER: I

SUBJECT NAME: Generic Elective-I - Scope and applications of Microbiology

SUBJECT CODE: 4SC01SAM1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1	70	3	---	---	---	100	

Objectives:- To provide basic knowledge of available scope and application of the Microbiology.

Prerequisites:- Basic knowledge of biological science.

Course outline:-

Sr. No.	Course Contents	Hours
1	<p>History of Development of Microbiology:</p> <p>Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Antonvon Leeuwenhoek, Louis Pasteur, RobertKoch, JosephLister, Alexander Fleming Role of microorganisms in fermentation, Germ theory of disease, Development of various microbiological techniques and golden era of microbiology, Development of the field of soil microbiology: Contributions of Martinus W.Beijerinck, Sergei N. Winogradsky, SelmanA. Waksman Establishment of fields of medical microbiology and immunology</p> <p>Through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner.</p>	20
2	<p>Microscopy:</p> <p>Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Transmission Electron Microscope,</p> <p>Scanning Electron Microscope</p>	15
4	<p>Sterilization:</p> <p>Moist Heat, Autoclave, Dry Heat, Hot Air Oven, Tyndallization,</p>	10



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	Filtration.	
5	Microbes in Human Health & Environment: Medical microbiology and immunology: List of important human diseases and their causative agents of various human systems. Definitions of immunity (active/passive), primary and secondary immune response, antigen, anti-body and their types Environmental microbiology: Definitions and examples of important microbial interactions– mutualism, commensalism, parasitism, Definitions and microorganisms used as biopesticides, biofertilizers, in biodegradation, biodeterioration and bioremediation (<i>e.g.</i> hydrocarbons in oil spills)	15
	Total	60

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of scope and application of microbiology.

Books Recommended:

1. **Tortora GJ, Funke BR and Case CL.** (2008). Microbiology: An Introduction. 9th edition. Pearson Education
2. **Madigan MT, Martinko JM, Dunlap PV and Clark DP.** (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition
3. **Cappucino J and Sherman N.** (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited
4. **Wiley J M, Sherwood LM and Woolverton CJ.** (2013) Prescott's Microbiology. 9th Edition. M c Graw Hill International.
5. **Atlas R M.** (1997). Principles of Microbiology. 2nd edition. W M. T. Brown Publishers.
6. **Pelczar M J, Chan E C Sand Krieg N R.** (1993). Microbiology. 5th edition. Mc Graw Hill Book Company.
7. **Stanier R Y Ingraham J L, Wheelis M L, and Painter P R.** (2005). General Microbiology. 5th edition. M c Millan.



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