

University of Pune

Department of Chemistry

Syllabus for M.Phil. / Ph.D. course in Biochemistry

(to be implemented from academic year 2010 – 11)

Course Structure

Course I : Research methodology 100 marks (05 credits)

Course II : Advances in Biochemistry 200 marks (10 credits)

Course III : Seminar, Field work & Review Writing 100 marks (05 credits)

University of Pune**Department of Chemistry****Syllabus for M.Phil. / Ph.D. course in Biochemistry to be implemented from academic year 2010 - 11****Course I : Research methodology 100 marks (05 credits)**

Fundamental Laboratory Techniques : Basic principles, Health and safety, working with liquids, Basic laboratory procedures I, Basic laboratory procedures II, Principles of solution chemistry, pH and buffer solutions (Ref. 1. Chapters 1 to 7 : pages 03 to 62)

The investigative approach : Making and recording measurements, SI units and their use, Scientific method and design of experiments, Project work (Ref. 1. Chapters 8 to 11 : pages 65 to 83)

Analysis and presentation data : Using graphs, Presenting data in tables, Hints for solving numerical problems, Descriptive statistics, choosing and using statistical tests, drawing chemical structures, chemometrics, computational chemistry (Ref. 1. Chapters 37 to 44 : pages 251 to 295)

Information technology and library resources : The Internet and World Wide Web, internet resources for chemistry, using spreadsheets, word processors, databases and other packages, finding and citing information (Ref. 1. Chapters 45 to 49 : pages 299 to 321)

Communicating information : General aspects of scientific writing, writing essays, reporting practical and project work, writing literature surveys and reviews, organizing a poster display, giving an oral presentation examinations (Ref. 1. Chapters 50 to 56 : pages 325 to 354)

Chemical safety and Disaster Management :

1. Emergency response : chemical spills, radiation spills, biohazard spills, leaking compressed gas cylinders, fires, medical emergency accident reporting

2. General safety : General safety and operational rules, safety equipments, personal protective equipments, compressed gas safety, safety practices for disposal of broken glass wares, centrifuge safety, treated biomedical wastes and scientific ethics.

Research problem : meaning of research problems, sources of research problems, criteria / characteristics of a good research problem, errors in selecting a research problem.

Hypothesis : Meaning, types of hypothesis.

Developing a Research Proposal : Format of research proposal, individual research proposal and institutional proposal.

Research Report : Format of the research report, style of writing the report, references and bibliography.

Books :

1. Practical Skills in Chemistry, J. R. Dean, A. M. Jones, D. Holmes, R. Reed, J. Weyers and A Jones, Pearson Education Ltd. [Prentice Hall] (2002)
2. OSU safety Manual 1.01.
3. Research Methodology. Methods and Techniques : Kothari, C. R.
4. Tests, Measurements and Research Methods in Behavioural Sciences : Singh, A. K.

Course II

Advances in Biochemistry

[10 Credits]

Unit A] (Note: Student can opt for any 5 topics from the following) 5 Credits

1. Microbial taxonomy: Approaches for identification up to species level (Principles and methods)
2. Advances in protein techniques (purification and characteristics)
3. Molecular diagnostic techniques for genetic disorders
4. Bioremediation: Microbial and phytoremediation.
5. Effluent analysis: Sample collection, storage, physico-chemical and biological methods of analysis.
6. Industrial enzymes: Amylase, protease, laccase, lipases.
7. Nanobiotechnology: Concept and applications
8. Secondary metabolites: Natural products, isolation, purification, characterization and applications (alkaloid, tannins, flavonoids)

Unit B] (Note: Student can opt for any 5 topics from the following) 5 Credits

1. Nutraceuticals: Concept, types, sources, production and application.
2. Plant transformation methods including tissue culture, non tissue culture based, Agrobacterium mediated co-cultivation, plant vectors, particle bombardment.
3. Proteomics including recognition, sequencing, identification, differential analysis, identity, fading etc.
4. Plant pathogens/ microbe/ insect interactions, plant defense proteins such as AI, PI, lectins, defensins, abiotic stress tolerance in plants.
5. Biotransformation reactions.
6. Signal transduction: Nerve cell structure, Synaptic transmission at nerve muscle and central synapse, secondary messengers mediated synaptic transmission.
7. Bioinformatics and database (protein and nucleotide)
8. Fermentation technology and Down stream processing

Reference:

1. Fundamentals of enzymology- Price and Stevens
2. Physical Biochemistry- Frifelder
3. Microbiology- Pelczar
4. Microbiology- Brock
5. Molecular Biology and Cell- Bruce Alberts
6. Principles and Techniques of Biochemistry- Wilson and Walker
7. Principles of neural sciences- Kandal, Schwartz
8. Principles of Toxicology- Casarett and Doull
9. Plant cell tissue and organ culture- Gambaz Phillips
10. Nutrition and Food processing- Miller
11. Principles of fermentation technology- Stanbary and Whitaker
12. Related Research and Review articles can also be referred.

Course III : Seminar, Field work & Review Writing* 100 marks (05 credits)

1. **Seminar** : Seminar to be delivered on a relevant theme (**01 credits**)
2. **Field Work** : Visit to industry/National institutes and interaction with experts. (Report to be submitted) (**01 credits**)
3. **Review** : Preparation and submission of review article based on research papers addressing a contemporary research problem. (**02 credits**)
4. **Other activities** : Attending National / International workshop / Symposium / Conferences or participation for oral / poster presentation or interaction with M.Sc. students for problem solving approaches / Work of Nobel laureates in last ten years in Science. (**01 credits**)

* Above topics shall be prepared in consultation with research guide
