

ZOS404: TOOLS AND TECHNIQUES IN BIOLOGY

Teaching Hours 10/Unit

COURSE OUTCOME

1. Here students are taught to deal with different tools and techniques applicable in biological research including various types of microscopes, centrifuges, electrophoresis, chromatography etc.
2. The theory session mainly focuses on understanding the principles and working mechanisms of different instruments.
3. Learning of microbiological techniques, media preparation and sterilization.
4. Fermentation methods to study product yield.
5. To get acquainted with Cytological and histological techniques
6. Develop skills of advanced instrumentation.
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UNIT I

Microscopy, principle & applications. Light microscope and phase contrast microscope, Fluorescence microscope, Electron microscope, Confocal microscopy. General principle and applications of Colorimeter, Spectrophotometer, Ultra centrifuge, Flame photometer, Beer and Lamberts law. Microbiological techniques, Media preparation and sterilization, Inoculation and growth monitoring, Microbial assays - Microbial identification (cytological staining methods for bacterial and fungal strains). Use of fermenters.

UNIT II

Computer aided techniques for data presentation data analysis and statistical techniques. Cryotechniques: Cryopreservation of cells, tissues, organs and organisms. Cryosurgery, Cryotomy, Freeze fracture and freeze drying. Separation techniques. Chromatography, principle type and applicants, Electrophoresis, Principles, types and applications PAGE and agarose gel electrophoresis. Organelle separation by centrifugation.

UNIT III

Radioisotope and their biological applications. Sample preparation for radioactive counting of biological samples and Autoradiography. Immunological techniques: Immunodiffusion (Single & Double) and immunoelectrophoresis. Techniques immunodetection: Immunocyto / histochemistry, immunoblotting, immunodetection, immunofluorescence. Surgical techniques: Organ ablation (eg. Ovariectomy, adrenalectomy), Perfusion techniques, Stereotaxy, Indwelling catheters, Biosensors.

UNIT IV

Histological techniques: Principles of tissue fixation, Microtomy, Staining, Mounting and Histochemistry. Cell culture techniques: Design and functioning of tissue culture laboratory, Culture media, essential components and Preparation. Cell viability testing.

UNIT V

Cytological techniques: mitotic and meiotic chromosome preparations from insects and vertebrates. Chromosome banding techniques (G-C-Q-R. banding), Flow cytometry. Molecular cytological techniques- In situ hybridization (radio labelled and non-radio labelled methods), FISH, Restriction banding. Molecular biology techniques: Southern hybridization, Northern hybridization, DNA Sequencing- Polymerase chain reaction (PCR)

REFERENCES

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2. Boyer, R.F. (1993) Modern Experimental Biochemistry, 2nd edition, Benjamin-Cummings.
3. Clark, J.M. and Swizer R.L. (2000) Experimental Biochemistry, 3rd edition, W.H. Freeman & Co Ltd.
4. Cooper, G.M. (1997) The Cell-A Molecular Approach. ASM press.
5. Freifelder, D.M. (1982) Physical Biochemistry, W.H. Freeman and Co.
6. Masters, J. R.W. (2000) Animal Cell culture- A practical approach. 3 edition, OUP Oxford.
7. Locquin, M. and Langeron M. (1983) Handbook of Microscopy, Butterworths – Heinemann.
8. Wilson, K. and Goulding K.H. (1986) A biologist Guide to principles and Techniques of Practical Biochemistry London.
9. Wilson, K. and Walker J. (2000) Practical Biochemistry, 5th edition, Cambridge University Press.