

ZOOL. 101: STRUCTURE AND FUNCTION OF INVERTEBRATES

UNIT I

1. Organization of coelom: Acoelomates, Pseudocoelomates and coelomates
2. Protostomia and Dueterostomia
3. Locomotion: Flagellar and cilliary movement in Protozoa
4. Hydrostatic movement in Coelenterata, Annelida and Echinodermata

UNIT II

5. Patterns of feeding and digestion in lower Metazoa
6. Filter feeding in Polychaeta, Mollusca and Echinodermata
7. Organs of respiration: Gills, lungs and trachea
8. Respiratory pigments and their functions
9. Mechanism of respiration and transport of

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10. Organs of excretion: Coelom, coelomoducts, nephridia and Malpighian tubules
11. Mechanism of excretion in invertebrates
12. Primitive Nervous system of Coelenterates and Echinoderms
13. Advanced Nervous system of Annelida, Arthropoda (Crustacea and Insecta) and Mollusca (Cephalopoda)

UNIT IV

14. Trends in neural evolution
15. Larval forms of crustacean, mollusca and echinodermata
16. Larval forms of invertebrate parasites
17. Strategies and evolutionary significance of larval forms

UNIT V

18. Organization and general characters of Rotifera
19. Organization and general characters of Acanthocephala
20. Organization and general characters of Ectoprocta
21. Organization and general characters of Endoprocta Barnes, R.D. *Invertebrate Zoology*, 3rd edition. W.B. Saunders Co., Philadelphia.
- Barrington, E.J.W. *Invertebrate Structure and Function*. Thomas Nelson and Sons Ltd., London.
22. Sedgwick, A.A. *Student Text Book of Zoo*
23. Organization and general characters of Phoronida

Suggested Readings:

- Hyman, L.H. *The Invertebrates. Vol - I Protozoa through Ctenophora*. McGraw Hill Co., New York.
- Hyman, L.H. *The Invertebrates. Vol. - II*. McGraw Hill Co., New York.
- Hyman, L.H. *The Invertebrates. Vol. - VIII*. McGraw Hill Co., New York and London. *logy. Vol. I, II and III*. Central Book Depot, Allahabad.
- Parker, T.J., Haswell, W.A. *Text Book of Zoology*. Macmillan.Co., London.

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**ZOOL. 102: BIostatISTICS, BIOinformatics & RESEARCH
METHODOLOGY**

UNIT I

1. The mean, mode, median, Standard deviation and Standard error of classified Data
2. Distribution : Normal, Binomial and Poisson
3. Hypothesis testing: Chi Square test, f -Test
4. Student's t test

UNIT II

5. Analysis of variance(one way and two way ANOVA)
6. Correlation & Regression
7. Sampling: Methods & significance
8. Tabulation & Presentation of data

UNIT III

9. Computers and their applications in biology
10. Operating systems: DOS, WINDOWS
11. Application softwares: MS Word, MS Access, MS Excel, MS Power Point
12. Internet and its uses

UNIT IV

13. Bioinformatics: Definition, history and scope
14. Analysis of DNA and protein sequences; molecular and genomic databases (e.g., GENEBANK, SWISS-PROT and other databases)
15. Introductory ideas on use of databases for sequence retrieval, similarity search and sequence alignment.
16. Bioinformatics in drug discovery

UNIT V

17. Research: Definition and meaning of research problem
18. Research design
19. Research methodology
20. Interpretation of research outcome and writing report

Suggested Readings:

- Batschelet, E. **Introduction to Mathematics for Life Scientists**. Springer-Verlag, Berlin. Jorgenson, S.E. **Fundamentals of Ecological Modelling**. Elsevier, New York.
- Swartzman, G. and S.P.O. Kaluzny. **Ecological Simulation Primer**. Macmillan, New York. Lendren, D. **Modelling in Behavioral Ecology**. Chapman and Hall, London, UK.
- Sokal, R.R. and F.J. Rohlf. **Biometry**. Freeman, San Francisco.
- Snedecor, G.W. and W.G. Cochran. **Statistical Methods**. Affiliated East-West Press, New Delhi (Indian Ed.)
- Green, R.H. **Sampling, Design and Statistical Methods for Environmental Biologists**. John Wiley & Sons, New York.
- Murray, J.D. **Mathematical Biology**. Springer-Verlag, Berlin.
- Pielou, E.C. **The Interpretation of Ecological Data: A Primer on Classification and Ordination**. De Sapiro, **Calculus for Biologists**.
- Rubinov, S.I. **Introduction to Mathematical Biology**.
- Saxena, V.P. 'Jaiv Ganit Ek Parichaya' (M.P. Hindi Granth Academy).

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- Brown, S.M. **Bioinformatics- A Biologists Guide to Biocomputing and Internet**. Eaton Publishing, New York, 2000.
- Lesk, A.M. **Introduction to Bioinformatics**. Oxford, 2002.
- Bioinformatics - Methods and Protocols. In: Methods in Molecular Biology**. Vol.132, Humana press, 2001
- Higgins & Taylor. **Bioinformatics - Sequence, Structure and Databanks**. Oxford, 2000. Baxevanis and Ouellette. **Bioinformatics**. John Wiley & Sons, 1998.
- Swindell. **Internet for the Molecular Biologists III**. Horizon Scientific, 1996.
- Peruski & Peruski. **The Internet and New Biology**. ASM, 1997.
- Gibson, G. & S.V. Muse. **A Primer of Genome Science**. Sinauer Associates Inc. Publishers, 2002. Krane and Raymer. **Fundamental Concept of Bioinformatics**. Pearson Education, 2003.
- Awesthead, Parish and Twyman. **Instant Notes: Bioinformatics**. Viva Book Pvt. Ltd., 2003.
- Attwood and Parry-Smith. **Introduction to Bioinformatics**. Pearson Education, 2003.
- Kothari C. R., **Research Methodology: Methods & Techniques**. New Age Publ., New Delhi, 2012
- Rastogi S. C. et. al., **Bioinformatics, Methods & Applications**. PHI Learning Pvt. Ltd., New Delhi

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ZOOL. 103: CELLULAR AND MOLECULAR BIOLOGY

UNIT I

1. Biomembranes: Structure of Membrane (Fluid mosaic model), Molecular composition of the membrane, functional significance
2. Transport across cell membranes: Simple diffusion and osmosis, facilitated diffusion (Transporters, uniports and antiports carriers, symports, Ion channels), Active transport, Membrane pumps, Bulk transport (Endocytosis and Exocytosis)
3. Cytoskeleton: Microfilaments: structure dynamics and functions, Intermediate filaments: structure, dynamics and functions, Microtubules: structure, dynamics and functions
4. intracellular transport: Axonal transport, Transport of pigment in melanophores: Role of kinesin and dynein

UNIT II

5. Cell - cell adhesion and cell junctions: Collagen and Non-collagen components of extracellular matrix of animal cells, Fibronectins and Integrins, Cell adhesion proteins & their types.
6. Cell junctions (occluding, Anchoring & Gap junctions)
7. Signal transduction mechanisms: Basic concept
8. Apoptosis: Basic concept

UNIT III

9. Neurons: General organization of neurons, Classification of neurons
10. Glia: Structure & Types of glia, Functions of glia
11. Synapses: Ultrastructure of a synapse, Types of synapses, Synaptic transmission: Electrical & chemical, Functions of nerve fibers
12. Muscle contraction: Excitation - contraction coupling and Sarcoplasmic reticulum

UNIT IV

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13. Genome organization: Molecular organization of Gene & Chromosomal organization of Gene
14. Organelle genome: Structure and functions of Mitochondrial genome
15. Gene mutation: Induced and spontaneous mutations
16. DNA damage and repair: Types of DNA damage, Basic pathway of DNA Repair

UNIT V

17. Gene regulation in prokaryotes: DNA binding motifs, Lac operon, Tryptophan operon
18. Sex determination in *Drosophila*: Chromosomal & Molecular basis
19. Sex determination in mammals: Primary and Secondary sex determination
20. Basic concepts of Dosage compensation in *Drosophila* and mammals

Suggested Readings:

- Alberts et al. **Essential Cell Biology**. Garland Publishing Inc., New York, 1998.
- Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson. **Molecular Biology of the Cell**. B. Garland Publishing Inc., New York, 2001.
- Boney. **Cell Biology Level II**. Macdonald & Evans, 1982.
- Darnell, J., H. Lodish and D. Baltimore. **Molecular Cell Biology**. Scientific American Book, Inc., USA
- De Robertis & De Robertis. **Cell and Molecular Biology**. Lea & Febiger
- Gilbert. **Developmental Biology**. Sinauer, 2000.
- Karp. **Cell and Molecular Biology**. John Willey & Sons, New York, 1996.
- Lodish et al. **Molecular Cell Biology**. Freeman & Co., 2000.
- Tobin and Morcel. **Asking about Cells**. Saunders, 1997.

ZOOL. 104: TOOLS AND TECHNIQUES FOR BIOLOGY

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UNIT I

1. Microscopy, principle & applications of light microscope, phase contrast microscope and Fluorescence microscope
2. General principle and applications of Electron microscope (TEM & SEM)
3. Principle and applications of Confocal microscopy
4. Cryotechniques: Cryopreservation of cells, tissues, organs and organisms Freeze fracture & freeze drying

UNIT II

5. Principles and applications of photometry; Beer & Lambert's law, Absorption spectrum & absorption maxima
6. Colorimeter & spectrophotometer: Working principle and applications
7. Flame photometer: Working principle and applications
8. Atomic absorption spectrophotometer: Working principle and applications

UNIT III

9. Separation techniques: Chromatography, principle, types and applications
10. Electrophoresis, principle, types & applications, PAGE and agarose gel electrophoresis
11. Radioisotopes in biology: Units of radioactivity, Radioactive counters



