C. U. SHAH UNIVERSITY

FACULTY OF LIFE SCIENCES

BACHELOR OF SCIENCE (MICROBIOLOGY)

DEPARTMENT OF HUMANITIES

SEMESTER: I CODE: LSHM101

NAME: Communicative English I

Teaching & Evaluation Scheme:-

Subject Code	Subject name	Teaching scheme				Evaluation scheme								
		T	Tu	Pr	Total	Univ	Hrs	Sessional	Hrs	CEC	Pr Ext	Pr Int	CEC	Total
LSHM101	Communicative English I	2	0	2	4	70	3	20	1	10	-----	------	------	100

Objectives: -

- The primary objective of this course is to provide sound knowledge of grammar and vocabulary to the students.

Prerequisites:-

- Basic knowledge of English for this course would be preferable.

Course content:

Sr. No.	Course contents	Teaching Hours
1	**Part:A Grammar & Vocabulary (Basic Writing Skills)**	**30**
	i) Parts of Speech	4
	ii) Concept of Time (Tenses)	4
	iil) Modals, Auxiliaries	2
	iv) Connectors	2
	v)Transformation:	
	a) Active - Passive Voice	3
	b) Simple. Compound & Complex Sentences	4
	c) Affirmative - Negative - Interrogative	2
	iv) Subject - Verb Agreement - Concord	2
	v) Vocabulary: Synonyms, Antonyms,	1
	One Word Substitute, Confusables	
	vi) Comprehension Skills	6
	What is Reading Comprehension?	

	reasons for poor reading comprehension	
	How to improve Comprehension Skills	
	Techniques of Reading Comprehension:	
	Skimming, Scanning, Extensive Reading,	
	Aloud Reading, Selected Text for Reading	
2	**Part:B Phonetics (Speaking)**	**30**
	Speech Mechanism	2
	Sounds in English : Vowels & Consonants	3
	Articulation of Vowels	6
	Articulation of Consonants	6
	Accents	2
	Tone	1
	Syllables	2
	Intonation pattern	2
	Phonetic Transcription	6
	Total Hours	**60**

Learning Outcomes:-

At the end of the course the student would have gained sufficient primary knowledge of English grammar.

Teaching & Learning Methodology:-

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

Books Recommended:

1. Working in English, Jones, Cambridge
2. A Writer's Workbook Fourth edition, Smoke, Cambridge
3. English for All - Edited by Nilanjana Gupta (Macmillan India Limited.)
4. Facets of English, Grammar II, R.N. Shukla, M.M. Nigam. (Macmillan Ltd.)
5. Contemporary English Grammar - David Green.
6. Phrasal Verb Plus - Macmillan India Ltd

E-Resources:

1. www.edufind.com/english/grammar/
2. www.englishclub.com › Learn English

3. www.englishgrammarsecrets.com/

4. www.englishleap.com/grammar

C. U. SHAH UNIVERSITY

FACULTY OF LIFE SCIENCES

BACHELOR OF SCIENCE (MICROBIOLOGY)

SEMESTER: I CODE: LSES101

NAME: Environmental science (THEORY)

Teaching & Evaluation Scheme:-

Subject Code	Subject name	Teaching scheme				Evaluation scheme								
		T	Tu	Pr	Total	Univ	Hrs	Sessional	Hrs	CEC	Pr Ext	Pr Int	CEC	Total
LSES101	Environmental Science	3	0	0	3	70	3	20	1	10	-----	------	------	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	Teaching 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 Hours	**45**

Learning Outcomes:-

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

Teaching & Learning Methodology:-

Use of multimedia, Field trip, student interaction, group discussion, seminar, quizzes, assignment, brain storming session, expert talks.

Books Recommended:

1. **Masters, G.M**., "Introduction to Environmental Engineering and Science", Prentice – Hall of India Pvt. Ltd., 1991
2. **Nebel, B.J**., "Environmental Science", Prentice –Hall Inc., 1987
3. **Odum, E.P**., "Ecology: The Link between the natural and social sciences", IBH Publishing Com., Delhi.

E-Resources:

1. en.wikipedia.org/wiki/Environmental_science
2. www.iisc.ernet.in/ug/environmentscience.htm
3. www.sciencedaily.com/gallery/earth_climate/environmental_science/
4. environment.nationalgeographic.co.in/

C. U. SHAH UNIVERSITY

FACULTY OF LIFE SCIENCES

BACHELOR OF SCIENCE (MICROBIOLOGY)

DEPARTMENT OF CHEMISTRY

SEMESTER: I CODE: LSCH101

NAME: Chemical Structure and Macromolecules (THEORY)

Teaching & Evaluation Scheme:-

Subject Code	Subject name	Teaching scheme				Evaluation scheme								
		T	Tu	Pr	Total	Univ	Hrs	Sessional	Hrs	CEC	Pr Ext	Pr Int	CEC	Total
LSCH101	Chemical Structure & Macromolecules	2	0	2	4	70	3	20	1	10	70	20	10	200

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,	07

	aldehyde and ketone groups. **Macromolecules: Lipids** Introduction, definition of fatty acids. Classification, nomenclatures, structures, properties of fatty acids (Essential Fatty Acids) Structure and function of prostaglandins, tri-acyl glycerol. Structure and functions of phospholipids (esp. lecithin, phospotidyl inositol and phospotidyl serine) spingo myelin, plasmologens. Structure and function of glycolipids, cholesterol.	
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 synthesis. Brief study of biologically important peptides-structure and functions (esp. insulin, glutathione, vasopressin).	07
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.Finar**,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.

E-Resources:

1. http://library.thinkquest.org/10429/low/atomic/atomic.html
2. http://en.wikipedia.org/wiki/Atom
3. http://www.chemguide.co.uk/atoms/properties/gcse.html
4. http://en.wikipedia.org/wiki/Chemical_bond
5. http://www.sparknotes.com/chemistry/bonding/properties/section1.rhtml
6. http://hyperphysics.phy-astr.gsu.edu/hbase/chemical/bond2.html
7. http://www.chem1.com/acad/webtext/chembond/cb01.html
8. http://en.wikipedia.org/wiki/Nuclear_chemistry
9. http://www.chem.duke.edu/~jds/cruise_chem/nuclear/nuclear.html
10. http://library.thinkquest.org/10429/low/nuclear/nuclear.htm
11. http://www.visionlearning.com/library/module_viewer.php?mid=59
12. http://en.wikipedia.org/wiki/Chemical_thermodynamics
13. http://www.shodor.org/unchem/advanced/thermo/
14. http://www.chem.arizona.edu/~salzmanr/480a/480ants/chemther.html

FACULTY OF LIFE SCIENCES

BACHELOR OF SCIENCE (MICROBIOLOGY)

DEPARTMENT OF CHEMISTRY

SEMESTER: I CODE: LSCH101

NAME: Chemical Structure and Macromolecules (PRACTICALS)

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.

C. U. SHAH UNIVERSITY - WADHWANCITY

FACULTY OF LIFE SCIENCES

BACHELOR OF SCIENCE (MICROBIOLOGY)

DEPARTMENT OF BOTANY

SEMESTER: I CODE: LSBO101

NAME: Plant morphology & Anatomy (THEORY)

Teaching & Evaluation Scheme:-

Subject Code	Subject name	Teaching scheme				Evaluation scheme								
		T	Tu	Pr	Total	Univ	Hrs	Sessional	Hrs	CEC	Pr Ext	Pr Int	CEC	Total
LSBO101	Plant Morphology & Anatomy	2	0	2	4	70	3	20	1	10	70	20	10	200

Objectives: -

- The course aims to enlighten the students on the concept of phytodiversity.
- The course serves as a platform for further studies in Botany in succeeding semesters by providing basic concepts.

Prerequisites:-

- Ability to understand the concepts of biology.

Course outline:

Sr. No.	Course contents	Teaching Hours
1	**Cell and tissue** Tissues – Meristems, Definition, Classification based on origin, position, growth patterns, functions. Permanent tissues – Definition, classification - simple, complex and secretory. Tissue systems – Epidermal tissue systems-stomata, structure and functions, Ground tissue systems & vascular tissue systems. Different types of vascular arrangements	08
2	**Morphology** Root and stem (exclude modification) Leaf: Parts of leaf, Phyllotaxis, Types of leaves, Stipules, Leaf shapes, margins, base, apex, venation. Inflorescence: Types with examples. Flowers: Definition and study of function and types of Calyx, Corolla, Perianth, Androecium, Gynoecium. Aestivation, placentation etc.	16

	Floral formula & Floral diagram of the following: Apocynaceae, Leguminosae and Umbelliferae	
3	Anatomy of monocot and dicot (root, stem, leaf)	06
	Total Hours	**30**

Learning Outcomes:-

The course provides basic aspects of botany which may serve to be useful when more descriptive aspects are covered.

Teaching & Learning Methodology:-

- Use of multimedia, charts and models.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session, expert talks.

Books Recommended:

1. **V. Singh, P.C. Pande & D.K. Jain**, A Text Book of Botany.
2. **A C Dutta**, Botany.
3. **N. S. Parihar**, Bryophytes.
4. **Ganguli and Kar**, College Botany Vol. I and II.
5. **G. M. Smith**, Cryptogamic Botany.
6. **D. Enger, F.C. Ross, D.B. Bailey**. Concepts in biology (McGraw-Hill). 2008.
7. **N. S. Parihar**, Pteridophytes.

E-Resources:

1. biology.uco.edu/bidlack/botany/notes.htm
2. www.liqwidmindz.com/LifeSciences/Botany.htm
3. www.bscnotes.gurukpo.com/
4. quizlet.com/subject/botany-notes/

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FACULTY OF LIFE SCIENCES

BACHELOR OF SCIENCE (MICROBIOLOGY)

DEPARTMENT OF BOTANY

SEMESTER: I CODE: LSBO101

NAME: Plant morphology & Anatomy (PRACTICALS)

S.No	Experiment
1	Study of microscope.
2	Anatomical study of Monocot root.
3	Anatomical study of Dicot root.
4	Anatomical study of Monocot stem.
5	Anatomical study of Dicot stem.
6	Anatomical study of Monocot leaf.
7	Anatomical study of Dicot leaf.
8	Morphological study of Leaf
9	Morphological study of Inflorescence.
10	Morphological study of Flowers (Calyx, Corolla and Perianth).
11	Morphological study of Flowers (Androecium).
12	Morphological Study of Flowers (Gynoecium)
13	Morphological study of Root.
14	Floral formula & diagram for Umbelliferae
15	Floral formula & diagram for Apocyanaceae.
16	Floral formula & diagram for Leguminosae.

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FACULTY OF LIFE SCIENCES

BACHELOR OF SCIENCE (MICROBIOLOGY)

DEPARTMENT OF MICROBIOLOGY

SEMESTER: I CODE: LSMB101

NAME: World of Microbes (THEORY)

Teaching & Evaluation Scheme:-

Subject Code	Subject name	Teaching scheme				Evaluation scheme								
		T	Tu	Pr	Total	Univ	Hrs	Sessional	Hrs	CEC	Pr Ext	Pr Int	CEC	Total
LSMB101	World of microbes	6	0	6	12	70	3	20	1	10	70	20	10	200

Objectives: -

- The course will help the student to have a good understanding of the history and basic concepts and contribution of various scientists in the field Microbiology.
- To study morphology, microscopy, staining technique and control of microorganism by different methods.

Prerequisites:- Students should have knowledge of fundamental concepts in biology.

Course content:

Sr. No.	Course contents	Teaching Hours
1	**History of Microbiology** Discovery of microorganisms, Controversy over spontaneous generation, Fermentation ,Germ theory of disease, Immunology and Immunization, Pure Culture Concept. **Scope of Microbiology**	10

2	**Microbial Nutrition** Basic Nutritional requirements. Uptake of nutrient in to the cell. Transport of nutrients by active and passive ways. Types of Media: liquid, solid, semi-solid, synthetic, non-synthetic media, composition and functions of beef, malt, yeast extract, peptone, agar, gelatin. Specific Media: Enriched, Selective, differential, assay, maintenance, and enumeration and characterization media. Determination of nutritional requirements: Auxonography, Replica plating technique. Nutritional Classification: (i) On the basis of carbon source (ii) On the basis of energy source. (f) Concept of autotrophy.	15
3	**Microscopy:** (a) General principles, resolving power, numerical aperture, angular aperture, magnification, working distance, Aberrations. (b) Compound Microscope (Bright field microscopy)- Parts, their functions, use of oil immersion objective, ray diagram, magnification, applications and detailed comparative study of : Dark field, Phase contrast, Ultraviolet, Fluorescence, Electron-Transmission & Scanning.	15
4	**Morphology of Bacteria** Size shape and arrangement of bacteria. Cell wall structure of bacteria: structure and chemical composition of Gram positive and Gram negative bacteria. Bacterial structure: External & Internal to cell wall.	15
5	**Staining:** Dyes and stains - Definitions, auxochromes, chromophore, mordent, chromogen, leucostain. Classification of dyes and stains: Outline, Theories of staining: Physical and Chemical. Principle and method of following techniques: Simple, Differential: Gram, Acid fast, Negative: Capsule, Microchemical: storage granules, Flagella staining, Cytological: Endospore.	15
6	**Control of Microorganisms** Fundamental principles of microbial control. Physical agents of microbial control. Chemical agents of microbial control. Biological agents of microbial control. Antimicrobial agents: Classification, Characteristics, selection and evaluation of ideal antimicrobial agent.	20
	Total Hours	**90**

Learning Outcomes:-

- The student would have got fundamental knowledge of the types of microbes.

- Knowledge pertaining to identification and observation of microbes would have been gained from this course.

Teaching & Learning Methodology:-

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

Books Recommended:

- **Dubey RC & Maheshwari AA,** Text Book of Microbiology, S. Chand Publications, New Delhi.
- **Harmeet Kaur**, Encyclopedia of Microbiology, Anmol Publication, New Delhi.
- **Mani A, Selvaraj AM, Narayanan LM and Armugam N**, Microbiology, Saras Publication, New Delhi.
- **Pelczar MJ, Chan ECS, Krieg NR**, Microbiology, 5th Edition, Tata McGraw Hill Publication Co. Ltd., New Delhi.
- **Purohit SS**, Microbiology – Fundamentals and Applications, 6th Edition, Agrobios Publications, New Delhi.
- **S.K. Sawhney, Randir Singh** Eds, Introductory practical biochemistry, Narosa publishing house New Delhi.
- **Sale, A.J,** "Fundamentals Principles of Bacteriology", 7th Edition. McGraw Hill Publishing Co. Ltd., New York. 1992.
- **Stanier RY, Lingraham JL, Wheelis ML, Painter RK**, General Microbiology, 5th Edition, McMilan Press Ltd., London.
- **Tortora, Funke & Case**, Microbiology – An Introduction, 8th Edition, Pearson Education, New Delhi.
- **Wiley, J., & Sherwood, L.** Prescott, Harley, and Klein's Microbiology, 7Ed., McGraw-Hill. 2007.

E-Resources:

1. http://www.cliffsnotes.com/study_guide/A-Brief-History-of-Microbiology.topicArticleId-8524,articleId-8406.html
2. http://www.slic2.wsu.edu:82/hurlbert/micro101/pages/Chap1.html
3. http://www.austincc.edu/rohde/noteref.html
4. http://faculty.ivytech.edu/~twmurphy/txt_202/disinfect.html
5. http://www.liqwidmindz.com/LifeSciences/Microbiology.htm
6. http://www.rapidlearningcenter.com/biology/microbiology/08-Classification-of-Microorganisms.html
7. http://www.slideshare.net/MMASSY/intro-to-medical-microbiology-lecture-notes
8. http://www.bristol.ac.uk/vetscience/pathology/labprot/histstaintechs/
9. http://sunitasharma091.hubpages.com/hub/-Basics-of-Microbiology

C. U. SHAH UNIVERSITY

FACULTY OF LIFE SCIENCES

BACHELOR OF SCIENCE (MICROBIOLOGY)

DEPARTMENT OF MICROBIOLOGY

SEMESTER: I CODE: LSMB101

NAME: World of Microbes (PRACTICALS)

S.No	Experiment
1	Introduction to laboratory setup.
2	Cleaning of glass ware.
3	Sterilization principle and methods-moist heat, dry heat and filtration methods.
4	Media preparation: Liquid media, solid media, Agar deep, Agar slants, Agar plates, Basal, enriched, selective media preparation - quality control of media, growth supporting properties and sterility check of media.
5	Identification of bacteria using selective media.
6	Identification of bacteria using differential media.
7	Isolation of bacteria [Streak plate, spread plate, pour plate, serial dilution].
8	Sampling and quantification of microorganisms in air, soil and water.
9	Staining techniques: Smear preparation. Simple Staining Negative staining Differential staining. Capsule staining. Cell wall staining. Spore staining. Metachromatic granule staining. Spirochete staining.
10	Micrometry: Determination of size of Bacteria, yeast. Fungal filaments.
11	Determination of antibiotic resistance of bacteria. (Filter paper disc

method).

12 Determination of antibiotic resistance of bacteria. (Cup and well method).

13 Sterility testing.

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FACULTY OF LIFE SCIENCES

BACHELOR OF SCIENCE (MICROBIOLOGY)

DEPARTMENT OF MICROBIOLOGY

SEMESTER: I CODE: LSMB102

NAME: Microbial diversity & Taxonomy

Teaching & Evaluation Scheme:-

Subject Code	Subject name	Teaching scheme				Credit	Evaluation scheme								
		T	Tu	Pr	Total		Univ	Hrs	Sessional	Hrs	CEC	Pr Ext	Pr Int	CEC	Total
LSMB102	Microbial diversity & Taxonomy	03	0	0	03	03	70	3	20	1	10	-----	------	------	100

Objectives: -

- To study microbial taxonomy & diversity

Prerequisites:-

- Basic concept of microbiology is needed.

Course content:

Sr. No.	Course contents	Teaching Hours
1	**Introduction to microbial diversity:** Introduction to biodiversity & microbial evolution. Overview of microbial taxonomy. Classification systems.	09
2	**Molecular approaches to taxonomy:** Concept of Phylogenetic analysis, Brief study of Bergey's manual of bacteriology.	09
3	**Prokaryotic diversity:** Archaea & Eubacteria. **Gram negative bacteria:** General features of aerobic, microaerophilic motile, helical vibroid. Non motile curved bacteria, aerobic rods & cocci Facultative anaerobes-rods, curved & helical bacteria.	09

	Phototrophic bacteria **Gram positive bacteria:** General features of: Endospore forming rods & Cocci. Asporogenous rods Mycobacteria & Actinomycetes	
4	**Eukaryotic Diversity:** **Fungi:** General characteristics, Structure, reproduction and classification of major division of Fungi. Importance of fungi. **Algae:** General characteristics, Structure, reproduction and economic importance of algae. **Protozoa:** General characteristics, Structure, reproduction and economic importance of protozoa.	09
5	**Akaryotic diversity:** Virus: Definition, structure & classification. Cultivation of virus Study of plant viruses: Tobacco mosaic virus. Study of animal viruses Bacteriophage: Classification, lytic cycle & lysogenic cycle	09
	Total Hours	**45**

Learning Outcomes:-

The course provides detailed insight into the taxonomical aspect of microbes.

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Use of charts.

Books Recommended:

1. **Ananthanarayan and Paniker's** Textbook of Microbiology R. Ananthanarayan, C.K. Jayaram Panikar.
2. **Greenwood, D., & Black, R. C**. Medical Microbiology, 7Ed., Churchill Livingstone. 2007.
3. **Tortora, G. J., & Funke, B. R.** Microbiology: An Introduction, 9Ed., Benjamin Cummings. 2006.

4. **Wiley, J., & Sherwood, L.** Prescott, Harley, and Klein's Microbiology, 7Ed., McGraw-Hill. 2007.

E-Resources:

1. https://en.wikipedia.org/wiki/Molecular_phylogenetics
2. https://www.boundless.com/.../**microbial**...and.../phylogenetic-analysis
3. www.wiziq.com/tutorial/181305-**MOLECULAR-TAXONOMY**