Zoology Course 3.02

CELL BIOLOGY AND INSTRUMENTATION

3 CREDITS

Objectives

- To study various cell organelles.
- To understand the importance of water and buffers.
- To get a basic knowledge of the working and application of various instruments used in biological studies.

UNIT I: CELL BIOLOGY (15 Lectures)

- **Plasma membrane**: Structure, composition and functions, fluid mosaic model, membrane fluidity, permeability, membrane transport- passive diffusion, facilitated transport , active transport, exocytosis and endocytosis.
- **Endoplasmic Reticulum:** Structure, types and functions of ER
- **Golgi complex:** Structure and functions.
- **Lysosome** : Primary and secondary lysosomes. Structure and functions.
- **Mitochondria:** Structure and functions.
- **Nucleus and Nucleolus:** Structure of nucleus and nucleolus, types of chromatin, Polytene and Lampbrush chromosomes.

UNIT II: WATER, pH, BUFFERS (15 Lectures)

- **Chemical bonds:** Covalent bonds - Single, Coordinate, Multiple, Polar and Nonpolar , Peptide, Disulphide and Glycosidic bonds.
- **Non covalent bonds:** Ionic or Electrostatic, Hydrogen bonds, Hydrophobic interactions, Van der Waal's interactions.

- **Water:** Molecular structure of water, Tetrahedral geometry , Hydrogen bond, and flickering, clusters, macromolecular association.
- **Physical and chemical properties of water:** Density, Specific heat, Heat of Vaporization, Heat of Fusion, Surface tension, Hydrogen bond with solutes, interaction with nonpolar compounds, Water as a reactant and interaction with charged solutes.
- **Ionization of Water:** K_w ion product of water, pH, pH scale, Dissociation of weak acid and weak base, pKa , Henderson Hasselbalch equation.
- **Titration curve of weak acid.**
- **Buffers of biological systems**.

UNIT III: INSTRUMENTATION / TOOLS AND TECHNIQUES OF BIOLOGY

(15 lectures)

- Principle and uses of some common instruments: Autoclave, Centrifuge, Balance.
- Principle and working of pH meter
- Principle, working and applications of Spectrophotometer and colorimeter: Beer-Lambert's law and selection of filters.
- Chromatography:- Principle and applications- i) Paper ii) Thin Layer iii) Ion exchange iv) Gas v) Adsorption
- Electrophoresis: - Principle and applications - Agarose and SDS-Polyacrylamide
- Principles of different types of microscopes: a) Simple b) Compound c) Phase contrast d) Electron e) Fluorescence f) Confocal.

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