



**SILVER OAK
UNIVERSITY**
EDUCATION TO INNOVATION

(Established under Gujarat Private Universities Act, 2009)

SEMESTER – I

Basics of Biology
Introduction and History of Microbiology
Fundamental Techniques in Microbiology
General Chemistry- I



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Subject: - Basics of Biology								
Program: B.Sc.				Subject Code:			Semester: I	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)-Theory	Continuous Internal Evaluation (CIE)-Practical	Total
04	-	4	6	24/60	20/50	16/40	-	150

THEORY

Unit 1: Life and its Origin

History of Earth, Theories of origin of life, Millers experiment, Quest for Extra-terrestrial life. Properties of Water, Carbon and Biomolecules. Evolution of Earliest life forms, Viruses, Prokaryotes, Eukaryotes, Endosymbiont Mitochondria and Chloroplast. Cell Theory, Cell differentiation, Levels of organization. Law of Natural Selection. Phylogenetic relation, Whittaker's five-kingdom classification.

Unit 2: Plant Kingdom

Plant Body: Organ system and Tissues, Stem, root, leaves. Plant Adaptation to land, Plant sensory systems. Growth: Nutritional requirements, Phytohormones, Reproductive structure, Pollination and Fertilization, Asexual reproduction. Common types of plants: *Bryophytes*, Vascular, *Gymnosperms* and *Angiosperms* plants. Outline of Kingdom *Plantae*.

Unit 3: Animal Kingdom

General characters of animal, Animal evolution, Body organization: Systems, Organs, Tissues, Coordination, Energy requirements. Primitive and advanced marine animals, Adaptation to land, Exchange with Environment, Outline of Kingdom *Animalia*.

Unit 4: The Microbial World

Bacteria: General character, Diversity, Harmful and Beneficial activities.

Eukaryotes: General character, Broad Classification and importance of Fungi, Algae and Protozoa. Viruses: Structure, Chemical composition, Replication cycle.

General characters of Prion, Viroid and Virusoid.



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PRACTICALS

1. Study of Laboratory Equipment
2. Preparation of Standard Solution, Stains and Buffers
3. Observation of microbes using Hanging-drop preparation
4. Microscopic observation of wet-mount preparation from fungi
5. Monochrome Staining of Yeasts
6. Estimation of reducing sugar by Cole's method
7. Demonstration of aerobic respiration detecting Catalase

References:

1. Elden D Enger, FC Ross and DB Bailey (2011) Concepts in Biology, (14th Ed), TMH
2. Lisa A. Urry, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, Jane B. Reece (2017) Campbell Biology (11th Ed), Pearson
3. Mary A Clark, Matthew Douglas, and Jung Choi (2018) Biology (2nd Ed) OpenStax Rice Univ, USA
4. Cowan K and KP Talaro (2009) Microbiology: A Systems Approach, (2nd Ed), McGraw-Hill
5. Purves William K, David Sadava, Gordon H. Orians, and H. Craig Heller (2006) Life: The Science of Biology, (7th Ed), Academic Internet.



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THEORY

Unit: 1 Introduction of microbiology

- Microbiology and Microorganisms
- Microbiology: A multidimensional Science
- Position of Microorganisms in living world
- Applied areas of Microbiology
- Major groups of Microorganisms

Unit: 2 Historical development of microbiology

- The discovery of microbial world and microscope
- The spontaneous generation theory
- Discovery of microbial effects on organic matter
- Discovery of the role of microbes in causation of disease
- Koch's postulates

Unit: 3 Scope of microbiology

- Medical Microbiology and Public Health Microbiology
- Immunology
- Agricultural Microbiology
- Food and dairy Microbiology
- Aero Microbiology and Exo Microbiology
- Aquatic Microbiology
- Soil Microbiology (Terrestrial Microbiology)
- Sanitary Microbiology



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- i. Geo microbiology and Petroleum Microbiology
- j. Industrial Microbiology and Microbes in some other fields

Unit: 4 Microbial diversity

- a. Physiological diversity of microorganisms
- b. Bacteria
- c. Archaea
- d. Eukaryotic microorganisms

PRACTICAL

1. Rules and safety in microbiological laboratory
2. Introduction to laboratory equipment-I (Microscope, Autoclave, Incubator, Hot Air Oven, Water Bath, Refrigerator, pH meter, Colony counter, Photoelectric Colorimeter spectrophotometer, Centrifuge, Orbital shaker)
3. Laboratory glass wares & accessories; its Cleaning, preparation & sterilization
4. Disposal of laboratory waste and cultures
5. Medium Preparation & sterilization
6. Adjustment of pH of medium
7. Microscopic examination of living and fixed microorganisms:
 - (i) Observation of hay infusion by Wet Mount Technique.
 - (ii) Observation of bacterial Motility by Hanging Drop technique
 - (iii) Observation of fixed bacterial, fungal and algae cell for introduction purpose

REFERENCES:

- **Microbiology:** Pelczar M J, Chan E C S and Kreig N R Tata Mc Grow Hill
- **A Handbook of Elementary Microbiology** Modi. H. A. (2014), Shanti Prakashan, (ISBN: 978-93-5070-1010)
- **General Microbiology:** R Y Stanier, Adelberg E A and J L Ingraham, Mac Millan Press Inc.
- **Introduction to microbiology:** Ingraham J L and Ingraham C A Thomson Brooks
- **Principles of microbiology** R M Atlas Wm C brown Publishers
- **Brock's biology of Microorganisms** Madigan M T and Martinko J M Pearson Education Inc
- **Microbiology An introduction:** Tortora G J, Funke B R and Case C L Pearson Education Inc
- **Elementary Microbiology Volume:1** Dr.H.A.Modi, Akta Prakashan
- **Alcamo's Fundamental of Microbiology** Pommerville J.C. (2014), 10th Edition, Jones & Barlett Pvt. Ltd., (ISBN: 978-0-07-462320-6)



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- **Brock Biology of Microorganisms**, Medigan M., et al., (2015), 14th Edition, Pearson education Ltd., (ISBN: 978-1-292-01831-7)
- 1 Experimental Microbiology Vol. I Rakesh J. Patel, Kiran R. Patel, Aditya Prakashan 2 Harley J.P. And Prescott. L.M. (2nd Edition). Wm.C. Brown Publishers.



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THEORY

Unit:1 Microscopy

- Principle and components and care of compound microscope
- Bright-field microscopy: Resolving power, Numerical Aperature. Magnification Limit of resolution
- Dark-field Microscopy
- Fluorescence Microscopy
- Phase-contrast Microscopy
- Electron Microscopy
 - Transmission electron Microscopy
 - Scanning electron microscopy
 - Limitation of electron microscopy

Unit:2 Dyes, Stains and Techniques

- Stains, Mordant, Intensifier and Decolourizer
- Smear Preparation and object fixation
- Principle of Staining techniques:
 - Simple staining
 - Negative staining
 - Differential staining (Gram staining and Acid-Fast staining)
 - Endospore staining
 - Capsule staining
 - Flagella staining
 - Nucleus staining
 - Metachromatic Granule staining



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Unit: 3 Sterilization and Aseptic Techniques

- a. Aseptic techniques for Working area, Culture handling, Disposal of materials
- b. Basic Laboratory sterilization techniques (Physical): Sterilization by heat: Moist heat (Steam under pressure, Fractional sterilization, Boiling water, Pasteurization), Dry heat, (Hot air sterilization, Incineration)
- c. Sterilization by radiation: Ultraviolet light, Ionizing radiation
- d. Sterilization by filtration: Membrane filters

Unit: 4 Techniques of Cultivation and Preservation of Pure Culture

- a. Cultivation in liquid media and characteristics of growth
- b. Cultivation in solid and solidified media and colony characterization
- c. Cultivation of aerobic and anaerobic bacteria
- d. Selective methods of pure culture
 - (i) Chemical methods of selection: Use of special carbon or nitrogen source, Use of dilute media, Use of inhibitor or toxic chemicals
 - (ii) Physical methods of selection: Heat treatment, Incubation temperature, pH of the medium
 - (iii) Biological methods of selection and Selection in nature
- e. Methods of Isolating Pure culture: Streak Plate, Pour plate, Spread plate, Micromanipulator
- f. Maintenance and preservation of pure culture
- g. Culture collection centres

PRACTICAL

1. Preparation of standard solutions:
 - a) Percent solutions
 - b) Part dilutions
 - c) Molar solutions
 - d) Normal solutions
 - e) Molal solutions
 - f) PPM and PPB solutions
2. Monochrome staining by Acidic and Basic dye
3. Gram staining
4. Acid fast staining
5. Observation of spirochaete by negative staining
6. Cultivation methods for bacteria: Agar slants,
7. Agar plate method (streak plate, spread plate, pour plate)



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- **Basic Practical Microbiology: A Manual:** Society for General Microbiology, 2006.
- **General Microbiology:** Stanier R Y, Ingraham J L, Wheelis M L, Painter P R. Mac Millan Press Inc.
- **Microbiology: An introduction:** Tortora G J, Funke B R and Case C L. Pearson Education Inc
- **Microbiology: Principles and Explorations:** Black J G. John Wiley & Sons, Inc.
- **Microbiology:** Willey J M, Sherwood L M, Woolverton C J. Mac Millan Press Inc.
- **Elementary Microbiology:** H. A. Modi, Akta Prakashan.
- **Principles of Microbiology:** Atlas R M. Wm. C. Brown Publishers



Subject: General Chemistry 1								
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THEORY

UNIT-I

ALKANE, ALKENE AND ALKYNE

Hydrocarbons: Physical properties of alkanes, alkene and alkynes, Common and IUPAC nomenclature of alkanes, alkenes and alkynes.

Alkanes: Preparation from alkene by hydrogenation, reduction of alkyl halide, The Grignard reagent, Corey-House reaction, Wurtz reaction. Mechanism of halogenations, Orientation of halogenations: n-butane, isopentane and n-pentane.

Alkenes: Preparation from dehydrohalogenation of alkyl halide with Mechanism, dehydration of alcohol. The E2 mechanism, Evidence: Absence of hydrogen exchange, The E1 mechanism, Evidence accompanied by rearrangement, Electrophilic addition Mechanism, Electrophilic addition rearrangement, Mechanism of addition of halogen, Halohydrin formation, Free-radical addition, Hydroxylation, Ozonolysis.

Alkynes: Preparation from dehydrohalogenation of alkyl halide, Reaction of metal acetylide with primary alkyl halides, Hydration of alkynes, Acidity of alkynes, Analysis of alkynes.

Unit – II

PERIODIC PROPERTIES

Periodic Table: Brief introduction and types of elements, shielding effect and effective nuclear charge, Factor affecting the magnitude of σ and Z_{eff} and their variation in the periodic table, Slater's rule for calculation σ and Z_{eff} .



Ionization Energy: Successive ionization energy, Factor affecting magnitude of Ionization Energy, Variation of IE values in main group element, Variation of IE values in different element groups, Ionization energies of isoelectronic species, Find out the order of second IE values of the element of second period, Difference between Ionization potential and Electrode potential of a metal.

Electron Affinity: Relation between EA of X(g) atom and IE of X-(g) ion, EA₂ represents energy required, Factor affecting the magnitude of electron affinity, Variation of electron affinity in main group elements of the periodic table, Variation of electron affinity values of different groups.

Electronegativity: Different methods used for calculating electronegativity (like Pauling, Mulliken, Allred-Rachow), Factor affecting the magnitude of electronegativity, Role of electronegativity in chemical behavior, Variation of electronegativity of the elements of different group, Variation of electronegativity in a period of s and p Block elements, Application of electronegativity.

Numericals based
on above topics.

UNIT-III

IONIC EQUILIBRIA IN AQUEOUS SOLUTIONS

Acids & Bases, Arrhenius theory of Acids and Bases, The Lowry – Bronsted Concept, Strength of Acids and Bases, The Lewis concept, pH Scale, Self-Ionization of water, Hydrolysis, Buffer Solutions, Indicator, Sparingly Soluble Salts, Common ion effect, Selective Precipitation, Numericals based on above topics.

UNIT-IV

ANALYTICAL CHEMISTRY

Introduction, Qualitative and Quantitative analysis, Instrumental and Chemical Methods of analysis, Applications of Chemical Analytical Chemistry, Sampling of Solid, Liquid and Gas, Stages of Analysis, Interferences, Selection of Methods, limitations of Analytical Methods, Classification of Errors, Accuracy and Precision, Absolute and Relative Error, Minimization of Error, Significant Figure, Rounding off, Mean, Median, Standard Deviation, , Distribution of Random Error, Reliability of Results (Q-test), Comparison of Results: Student's t-test and F-test, confidence limit (interval), Numerical based on above topics.



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Reference

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- Day, R. A. and Underwood A. L., *Quantitative Analysis* 6th Edition)
- Mahan, B.H. *University Chemistry*, 3rd Ed. Narosa.

- Morrison, R. T. & Boyd, R. N., *Organic chemistry* (6th edition).
- Cotton, F.A. & Wilkinson, G. *Basic Inorganic Chemistry*, Wiley.
- Lee J. D., *Concise Inorganic Chemistry* (4th Edition).
- Clayden, J., Greeves, N., Warren, S., *Organic Chemistry* 2nd Edition, Oxford University Press.