Paper 1-LSPT 101: BIOLOGY-I (INTRODUCTION TO BIOLOGY)

THEORY Marks: 100

Unit 1: Biological systems, evolution and biodiversity

a. Introduction to concepts of biology **(Ch 1 Campbell)**

Themes in the study of biology; A closer look at ecosystem; A closer look at cell; The process of Science; Biology and everyday life

b. Evolutionary history of biological diversity (**Ch 25 Campbell)**

Early earth and the origin of life; Major events in the history of life; Mechanism of Macroevolution; Phylogeny and the tree of life

c. Classifying the diversity of life **(Ch 25 Raven)**

Kingdoms of Life –Prokaryotes, Eukaryotes, Archaea

d. Darwinian view of life and origin of species **(Ch22, 24 Campbell)**

Darwin's theory of evolution; The evolution of populations; Concepts of species; Mechanism of speciation

e. Genetic approach to Biology **(Ch 1 Griffiths)**

Patterns of inheritance and question of biology; Variation on Mendel's Law; The molecular basis of genetic information; The flow of genetic information from DNA to RNA to protein; Genetic Variation; Methodologies used to study genes and gene activities; Developmental noise; Detecting macromolecules of genetics; Model organisms for the genetic analysis; Distinction between Phenotype and Genotype

Unit 2: Chemical context of living systems

a. Chemistry of life **(Ch 2 Campbell)**

The constituents of matter; Structure of an atom; The energy level of electron; The formation and function of molecules depend on chemical bonding between atoms; Chemical reaction make or break chemical bonds

b. Water and life **(Ch 3 Campbell)**

The water molecule is polar; Properties of water; Ionization of water

c. Carbon and life **(Ch 4 Campbell)**

Organic chemistry-the study of carbon compounds; What makes carbon special? Properties of organic compounds

d. Structure and function of biomolecules **(Ch 5 Campbell)**

Most macromolecules are Polymers; Carbohydrates act as fuel and building materials; Lipids are group of hydrophobic molecules; Protein have diverse structures and functions; Nucleic acids store and transmit hereditary information

LSPP 101: INTRODUCTION TO BIOLOGY

PRACTICALS Marks: 50

1. To learn a) use of microscope b) principles of fixation and staining.
2. Preparation of Normal, molar and standard solutions, phosphate buffers, serial dilutions
3. Use of micropipettes.
4. Separation of A) amino acids B) chloroplast pigments by paper chromatography.
5. To perform gram staining of bacteria.
6. To study the cytochemical distribution of nucleic acids and mucopolysaccharides with in cells/tissues from permanent slides.
7. To perform quantitative estimation of protein using the Lowry's method. Determine the concentration of the unknown sample using the standard curve plotted.
8. To separate and quantify sugars by thin layer chromatography.
9. To raise the culture of *E. coli* and estimate the culture density by turbidity.
   method. Draw a growth curve from the available data.
10. Isolation of genomic DNA from *E.coli*.

SUGGESTED BOOKS

1. Campbell, N.A. and Reece, J. B. (2008) Biology 8th edition, Pearson Benjamin Cummings, San Francisco.
2. Raven, P.H et al (2006) Biology 7th edition Tata McGrawHill Publications, New Delhi
3. Griffiths, A.J.F et al (2008) Introduction to Genetic Analysis, 9th edition, W.H. Freeman & Co. NY

Paper 2-ZOHT 101: BIODIVERSITY-I "NON-CHORDATA"

THEORY **Marks: 100**

General characters and outline classification of different phyla:

Unit 1. Protozoa **(Ch 2 Barnes)**

General characters and outline classification
Locomotion and reproduction in Protozoa.

Unit 2. Metazoa **(Ch 3 Barnes)**

Origin of metazoa, metamerism and coelom.

Unit 3. Phylum Porifera **(Ch 4 Barnes)**

General characters and outline classification

Structural organization of *Sycon.*

Unit 4. Phylum Cnidaria **(Ch 5 Barnes)**

General characters and outline classification

Polymorphism in Cnidarians; corals and coral reefs

Unit 5. Phylum Platyhelminthes **(Ch 7 Barnes)**

General characters and outline classification
Fasciola: life history; parasitic adaptations and evolution of parasitism

Unit 6. Phylum Aschelminthes **(Ch 9 Barnes)**

General characters and outline classification
Life history of *Ascaris* and its parasitic adaptations.

Unit 7. Phylum Annelida **(Ch 10 Barnes)**

General characters and outline classification
Adaptive radiations in Polychaeta.

Unit 8. Phylum Arthropoda **(Ch 12, 13 Barnes)**

General characters and outline classification.
Larval forms of crustacea; social life, moulting and metamorphosis in Insecta; vision in Arthropoda.

Unit 9. Affinities of **Onychophora**

Unit 10. Phylum Mollusca **(Ch 11 Barnes)**

General characters and outline classification

Torsion and detorsion; modifications of shell and foot

Unit 11. Phylum Echinodermata **(Ch 19 Barnes)**

General characters and outline classification
Water-vascular system and larval forms

ZOHP 101: BIODIVERSITY-I "NON-CHORDATA"

PRACTICALS Marks: 50

Protozoa:

1. Examination of *Amoeba*, *Euglena, Paramecium, Ceratium, Noctiluca, and Vorticella.*

Porifera:

2. Study of *Sycon* (including T.S. and L.S.). *Hyalonema,* and *Euplectella;*

3. Temporary mounts of spicules, gemmules and spongin fibres.

Cnidaria:

4. Study of*, Obelia, Sertularia, Physalia, Millepora, Aurelia, Scyphistoma and Ephyra larvae, Tubipora, Metridium* (including T.S. and L.S).

Platyhelminthes:

5. Study of *Fasciola,, Taenia,, Echinococcus;* life history and sections of *Fasciola* and *Taenia*

Aschelminthes:

6. Study of male and female *Ascaris* (including sections).

Annelida:

7. **Dissections:** digestive and nervous systems of earthworm.
8. **Temporary mounts:** Ovary, pharyngeal and septal nephridia of earthworm.
9. **Slides:** T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm.
10. **Specimens:** *Aphrodite, Heteronereis, Chaetopterus, Pheretima, Tubifex, Hirudinaria.*

Arthropoda:

11. **Dissections:** digestive and nervous systems of cockroach.
12. **Temporary mounts:** salivary glands and mouth parts of cockroach.
13. **Specimens/slides:** *Limulus*, spider, crustacean larvae, *Daphnia*, *Balanus*, *Sacculina*, *Cancer*, Eupagurus, *Scolopendra*, *Julus*, termite, louse, wasp, honeybee, silkmoth and *Peripatus*.

Mollusca:

14. **Dissections:** digestive system of *Pila*; Temporary mounts- radula and gill of *Pila*.

15. **Specimens:** *Chiton, Dentalium, Unio, Ostrea, Teredo, Loligo, Sepia, Octopus* and *Nautilus.*

Echinodermata:

16. **Slides:** T. S. arm of *Pentaceros,* Echinoderm larvae.

17. **Specimens:** *Pentaceros, Ophiura, Clypeaster, Echinu, Echinocardium, Cucumaria* and *Antedon.*

SUGGESTED BOOKS

1. Barnes, R.D. Invertebrate Zoology (1982) VI Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. & J.I., Spicer (2002) The Invertebrates: A New Synthesis. III Edition. Blackwell Science.
3. Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
4. Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students. Asia Publishing Home.
5. Bushbaum, R. (1964) Animals without Backbones. University of Chicago Press.

Paper 3-CHCT 301: CHEMISTRY-1

THEORY Marks: 100

Section A: Inorganic Chemistry **(30 Periods)**

Unit 1 : Atomic Structure: *Recapitulation of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de-Broglie's relation, Heisenberg Uncertainty principle. Need of a new approach to Atomic structure.*

What is Quantum mechanics? Time independent Schrodinger equation ($H\Psi = E\Psi$) and meaning of various terms in it. Significance of Ψ and Ψ^2, Schrodinger equation for hydrogen atom in Cartesian coordinates (x,y,z). Need of polar coordinates, transformation of Cartesian coordinates (x,y,z) into polar coordinates (r,θ,ϕ). Radial and angular parts of the hydogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals. (Only graphical representation), Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distances with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers m_r and m_s. Shapes of s, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (m_s).

Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

Unit 2: Chemical Bonding and Molecular Structure

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and salvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Lande equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Covalent bonding: *VB Approach* Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of, linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures.

Section B: Physical Chemistry **(30 Periods)**

Unit 3: Chemical Thermodynamics

What is thermodynamics? State of a system, state variables, intensive and extensive variables, concept of heat and work, thermodynamic equilibrium, thermodynamic properties, various types of systems and processes. F irst Law of thermodynamics. Calculation of work (w), heat (q), changes in internal energy (ΔU) and enthalpy (ΔH) for expansion or compression of ideal gases under isothermal and adiabatic conditions for both reversible and irreversible processes. Calculation of w, q, ΔU and ΔH for processes involving changes in physical states. Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution.

Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation.
Various statements of Second Law of thermodynamics, Carnot cycle, concept of entropy, Gibbs free energy and Helmholtz energy, Calculations of entropy change and free energy change for reversible and irreversible processe s under isothermal and adiabatic conditions. Criteria of spontaneity. Gibbs - Helmholtz equation.
Maxwell's relations.
Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

Unit 4: Ionic Equilibria

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect,
Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts.
Buffer solutions. Solubility and solubility product of sparingly soluble salts - applications of solubility product principle.
Qualitative treatment of acid base titration curves (calculation of pH at various stages of HCl –NaOH titration only). Theory of acid – base indicators.

CHCP 301: CHEMISTRY-1

PRACTICALS **Marks: 50**

Section A: Inorganic Chemistry

Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.

2. Estimation of oxalic acid by titrating it with $KMnO_4$.

3. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$.

4. Estimation of Fe(II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator.

5. Estimation of Cu(II) ions iodometrically using $Na_2S_2O_3$.

6. Estimation of (i) Mg^{2+} or (ii) Zn^{2+} by complexometric titrations using EDTA.

Section B: Physical Chemistry

(I) **Surface tension measurement** (use of organic solvents excluded)

Determination of the surface tension of a liquid or a dilute solution using a stalagmometer.

(II) **Viscosity measurement** (use of organic solvents excluded)

Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer.

(III) Kinetic studies

Study of the kinetics of the following reaction by integrated rate method: Acid hydrolysis of methyl acetate with hydrochloric acid volumetrically

SUGGESTED BOOKS

1. Barrow, G. M. *Physical Chemistry* Tata McGraw-Hill (2007).
2. Castellan, G. W. *Physical Chemistry* 4th Ed. Narosa (2004).
3. Kotz, J. C., Treichel, P. M. & Townsend, J. R. *General Chemistry* Cengage Learning India Pvt. Ltd.: New Delhi (2009).
4. Mahan, B. H. *University Chemistry* 3rd Ed. Narosa (1998).
5. J. D. Lee : *A new Concise Inorganic Chemistry*, E L. B. S.
6. F. A. Cotton & G. Wilkinson : *Basic Inorganic Chemistry*, John Wiley.
7. Douglas, McDaniel and Alexader : *Concepts and Models in Inorganic Chemistry*, John Wiley.
8. James E. Huheey, *Ellen Keiter and Richard Keiter : Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Publication.
11. Vogel's Qualitative Inorganic Analysis, A.I. Vogel , Prentice Hall ,7th Edition.
12. Vogel's Quantitative Chemical Analysis, A.I. Vogel , Prentice Hall ,6th Edition.
13. Senior Practical Physical Chemistry, B.D.Khosla, R. Chand & Co.

Paper 4/8-ENAT 101/201: TECHNICAL WRITING AND COMMUNICATION IN ENGLISH

Marks: 100

Unit 1
Communication: Language and communication, differences between speech and writing, distinct features of speech, distinct features of writing.

Unit 2
Writing Skills; Selection of topic, thesis statement, developing the thesis; introductory, developmental, transitional and concluding paragraphs, linguistic unity, coherence and cohesion, descriptive, narrative, expository and argumentative writing.

Unit 3
Technical Writing: Scientific and technical subjects; formal and informal writings; formal writings/reports, handbooks, manuals, letters, memorandum, notices, agenda, minutes; common errors to be avoided.

SUGGESTED READINGS

1. M. Frank. Writing as thinking: *A guided process approach, Englewood Cliffs,* Prentice Hall Reagents.
2. L. Hamp-Lyons and B. Heasely: Study Writing; *A course in written English.* For academic and professional purposes, Cambridge Univ. Press.
3. R. Quirk, S. Greenbaum, G. Leech and J. Svartik: *A comprehensive grammar of the English language*, Longman, London.
4. Daniel G. Riordan & Steven A. Panley: *"Technical Report Writing Today"* - Biztaantra.

Additional Reference Books

5. Daniel G. Riordan, Steven E. Pauley, Biztantra: *Technical Report Writing Today*, 8th Edition (2004).
6. *Contemporary Business Communication*, Scot Ober, Biztantra, 5th Edition (2004).

Paper 4/8-CSAT 101/201: COMPUTATIONAL SKILLS

THEORY Marks: 100

Computer Fundamentals **(12 Periods)**

Introduction to Computers: Characteristics of Computers, Uses of computers, Types and generations of Computers

Basic Computer Organization - Units of a computer, CPU, ALU, memory hierarchy, registers, I/O devices

User Interface with the Operating System, System Tools

Data Representation **(8 Periods)**

Binary representation of integers and real numbers, 1's Complement, 2's Complement, Addition and subtraction of binary numbers, BCD, ASCII, Unicode;

Networks terminology **(4 Periods)**

Types of networks, router, switch, server-client architecture

Multimedia **(4 Periods)**

Introduction, Characteristics, Elements, Applications

Problem Solving **(10 Periods)**

Notion of algorithms, stepwise methodology of developing an algorithm, developing macros in spreadsheet

General Awareness **(4 Periods)**

IT Act, System Security (virus/firewall etc.) ***I-Tax, Reservations,Banking***

CSAP 101/201: COMPUTATIONAL SKILLS

PRACTICALS Marks: 50

1. Defined projects will be done by the students and evaluated by the instructor.
2. Document Preparation
3. Presentation Software
4. Familiarizing with the Operating System, Control Panel, Networking Configuration, Firewall setting
5. Spreadsheet Handing, Working with worksheets, Creating a spreadsheet, entering and formatting information, basic functions and formulas, creating charts, tables and graphs.

SUGGESTED BOOKS

[1] V Rajaraman, **Fundamentals of Computers,** Fourth Edition, PHI.

[2] Anita Goel, **Fundamentals of Computers;** Forthcoming title in Pearson-Education

Note: Use of Open Office/Star Office is recommended, as they are freely downloadable.

Reference manual for Open Office available at: http://www.openffice.org

Reference manual for Star Office available at: http://www.sun.com/software/staroffice/