

Faculty of Medicine



JSS Academy of Higher Education & Research

(Deemed to be University)

Accredited "A" Grade by NAAC

Sri Shivarathreshwara Nagar, Mysuru – 570 015

Regulation & Syllabus

Post Graduate Degree Programs
BIOCHEMISTRY 2016

MD

Regulation & Syllabus

MD BIOCHEMISTRY

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REGULATION AND SYLLABUS FOR POST GRADUATE DEGREE PROGRAMS 2016

MD BIOCHEMISTRY



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CHAPTER I

REGULATION FOR POST GRADUATE DEGREE AND DIPLOMA COURSES

1. Branch of study

Post graduate degree courses

Doctor of Medicine

- a) Anaesthesiology
- b) Anatomy
- c) Biochemistry
- d) Community medicine
- e) Dermatology, venereology and leprosy
- f) Emergency medicine
- g) Forensic medicine
- h) General medicine
- i) Hospital administration
- j) Microbiology
- k) Pathology
- l) Paediatrics
- m) Pharmacology
- n) Physiology
- o) Psychiatry
- p) Tuberculosis and Respiratory Medicine
- q) Radio Diagnosis

Master of Surgery

- a) General surgery
- b) Obstetrics and gynaecology
- c) Ophthalmology
- d) Orthopaedics
- e) Otorhinolaryngology

Post graduate diploma courses

- a) Anaesthesiology (DA)
- b) Child Health (DCH)
- c) Clinical Pathology (DCP)
- d) Dermatology, Venereology & Leprosy (DDVL)
- e) Medical Radio Diagnosis (DMRD)
- f) Obstetrics & Gynaecology (DGO)
- g) Ophthalmology (DO)
- h) Orthopaedics (D Ortho)
- i) Otolaryngology (DLO)
- j) Psychiatric Medicine (DPM)

2. Eligibility for admission

MD / MS Degree and Diploma courses: A candidate who has passed final year MBBS examination after pursuing a study in a medical college recognized by the Medical Council of India and has completed one year compulsory rotating internship in a teaching institution or other institution recognized by the Medical Council of India, and has obtained permanent registration of any State Medical Council, shall be eligible for admission.

3. Admission

A candidate desirous of admission to Post Graduate Medical Programmes MD/ MS / PG Diploma Courses is required to complete the application form and submit to the Deemed to be University along with prescribed documents on or before the scheduled date. Eligibility criteria, application form and details of documents to be submitted are available in the Deemed to be University website: www.jssuni.edu.in.

4. Registration

A candidate who has been admitted to postgraduate course shall register in the Deemed to be University within a month of admission after paying the registration fee.

5. Intake of students

The intake of students to each course shall be in accordance with the MCI.

6. Duration of study

MD, MS Degree Courses: The course of study shall be 3 completed years including the period of examination.

Provided that in case of students having a recognized 2 years postgraduate diploma course in the same subject, the period of training including the period of examination shall be 2 years.

Diploma courses: The course of study shall be 2 completed years including the examination period.

7. Methodology of training

The training of postgraduate for degree/diploma shall be residency pattern, with graded responsibilities in the management and treatment of patients entrusted to his/her care. The participation of the students in all facets of educational process is essential. Every candidate should take part in seminars, group discussions, grand rounds, case demonstration, clinics, journal review meetings, CPC and clinical meetings. Every candidate shall participate in the teaching and training programme of undergraduate students. Training should include involvement in laboratory and experimental work, and research studies. Basic medical sciences students should be posted to allied and relevant clinical departments or institutions. Similarly, clinical subjects' students should be posted to basic medical sciences and allied specialty departments or institutions.

8. Attendance, progress and conduct

A candidate pursuing degree/diploma course, shall work in the concerned department of the institution for the full period as full time student. No candidate is permitted to run a clinic/laboratory/nursing home while studying postgraduate course, nor can he/she work in a nursing home or other hospitals/

clinic/laboratory while studying postgraduate course.

Each year shall be taken as a unit for the purpose of calculating attendance.

Every student shall attend symposia, seminars, conferences, journal review meetings, grand rounds, CPC, case presentation, clinics and lectures during each year as prescribed by the department and not absent himself / herself from work without valid reasons.

Every candidate is required to attend a minimum of 80% of the training during each academic year of the post graduate course. Provided, further, leave of any kind shall not be counted as part of academic term without prejudice to minimum 80% attendance of training period every year.

Any student who fails to complete the course in the manner stated above shall not be permitted to appear for the Deemed to be University Examinations.

9. Monitoring progress of study

Work diary / Log Book: Every candidate shall maintain a work diary and record his/her participation in the training programmes conducted by the department such as journal reviews, seminars, etc. Special mention shall be made of the presentations by the candidate as well as details of clinical or laboratory procedures, if any, conducted by the candidate. The work diary shall be scrutinized and certified by the Head of the Department and Head of the Institution, and presented in the Deemed to be University practical/clinical examination.

Periodic tests: In case of degree courses of three years duration (MD/MS), the concerned departments shall conduct three tests, two of them be annual tests, one at the end of first year and the other at the end of the second year. The third test shall be held three months before the final examination. The tests shall include written papers, practical / clinical and viva voce. Records and marks obtained in such tests shall be maintained by the Head of the Department and sent to the Deemed to be University, when called for.

In case of diploma courses of two years duration, the concerned departments shall conduct two tests, one of them at the end of first year and the other in the second year, three months before the final examination. The tests shall include written papers, practical / clinical and viva voce.

Records: Records and marks obtained in tests shall be maintained by the Head of the Department and shall be made available to the Deemed to be University or MCI.

10. Dissertation

Every candidate pursuing MD/MS degree course is required to carry out work on a selected research project under the guidance of a recognised post graduate teacher. The results of such a work shall be submitted in the form of a dissertation.

The dissertation is aimed to train a postgraduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, and comparison of results and drawing conclusions.

Every candidate shall submit to the Controller of Examinations of the Deemed to be University in the prescribed proforma, a synopsis containing particulars of proposed dissertation work within six months from the date of commencement of the course, on or before the dates notified by the Deemed to be University. The synopsis shall be sent through proper channel.

Such synopsis will be reviewed and the dissertation topic will be registered by the Deemed to be University. No change in the dissertation topic or guide shall be made without prior approval of the Deemed to be University.

The dissertation should be written under the following headings:

- a) Introduction
- b) Aims or Objectives of study
- c) Review of Literature
- d) Material and Methods
- e) Results
- f) Discussion
- g) Conclusion
- h) Summary
- i) References
- j) Tables
- k) Annexure
- l) Proof of Paper presentation and publication

The written text of dissertation shall be not less than 50 pages and shall not exceed 150 pages excluding references, tables, questionnaires and other annexure. It should be neatly typed in double line spacing on one side of paper (A4 size, 8.27" x 11.69") and bound properly. Spiral binding should be avoided. The dissertation shall be certified by the guide, head of the department and head of the Institution.

Four copies of dissertation thus prepared shall be submitted to the Controller of Examinations, six months before final examination, on or before the dates notified by the Deemed to be University.

The dissertation shall be valued by examiners appointed by the Deemed to be University. Approval of dissertation work is an essential precondition for a candidate to appear in the Deemed to be University examination.

Guide: The academic qualification and teaching experience required for recognition as a guide for dissertation work is as per MCI Minimum Qualifications for Teachers in Postgraduate Medical Education Regulations, 2000. Teachers in a medical college/institution having a total of eight years teaching experience out of which at least five years teaching experience as Assistant Professor gained after obtaining post graduate degree shall be recognised as post graduate teachers.

Co Guide: A Co-guide may be included provided the work requires substantial contribution from a sister department or from another medical institution recognised for teaching/training by JSS Deemed to be University / Medical Council of India.

Change of guide: In the event of a registered guide leaving the college for any reason or in the event of death of guide, guide may be changed with prior permission from the Deemed to be University.

A postgraduate student is required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.

11. Schedule of examination

The examination for MD / MS courses shall be held at the end of three academic years (six academic terms). The examination for the diploma courses shall be held at the end of two academic years.

For students who have already passed Post Graduate Diploma and appearing for MD examination, the examination shall be conducted after two academic years including submission of dissertation. The Deemed to be University shall conduct two examinations in a year at an interval of four to six months between the two examinations. Not more than two examinations shall be conducted in an academic year.

12. Scheme of examination

MD/MS

Dissertation: Every candidate shall carry out work and submit a dissertation as indicated in Sl. No. 10. Acceptance of dissertation shall be a precondition for the candidate to appear for the final examination.

Written Examination (Theory): A written examination shall consist of four question papers, each of three hours duration. Each paper shall carry 100 marks. Out of the four papers, the 1st paper in clinical subjects will be on applied aspects of basic medical sciences. Recent advances may be asked in any or all the papers. In basic medical subjects and para-clinical subjects, questions on applied clinical aspects shall also be asked.

Pattern of Theory Examination Question Paper:

Each paper shall consist of two long essay questions each carrying 20 marks, 3 short essay questions each carrying 10 marks and 6 short answer questions each carrying 5 marks. Total marks for each paper shall be 100.

Practical/Clinical Examination: In case of Practical examination for the subjects in Basic Medical Sciences Practical Examination shall be conducted to test the knowledge and competence of the candidates for making valid and relevant observations based on the experimental/Laboratory studies and his ability to perform such studies as are relevant to his subject.

Clinical examination for the subjects in Clinical Sciences shall be conducted to test the knowledge and competence of the candidates for undertaking independent work as a specialist/Teacher, for which candidates shall examine a minimum one long case and two short cases.

The total marks for Practical / clinical examination shall be 200.

Viva Voce: Viva Voce shall be thorough and shall aim at assessing the candidate knowledge and competence about the subject, investigative procedures, therapeutic technique and other aspects of the speciality, which form a part of the examination.

The total marks shall be 100 and the distribution of marks shall be as under:

- | | | |
|-----|---|----|
| i) | For examination of all components of syllabus | 80 |
| ii) | For Pedagogy | 20 |

If there is skills evaluation, 10 marks shall be reserved for Pedagogy and 10 marks for skill evaluation.

Examiners. There shall be at least four examiners in each subject. Out of

them, two shall be external examiners and two shall be internal examiners. The qualification and teaching experience for appointment as an examiner shall be as laid down by the Medical Council of India.

Criteria for declaring as pass in Deemed to be University Examination:

A candidate shall pass theory and practical including clinical and viva-voce examination separately and shall obtain 40% marks in each theory paper and not less than 50% marks cumulatively in all the four papers for post graduate degree examination to be declared as pass.

A candidate obtaining less than 40% marks in any paper and obtaining less than 50% of marks cumulatively in all the four papers for postgraduate degree examination shall be declared to have failed in the examination. Failed candidate may appear in any subsequent examination upon payment of fresh fee to the Controller of Examinations.

Declaration of class: A successful candidate passing the Deemed to be University examination in first attempt and secures grand total aggregate 75% of marks or more will be declared to have passed the examination with distinction, 65% but below 75% declared as First Class and 50% but below 65% declared as Second Class.

A candidate passing the Deemed to be University examination in more than one attempt shall be declared as Pass Class irrespective of the percentage of marks.

Post Graduate Diploma Examinations

Diploma examination in any subject shall consist of theory (written papers), Practical / Clinical and Viva - Voce.

Theory: There shall be three written question papers each carrying 100 marks. Each paper will be of three hours duration. In clinical subjects one paper out of this shall be on basic medical sciences. In basic medical subjects and Para-clinical subjects, questions on applied clinical aspects shall also be asked.

Pattern of Theory Examination Question Paper:

Each paper shall consist of two long essay questions each carrying 20 marks, 3 short essay questions each carrying 10 marks and 6 short answer questions each carrying 5 marks. Total marks for each paper shall be 100.

Practical Clinical Examination: In case of practical examination it shall be aimed at assessing competence, skills related to laboratory procedures as well as testing students ability to make relevant and valid observations, interpretation of laboratory or experimental work relevant to his/her subject.

In case of clinical examination, it shall aim at examining clinical skills and competence of candidates for undertaking independent work as a specialist. Each candidate shall examine at least one long case and two short cases.

The maximum marks for Practical / Clinical shall be 150.

Viva Voce Examination: Viva Voce examination shall be thorough and shall aim at assessing the candidate's knowledge and competence about the subject, investigative procedures, therapeutic technique and other aspects of the speciality, which shall form a part of the examination. The total marks shall be 50.

Examiners. There shall be at least four examiners in each subject. Out of

them, two shall be external examiners and two shall be internal examiners. The qualification and teaching experience for appointment as an examiner shall be as laid down by the Medical Council of India.

Criteria for declaring as pass in Deemed to be University Examination:

A candidate shall pass theory and practical including clinical and viva-voce examination separately and shall obtain 40% marks in each theory paper and not less than 50% marks cumulatively in all the three papers for post graduate diploma examination to be declared as pass.

A candidate obtaining less than 40% marks in any paper and obtaining less than 50% of marks cumulatively in all the three papers for post graduate diploma examination shall be declared to have failed in the examination. Failed candidate may appear in any subsequent examination upon payment of fresh fee to the Controller of Examinations.

Declaration of class: A successful candidate passing the Deemed to be University examination in first attempt and secures grand total aggregate 75% of marks or more will be declared to have passed the examination with distinction, 65% but below 75% declared as First Class and 50% but below 65% declared as Second Class.

A candidate passing the Deemed to be University examination in more than one attempt shall be declared as Pass Class irrespective of the percentage of marks.

13. Number of candidates per day

The maximum number of candidates to be examined in Clinical/ practical and Oral on any day shall not exceed eight for M.D./M.S. degree, eight for diploma.

CHAPTER II

GOALS AND GENERAL OBJECTIVES OF POSTGRADUATE MEDICAL EDUCATION PROGRAM

GOAL

The goal of postgraduate medical education shall be to produce competent specialists and/or medical teachers:

1. Who shall recognize the health needs of the community and carry out professional obligations ethically and in keeping with the objectives of the national health policy.
2. Who shall have mastered most of the competencies, pertaining to the specialty, that are required to be practiced at the secondary and the tertiary levels of the health care delivery system.
3. Who shall be aware of the contemporary advance and developments in the discipline concerned.
4. Who shall have acquired a spirit of scientific inquiry and is oriented to the principles of research methodology and epidemiology and
5. Who shall have acquired the basic skills in teaching of the medical and paramedical professionals.

GENERAL OBJECTIVES

At the end of the postgraduate training in the discipline concerned the student shall be able to:

1. Recognize the importance to the concerned speciality in the context of the health needs of the community and the national priorities in the health section.
2. Practice the specialist concerned ethically and in step with the principles of primary health care.
3. Demonstrate sufficient understanding of the basic sciences relevant to the concerned specialty.
4. Identify social, economic, environmental, biological and emotional determinants of health in a given case, and take them into account while planning therapeutic, rehabilitative, preventive and primitive measure/strategies.
5. Diagnose and manage majority of the conditions in the speciality concerned on the basis of clinical assessment, and appropriately selected and conducted investigations.
6. Plan and advice measures for the prevention and rehabilitation of patients suffering from disease and disability related to the specialty.
7. Demonstrate skills in documentation of individual case details as well as morbidity and mortality rate relevant to the assigned situation.
8. Demonstrate empathy and humane approach towards patients and their families and exhibit interpersonal behavior in accordance with the societal norms and expectations.
9. Play the assigned role in the implementation of national health programme, effectively and responsibly.

10. Organize and supervise the chosen/assigned health care services demonstrating adequate managerial skills in the clinic/hospital or the field situation.
11. Develop skills as a self-directed learner, recognize continuing education needs; select and use appropriate learning resources.
12. Demonstrate competence in basic concepts of research methodology and epidemiology, and be able to critically analyze relevant published research literature.
13. Develop skills in using educational methods and techniques as applicable to the teaching of medical/nursing students, general physicians and paramedical health workers.
14. Function as an effective leader of a health team engaged in health care, research or training.

STATEMENT OF THE COMPETENCIES: Keeping in view the general objectives of postgraduate training, each discipline shall aim at development of specific competencies which shall be defined and spelt out in clear terms. Each department shall produce a statement and bring it to the notice of the trainees in the beginning of the programme so that he or she can direct the efforts towards the attainment of these competencies.

COMPONENTS OF THE POSTGRADUATE CURRICULUM:

The major components of the Postgraduate curriculum shall be:

- Theoretical knowledge
- Practical and clinical skills
- Dissertation skills.
- Attitudes including communication skills.
- Training in Research Methodology, Medical Ethics and Medicolegal aspects.

(Source: Medical Council of India, Regulations on Postgraduate Medical Education, 2000)

CHAPTER III

Monitoring Learning Progress

It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only helps teachers to evaluate students, but also students to evaluate themselves. The monitoring shall be done by the staff of the department based on participation of students in various teaching / learning activities. It may be structured and assessment be done using checklists that assess various aspects. Model checklists are given in this chapter which may be copied and used.

The learning outcomes to be assessed should include:

1. Personal Attitudes.
2. Acquisition of Knowledge.
3. Clinical and operative skills and
4. Teaching skills.

1. Personal Attitudes: The essential items are:

- a) Caring attitude.
- b) Initiative.
- c) Organisational ability.
- d) Potential to cope with stressful situations and undertake responsibility.
- e) Trustworthiness and reliability.
- f) To understand and communicate intelligibly with patients and others.
- g) To behave in a manner that establishes professional relationships with patients and colleagues.
- h) Ability to work in a team.
- i) A critical enquiring approach to the acquisition of knowledge.

The methods used mainly consist of observation. It is appreciated that these items require a degree of subjective assessment by the guide, supervisors and peers.

2. Acquisition of Knowledge: The methods used comprise of 'Log Book' which records participation in various teaching / learning activities by the students. The number of activities attended and the number in which presentations are made are to be recorded. The log book should periodically be validated by the supervisors. Some of the activities are listed. The list is not complete. Institutions may include additional activities, if so, desired.

- a) **Journal Review Meeting (Journal Club).** The ability to do literature search, in depth study, presentation skills, and use of audio- visual aids are to be assessed. The assessment is made by faculty members and peers attending the meeting using a checklist (see Model Checklist – I, Chapter III)
- b) **Seminars / Symposia.** The topics should be assigned to the student well in advance to facilitate in depth study. The ability to do literature search, in depth study, presentation skills and use of audio- visual aids are to be assessed using a checklist (see Model Checklist-II, Chapter III)

- c) **Clinico-pathological conferences.** This should be a multidisciplinary study of an interesting case to train the candidate to solve diagnostic and therapeutic problems by using an analytical approach. The presenter(s) are to be assessed using a check list similar to that used for seminar.
- d) **Medical Audit.** Periodic morbidity and mortality meeting shall be held. Attendance and participation in these must be insisted upon. This may not be included in assessment.

3. Clinical skills:

- a. **Day to Day work:** Skills in outpatient and ward work should be assessed periodically. The assessment should include the candidates' sincerity and punctuality, analytical ability and communication skills (see Model Checklist III, Chapter III).
 - b. **Clinical meetings:** Candidates should periodically present cases to his peers and faculty members. This should be assessed using a check list (see Model checklist IV, Chapter III).
 - c. **Clinical and Procedural skills:** The candidate should be given graded responsibility to enable learning by apprenticeship. The performance is assessed by the guide by direct observation. Particulars are recorded by the student in the log book. (Table No.3, Chapter III).
4. **Teaching skills:** Candidates should be encouraged to teach undergraduate medical students and paramedical students, if any. This performance should be based on assessment by the faculty members of the department and from feedback from the undergraduate students (See Model checklist V, Chapter III).
5. **Periodic tests:** In case of degree courses of three years duration, the department may conduct three tests, two of them be annual tests, one at the end of first year and the other in the second year. The third test may be held three months before the final examination. In case of diploma courses of two year duration, the departments may conduct two tests. One of them at the end of first year and the other in the second year, three months before the final examination. The tests may include written papers, practical / clinical and viva voce.
6. **Work diary:** Every candidate shall maintain a work diary and record his/her participation in the training programmes conducted by the department such as journal reviews, seminars, etc. Special mention may be made of the presentations by the candidate as well as details of clinical or laboratory procedures, if any conducted by the candidate.
7. **Records:** Records, log books and marks obtained in tests will be maintained by the Head of the Department and will be made available to the Deemed to be University or MCI.
8. **Log book:** The log book is a record of the important activities of the candidates during his training. Internal assessment should be based on the evaluation of the log book. Collectively, log books are a tool for the evaluation of the training programme of the institution by external agencies. The record includes academic activities as well as the presentations and procedures carried out by the candidate. Format for the log book for the different activities is given in Tables 1, 2 and 3 of Chapter III. Copies may be made and used by the institutions.

Procedure for defaulters: Every department should have a committee to review such situations. The defaulting candidate is counseled by the guide and head of the department. In extreme cases of default the departmental committee may recommend that defaulting candidate be withheld from appearing the examination, if she/he fails to fulfill the requirements in spite of being given adequate chances to set him or herself right.

Format of Model Check Lists

Check List-I

MODEL CHECK-LIST FOR EVALUATION OF JOURNAL REVIEW PRESENTATIONS

Name of the Student:

Name of the Faculty/Observer:

Date:

Sl No	Items for observation during presentation	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Article chosen was					
2.	Extent of understanding of scope & objectives of the paper by the candidate					
3.	Whether cross references have been consulted					
4.	Whether other relevant publications consulted					
5.	Ability to respond to questions on the paper / subject					
6.	Audio-visual aids used					
7.	Ability to defend the paper					
8.	Clarity of presentation					
9.	Any other observation					
	Total Score					

Check List – II

MODEL CHECK-LIST FOR EVALUATION OF SEMINAR PRESENTATIONS

Name of the Student:

Name of the Faculty/Observer:

Date:

Sl No	Items for observation during presentation	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Whether other relevant publications consulted					
2.	Whether cross references have been consulted					
3.	Completeness of Preparation					
4.	Clarity of Presentation					
5.	Understanding of subject					
6.	Ability to answer questions					
7.	Time scheduling					
8.	Appropriate use of Audio-Visual aids					
9.	Overall Performance					
10.	Any other observation					
	Total Score					

Check List - III

MODEL CHECK LIST FOR EVALUATION OF CLINICAL WORK IN WARD / OPD

(To be completed once a month by respective Unit Heads,
including posting in other departments)

Name of the Student:

Name of the Faculty/Observer:

Date:

SI No	Points to be considered	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Regularity of attendance					
2.	Punctuality					
3.	Interaction with colleagues and supportive staff					
4.	Maintenance of case records					
5.	Presentation of cases during rounds					
6.	Investigations work up					
7.	Beside manners					
8.	Rapport with patients					
9.	Counseling patient's relatives for blood donation or Postmortem and Case follow up.					
10.	Overall quality of ward work					
	Total Score					

Check List - IV
EVALUATION FORM FOR CLINICAL PRESENTATION

Name of the Student:

Name of the Faculty:

Date:

Sl No	Points to be considered	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Completeness of history					
2.	Whether all relevant points elicited					
3.	Clarity of Presentation					
4.	Logical order					
5.	Mentioned all positive and negative points of importance					
6.	Accuracy of general physical examination					
7.	Whether all physical signs elicited correctly					
8.	Whether any major signs missed or misinterpreted					
9.	Diagnosis: Whether it follows logically from history and findings					
10.	Investigations required <ul style="list-style-type: none"> • Complete list • Relevant order • Interpretation of investigations 					
11.	Ability to react to questioning Whether it follows logically from history and findings					
12.	Ability to defend diagnosis					
13.	Ability to justify differential diagnosis					
14.	Others					
	Total Score					

Check List - V

MODEL CHECK LIST FOR EVALUATION OF TEACHING SKILL PRACTICE

SI No		Strong Point	Weak Point
1.	Communication of the purpose of the talk		
2.	Evokes audience interest in the subject		
3.	The introduction		
4.	The sequence of ideas		
5.	The use of practical examples and/or illustrations		
6.	Speaking style (enjoyable, monotonous, etc., specify)		
7.	Attempts audience participation		
8.	Summary of the main points at the end		
9.	Asks questions		
10.	Answers questions asked by the audience		
11.	Rapport of speaker with his audience		
12.	Effectiveness of the talk		
13.	Uses AV aids appropriately		

Check List - VI

MODEL CHECK LIST FOR DISSERTATION PRESENTATION

Name of the Student:

Name of the Faculty:

Date:

Sl No	Points to be considered divine	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Interest shown in selecting a topic					
2.	Appropriate review of literature					
3.	Discussion with guide & other faculty					
4.	Quality of Protocol					
5.	Preparation of proforma					
	Total Score					

Check List - VII

**CONTINUOUS EVALUATION OF DISSERTATION WORK
BY GUIDE / CO GUIDE**

Name of the Student:

Name of the Faculty:

Date:

Sl No	Items for observation during presentations	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Periodic consultation with guide/co-guide					
2.	Regular collection of case Material					
3.	Depth of analysis / discussion					
4.	Departmental presentation of findings					
5.	Quality of final output					
6.	Others					
	Total Score					

LOG BOOK

Table 3: Diagnostic and Operative procedures performed

Name:

Admission year:

College:

Date	Name	ID No.	Procedure	Category O, A, PA, PI*

*** Key:**

O - Washed up and observed

A - Assisted a more senior Surgeon

PA - Performed procedure under the direct supervision of a senior Surgeon
PI - Performed independently

Model Overall Assessment Sheet

SI No	Faculty Member & Others	Name of Student and Mean Score*																		
		A	B	C	D	E	F	G	H	I	J									
1.	Journal Review Presentations																			
2.	Seminars																			
3.	Clinical work in wards																			
4.	Clinical presentation																			
5.	Teaching skill practice																			
	Total Score																			

Note: Use separate sheet for each year.

Signature of HOD

Signature of Principal

The above overall assessment sheet used along with the logbook should form the basis for certifying satisfactory completion of course of study, in addition to the attendance requirement.

* KEY:

Mean score : Is the sum of all the scores of checklists 1 to 7.
A, B, Name of the trainees.

Chapter IV

Medical Ethics Sensitisation and Practice

Introduction

There is now a shift from the traditional individual patient- doctor relationship and medical care. With the advances in science and technology and the needs of patients, their families and the community, there is an increased concern with the health of society. There is a shift to greater accountability to the society. Doctors and health professionals are confronted with many ethical problems. It is, therefore necessary to be prepared to deal with these problems. To accomplish the Goal and General Objective stated in Chapter II and develop human values it is urged that ethical sensitisation be achieved by lectures or discussion on ethical issues, clinical discussion of cases with an important ethical component and by including ethical aspects in discussion in all case presentation, bedside rounds and academic postgraduate programmes.

Course Contents

1. Introduction to Medical Ethics

- What is Ethics?
- What are values and norms?
- Relationship between being ethical and human fulfillment.
- How to form a value system in one's personal and professional life.
- Heteronomous Ethics and Autonomous Ethics.
- Freedom and personal Responsibility.

2. Definition of Medical Ethics

- Difference between medical ethics and bio-ethics
- Major Principles of Medical Ethics
 - Beneficence = fraternity
 - Justice = equality
 - Self determination (autonomy) = liberty

3. Perspective of Medical Ethics

- The Hippocratic Oath.
- The Declaration of Helsinki.
- The WHO Declaration of Geneva.
- International code of Medical Ethics. (1993)
- Medical Council of India Code of Ethics.

4. Ethics of the Individual

- The patient as a person.
- The Right to be respected.
- Truth and Confidentiality.
- The autonomy of decision.
- The concept of disease, health and healing.
- The Right to health.
- Ethics of Behaviour modification.
- The Physician – Patient relationship.
- Organ donation.

5. The Ethics of Human life

- What is human life?
- Criteria for distinguishing the human and the non-human.

- Reasons for respecting human life.
- The beginning of human life.
- Conception, contraception.
- Abortion.
- Prenatal sex-determination.
- In vitro fertilization (IVF).
- Artificial Insemination by Husband (AIH).
- Artificial Insemination by Donor (AID).
- Surrogate motherhood.
- Semen Intra-fallopian Transfer (SIFT).
- Gamete Intra-fallopian Transfer (GIFT).
- Zygote Intra-fallopian Transfer (ZIFT).
- Genetic Engineering.

6. The Family and Society in Medical Ethics

- The Ethics of human sexuality.
- Family Planning perspectives.
- Prolongation of life.
- Advanced life directives – The Living Will
- Euthanasia
- Cancer and Terminal Care

7. Profession Ethics

- Code of conduct.
- Contract and confidentiality.
- Charging of fees, Fee-splitting.
- Prescription of drugs.
- Over-investigating the patient.
- Low – Cost drugs, vitamins and tonics.
- Allocation of resources in health care.
- Malpractice and Negligence.

8. Research Ethics

- Animal and experimental research / humaneness.
- Human experimentation.
- Human volunteer research — Informed Consent Drug trials.

9. Ethical workshop of cases

- Gathering all scientific factors.
- Gathering all human factors.
- Gathering all value factors.
- Identifying areas of value — conflict, setting of priorities
- Working out criteria towards decisions.

Recommended Reading

1. Francis C.M., Medical Ethics, 1 Ed, 1993, Jaypee Brothers, New Delhi.
2. Good Clinical Practices:GOI Guidelines for clinical trials on Pharmaceutical Products in India (www.cdsco.nic.in)
3. INSA Guidelines for care and use of Animals in Research – 2000.
4. CPCSEA Guidelines 2001 (www.cpcsea.org.)
5. Ethical Guidelines for Biomedical Research on Human Subjects, 2000, ICMR, New Delhi.
6. ICMR Guidelines on animal use 2001, ICMR, New Delhi.

CHAPTER V - SYLLABUS

M D BIOCHEMISTRY

I. Goal

The postgraduate course MD in Biochemistry should enable the student to acquire an in-depth knowledge of the fundamental principles of the subject of biochemistry, so that the candidate can apply this knowledge, for understanding the basis of health and disease.

At the end of the course the student should have gained knowledge and expertise so that he/she is equipped to pursue a career in one or more of the following facets of biochemistry i.e., teaching, diagnostic work and research.

II. Objectives

At the end of the course the MD student should have gained knowledge in the following key areas of the subject:

1. The chemical and three dimensional structures of the various classes of biomolecules such as carbohydrates, proteins, lipids and nucleic acids as a prelude to understanding the correlation between structure and function.
2. An in-depth insight into the metabolic pathways of the major classes of biomolecules, regulatory mechanisms, interactions, significance and alterations in disease states.
3. Mechanism of energy release, conservation, utilization and derangements thereof.
4. Role of micro and macro nutrients such as vitamins and minerals in health and the pathophysiology of nutritional disorders.
5. Mechanism involved in the storage, transmission and expression of genetic information.
6. Biochemical techniques and methodology used to assess health and aid in the diagnosis and prognosis of diseases.
7. Develop skill in performing and interpreting data generated by advanced biochemical techniques such as electrophoresis, chromatography, enzyme assays, organ function tests, etc.

III. Course outcomes

After completing the course the postgraduate should be able to :

1. Demonstrate comprehensive understanding of biochemistry as well as applied aspects.
2. Educate medical & paramedical professionals.
3. Operate basic instrumentation and procedures pertaining to biochemistry that are required to be practiced in community and at all levels of health care system.
4. Perform relevant investigations which will help to diagnose important medical conditions.
5. Interpret all laboratory reports.
6. Perform independent research.
7. To train scientists to identify, address and solve biochemical problems at molecular level.

Theory

Paper–I: Bioorganic chemistry, biophysical chemistry and biochemical techniques.

1. Proteins: Functional roles of proteins in humans. Charge and chemical properties of amino acids and proteins. Amino acid sequence determination, structure of proteins in detail (primary, secondary, tertiary and quaternary). Structure of insulin, collagen, hemoglobin and myoglobin. Methods of study of structure of proteins and different levels of structural organization. Method of determination of molecular weight in proteins. Biologically important peptides, conjugated proteins, lipoproteins and glycoproteins, structure of immunoglobulins.
2. Carbohydrates: Biological importance of carbohydrates, chemistry, structure and properties of monosaccharides, disaccharides and polysaccharides. Structure and functions of heteropolysaccharides.
3. Lipids: Biological importance of lipids. Chemistry and structure of simple, compound and derived lipids. Chemistry of steroids.
4. Nucleic acids: Biological importance of nucleic acids. Structure of nucleic acids and biologically important nucleotides. Methods of study of base sequence of DNA. Structure and functions of gene with respect to mammalian genome, recombinant DNA technology. General principles of blotting techniques. PCR and its application in medicine. Principle, procedure and application of RFLP, Transgenic animals and knock out animals
5. Biophysical Chemistry
 - a. pH, buffers, Henderson – Hassel Balch equation, principles and procedures of determination of pH, pO_2 , pCO_2 (blood gas analysis).
 - b. Isotopes – detection and measurement of stable and radioactive isotopes; their application in biochemistry.
 - c. Bioenergetics – free energy change, high-energy linkages, redox potentials.
6. Biochemical Techniques
 - a. Chromatography: Principles and applications of paper, thin layer, ion exchange, gas phase and affinity chromatography, HPLC, gel filtration and its applications.
 - b. Electrophoresis: Principles, procedure and applications of paper, agarose gel, polyacrylamide, capillary, immuno-electrophoresis. Isoelectric focusing.
 - c. Photometry and spectrophotometer: principle and applications.
 - d. Flame photometry: principle and applications.
 - e. Ultra-centrifugation techniques: Their applications in the study of lipoproteins.
 - f. Radio immuno assay: competitive binding assay – Principles procedure and applications. Elisa – Principles and applications.
 - g. Ion selective electrodes: Their applications in medicine.
 - h. Cell fractionation: Isolation and purification of sub cellular particles, biochemical markers of different subcellular organelles.

- i. Atomic absorption spectroscopy
- j. Osmometry, Nephelometry, Chemiluminescence, Blood gas analyzer
- k. Basics of mass spectrometry and nuclear magnetic resonance
- l. Recent advances in medical laboratory technology and instrumentation: semi auto analyser, auto analyzer, PCR etc.

Paper–II: Intermediary Metabolism and Biochemical Genetics

1. Introduction to intermediary metabolism, various methods of study of intermediary metabolism with examples. Their advantages and disadvantages.
2. Biological oxidation – structure of mitochondria, its role in biological oxidation, electron transport chain, mechanisms of electron transport and oxidative phosphorylation. Regulation of oxidative phosphorylation.
3. Carbohydrate metabolism: A detailed discussion of the metabolic pathways as it occurs in humans and its disorders.
4. Amino acid metabolism: A detailed study of metabolism of the amino acids in humans and its disorders.
5. Lipid metabolism: Fatty acids – oxidation of saturated and unsaturated fatty acids, bio-synthesis of fatty acids and triacylglycerols. Biosynthesis and degradation of phospholipids. Role of phospholipids, biosynthesis and metabolism of cholesterol. Plasma lipoproteins, role of adipose tissue and liver in fat metabolism. Hyper and hypolipoproteinemias.
6. Integration of metabolic pathways of carbohydrate, protein and lipid. Regulation of metabolic pathways.
7. Biosynthesis and catabolism of purine and pyrimidine, nucleotides. Disorders of purine and pyrimidine metabolism
8. Genetics and Molecular Biology, DNA replication, DNA transcription and post transcriptional Modifications, Genetic Code, Translation and post translation modifications. Regulation of gene expression, PCR, recombinant DNA technology, Blotting techniques, RFLP, Genetic engineering, cell cycle, DNA damage and repair mechanism
9. Human genome project, gene therapy, antisense therapy
10. Fluorescent in situ hybridization, karyotyping, fetal lung maturity testing, Nucleic acid hybridization, DNA probes, microarray of gene probes
11. Bioinformatics & Biostatistics

Paper–III: Enzymes, Nutrition and Specialized Tissues

1. Enzymes

- a. Classification, kinetics, specificity.
- b. Isoenzymes and coenzymes.
- c. Enzyme inhibition – competitive, non-competitive, uncompetitive and allosteric, mechanism and application. Enzyme poisons.
- d. Active site of enzyme. Methods of locating the functional groups of active sites. Mechanism of enzyme action in detail. Enzyme regulations. Mechanism of specific enzymes.
- e. Immobilized enzymes – application.
- f. Factors affecting enzyme catalyzed reactions, Michaelis – Menten

constant, Lineweaver – Burk plot, Edey-Hofstee plot.

g. Modification and supplementation of dietary requirements in Health and Disease.

2. Nutrition:

- a. Detailed account of chemistry and biochemical roles of fat soluble and water-soluble vitamins, requirements, source and deficiency symptoms. Antivitamins.
- b. Detailed account of metabolism of the micronutrients.
- c. Energy metabolism – BMR, RQ. Energy requirement at different stages, balanced diet. Diet planning in health and disease, SDA of foods.
- d. Protein, carbohydrates and fat requirements, RDA, biological value of proteins. Protein energy malnutrition.
- e. Malabsorption syndromes, parenteral nutrition.
- f. Modification and supplementation of dietary requirements in health and disease.
- g. Diet formulation in health and disease: pregnancy and lactation, diabetes, obesity, coronary artery disease, chronic kidney disease, cancer, hypertension, anemia, rickets, osteomalacia, mixed diet, food toxins and additives

3. Specialized tissues:

- i) Muscle tissue – composition, mechanism of muscle contraction.
- ii) Nerve tissue – composition, transmission of nerve impulse, neurotransmitters.
- iii) Erythrocytes – composition and metabolism, blood clotting, other blood cells. Phagocytosis.
- iv) Connective tissue – composition, chemistry of collagen, elastin and other fibrous proteins.
- v) Adipose tissue including brown adipose tissue metabolism.
- vi) Bone and teeth – composition, osteocalcin.
- vii) Composition of lens – biochemical changes during cataractogenesis.
- viii) Structure of bio membranes, transport across membranes.

Paper – IV Clinical Biochemistry

- Basic concepts in laboratory investigations. Quality control.
- Diagnostic enzymology – an exhaustive account.
- Inborn errors of metabolism involving amino acids, carbohydrates, lipids, purines, pyrimidines and porphyrin metabolism, mucopolysaccharidoses.
- Diabetes mellitus: recent concepts.
- Plasma lipoproteins in health and disease.
- Liver function tests, jaundice, hepatic coma.
- Kidney function tests.
- Pancreatic function tests.
- Gastric function tests.
- Endocrines – A detailed account of the mechanism of action, chemistry and regulatory role of hormones secreted by pituitary, pancreas, adrenal, thyroid, parathyroid and gonads. Endocrine disorders. Methods of assay

and clinical interpretations.

- Abnormal hemoglobins, anaemias, thalassemia.
- Basic immunology, immune system. T & B Lymphocytes, antigen presenting cells, humoral immunity lymphokines. Immune regulation. Monoclonal antibodies, application of immunological techniques, oncogenes, biochemical tests for cancer.
- Disorders of calcium and phosphorus metabolism.
- Water and electrolyte balance, acid base balance – their disturbances.
- Biochemical aspects of cancer. Tumour markers.
- Composition of CSF, alterations in disease.
- Laboratory investigations in myocardial infarction.
- Biochemistry of aging
- Diseases of circulatory system, hematopoietic – coagulation pathway, fibrin degradation products, D-Dimer
- Diseases of heart & kidney, principles of peritoneal and hemodialysis
- Point of care testing.

Practical

Part I – General Biochemistry

1. Estimation of amino acids by ninhydrin method.
2. Estimation of protein by Folin's method.
3. Estimation of protein by dye-binding method.
4. Titration of amino acids – formol titration and pK values.
5. Amino acid – paper chromatography, TLC. Two dimensional paper chromatography
6. Gross separation of proteins – precipitation by salts.
7. Absorption spectra of phenylalanine, tyrosine, tryptophan (UV).
8. Ion exchange chromatography of amino acids.
9. Paper electrophoresis.
10. Separation of mono and disaccharides by paper chromatography.
11. Estimation of DNA – diphenylamine method.
12. Absorption spectra of bases of nucleic acids.
13. Estimation of vitamin C.
14. Estimation of vitamin A.
15. Estimation of vitamin E.
16. Assay of trypsin, chymotrypsin.
17. Enzyme inhibitions.
18. Effect of pH, temperature on enzyme activity: Determination of K_m , V_{max} .
19. PAGE electrophoresis. Molecular weight determination.
20. Gel chromatography. Molecular weight determination.
21. Immunodiffusion.
22. Affinity chromatography
23. Analysis of Abnormal urine
24. Stone Analysis
25. Isolation of DNA from Mammalian Tissue using Phenol chloroform method & Kit Method
26. Estimation of DNA Content by UV-Visible spectrophotometry & Determination of Purity of DNA
27. Design of Primers using manual procedures as well as primer 3 software
28. DNA amplification using PCR
29. ELISA

30. Estimation of Antioxidant activity using a) FRAP- ferric reducing antioxidant power
31. b) DPPH- 2,2 Diphenyl-1-picryl hydrazyl method.

Part – II: Clinical Biochemistry

1. Estimation of plasma glucose – glucose oxidase method and o – toluidine method.
2. Plasma urea – urease method.
3. Plasma uric acid – uricase method.
4. Serum creatinine – Jaffe’s kinetic and end-point methods.
5. Cholesterol/HDL cholesterol by enzymatic method.
6. Albumin / globulin ratio.
7. Serum calcium.
8. electrolytes estimation.
9. Serum bilirubin – direct and total.
10. Alkaline & acid phosphatases.
11. AST, ALT; UV kinetic methods and assay of gamma GT.
12. LDH isoenzymes, CPK isoenzymes.
13. Serum amylase – Somogyi amylolytic method
14. Iron profile.
15. Agar gel electrophoresis of serum proteins, hemoglobin.
16. Lipoproteins – electrophoresis.
17. ketosteroids in urine.
18. Fertility Profile.
19. Creatinine clearance.
20. Plasma Cl, HCO₃, pH, PO₂, PCO₂, blood gas analysis
21. CSF analysis.

IV. Practical Training in Biochemistry: (First half of Ist year)

1. Introduction to research methodology and bio statistics. Every post-graduate student should be given an introductory course in research methodology and research techniques. He / she must be taught as to how a research project can be planned and implemented. He / she must also acquire a basic knowledge in the statistical methods and their applications.
2. The postgraduate student will be posted in departments of:

a)	Medicine	2Months
b)	Paediatrics	30 days
c)	Nephrology	15 days
c)	Gastroenterology	15 days
d)	Obstetrics & Gynaec	15 days
e)	Cardiology	15 days

The student has to attend the clinical postings in the forenoon from 09.00 am to 12.00 noon and return back to the department of biochemistry, to do the experimental work in the afternoon. They shall not be posted for any duties in the clinical departments.

Every post graduate student shall be posted for six months to the clinical bio-

chemistry laboratory of the department where clinical investigations of the attached hospital are done, from 9.00 AM to 1.00 pm every day on all days, including holidays, in the 2nd year and 3rd year. The post graduate students may also be posted at the clinical biochemistry laboratory for night duties during the 2nd and 3rd academic year.

Skills to be acquired during the clinical/laboratory postings

Clinical postings: During posting in clinical departments, the student should acquire relevant knowledge and skills. These generally include:

1. Taking the history, Clinical examination of a patient and presenting the case.
2. Investigations to be carried and their relevance.
3. Drawing of blood, collection of urine and / or other relevant specimens of investigations and their storage.
4. Biopsy techniques and handling of biopsy material to be sent for relevant tests / investigations.
5. Interpretation of laboratory data, X-ray and biopsy results.

Clinical biochemistry laboratory posting:

Student should be trained in collection of samples, carrying out investigations, interpretation, reporting of the results, maintenance of records of investigations and quality assurance, including quality control.

Practical – Observation book and Practical record:

Post graduate student should maintain an observation book, practical record for general & clinical biochemistry, separately of all practical carried out during the course. The practical exercises shall be carried out under the supervision of the assigned teaching staff (assistant professor and above) and get them approved after the completion of each exercise. At the end of the 3rd year, the practical records have to be submitted to the Head of the Department for certification. The observation book and the practical records, along with the log books and diary are to be presented compulsorily, to the examiners at the Deemed to be University examination.

VI. Seminars, Journal Clubs

Students of biochemistry are expected to actively participate in the departmental seminars and journal clubs. A record should be maintained for each student and the list of seminars and paper presented in journal club by each student should be presented at the time of Deemed to be University examination. The journal club and the subject seminars shall be held on alternate weeks.

Post graduate students should participate in undergraduate teaching, in theory, practical and tutorials.

Each of the above activities are to be assessed as per the annexures.

VII. Dissertation – Synopsis & Dissertation

The synopsis of the dissertation should be submitted within 6 months from the date of commencement of course. Every student should submit a dissertation on

a selected research problem involving laboratory investigations. The dissertation has to be prepared by the student, in consultation with the allotted guide and submitted to the Deemed to be University 6 months prior to the final examination, as notified by the Deemed to be University.

VIII. Periodical Assessment

Every student should be assessed. For assessment, participation in seminars, journal clubs, standardization of analytical techniques and involvement in clinical laboratory investigations should be taken into consideration. The periodic internal assessment shall be conducted once a year as follows:

Ist Internal assessment (at the end of twelve months).

IInd Internal assessment (at the end of twenty four months).

IIIrd Internal assessment (at the end thirty two months).

LOG BOOK: The log book is a record of the important activities of the candidates during his training; internal assessment should be based on the evaluation of the log book. Collectively, log books are a tool for the evaluation of the training programme of the institution by external agencies. The record includes academic activities as well as the presentations and procedures carried out by the candidate.

Format for the log book for the different activities is provided. Copies may be made and used by the institutions.

Procedure for defaulters: Every department should have a committee to review such situations. The defaulting candidate is counseled by the guide and head of the department. In extreme cases of default the departmental committee may recommend that defaulting candidate be withheld from appearing the examination, if she/he fails to fulfill the requirements in spite of being given adequate chances to set himself or herself right

LOG BOOK EVALUATION

At the end of first year, second year and 3 months before final examination, the logbook will be evaluated considering the following parameters:

1. Skills and procedures learned independently.
2. Presentations in journal clubs
3. Cases presented in clinical meetings
4. Presentation in departmental seminars
5. Intra and interdepartmental training and evaluation details
6. Teaching activities
7. Conferences/workshops/CME attended
8. Papers presented/published conferences
9. Side lab procedures done
10. Thesis progress and evaluation detail

IX Scheme of Examination

- a. **Theory** – There shall be four papers of 100 marks each. Each paper shall be of three hours duration. Each paper shall have two long essay questions of 20 marks (20 x 2 = 40), three short essay of 10 marks (10 x 3 = 30)

and six short answer questions of 5 marks (5 x 6 = 30).

The distribution of topics/chapters for the papers will be as under*:

Paper – I- Bio-organic chemistry, biophysical chemistry and biochemical techniques.

Paper – II- Intermediary metabolism and biochemical genetics.

Paper – III- Enzymes, nutrition and specialized tissues.

Paper – IV- Clinical biochemistry.

*** The topics assigned to the different papers are given as general guidelines. A strict division of subjects may not be possible. Some overlapping of topics is inevitable. Students should be prepared to answer the overlapping topics.**

Questions on recent advances may be asked in any or all papers

WEIGHTAGE OF MARKS IN EACH PAPER

Paper I

Topic	Weightage
Bio-organic chemistry	30%
Biophysical chemistry	20%
Biochemical technique	50%

Paper II

Carbohydrate metabolism	20%
Amino acid metabolism	20%
Lipid metabolism	20%
Biological oxidation Integration of metabolic pathways	05%
Nucleotide Metabolism	10%
M Molecular Biology	20%
Bi Bioinformatics & Biostatistics	05%

Paper III

Enzyme	40%
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Nutrition	40%
Specialised tissue	20%

Paper IV

Basic concepts in laboratory investigations. Quality control.	10%
Inborn errors of metabolism	10%
Diabetes mellitus Plasma lipoproteins in health and disease.	20%
Organ function test Diagnostic enzymology	10%
Endocrines	20%
Abnormal hemoglobins, anaemias, thalassemia	10%
Basic immunology	05%
Minerals, Water and electrolyte balance, acid base balance – their disturbances.	10%
Biochemical aspects of cancer, aging Diseases of circulatory system Diseases of heart & kidney, principles of peritoneal and hemodialysis, point of care testing	05%

B. Practical Examination: 200 marks

Duration: Two days

Part – I - Clinical examination of a patient and listing of relevant investigations in clinical biochemistry.

Part – II - Laboratory procedures in general biochemistry.

The assignment of work under part I and part II should begin on first day and the candidate is expected to complete the work by forenoon on second day, so that viva voce and pedagogy examinations are held on the second day afternoon

Part I – Clinical Examination & Clinical Chemistry Experiments

Each candidate is expected to take the history, perform clinical examination, list the laboratory investigations and present the case to the examiners. The examiners would select two or three laboratory investigations, which the candidate will perform.

Clinical examination and discussion (30 minutes) 25 Marks

Clinical biochemistry (Three relevant biochemical investigations which includes preparation of standard graph, estimation of a relevant analyse in blood /plasma/ serum / or other body fluids) 75 Marks

Part II – General Biochemistry

		Marks
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1	Qualitative analysis of any biological fluid (urine, CSF, pleural fluid) – interpretation and discussion.	20 Marks
2	Experiments on enzymes kinetics. ex. determination of pH optimum or Km value or temperature optimum or Vmax etc.	40 Marks
3	Experiments involving chromatography or electrophoresis to be given, separation and identification of amino acids or carbohydrates by chromatography or separation and interpretation of serum proteins, lipoproteins, isoenzymes of (LDH & CPK) by electrophoresis to be given.	40 Marks
	TOTAL	100 Marks

C.Viva voce **100Marks**

1. Viva-Voce Examination: **80Marks**

Viva voce examination will be conducted at four stations for 15 marks each. The Stations are as follows

- Station I: Biochemical techniques and its analytical approach.
- Station II: Molecular events in health and disease.
- Station III: Molecular biology and Genetics.
- Station IV: Clinical Biochemistry, Interpretation of case reports & charts.

2. Pedagogy Exercise: **10 Marks**

A topic will be given to each candidate in the beginning of viva voce examination. He/she is asked to make a presentation on the topic for 8-10 minutes.

3. LOG BOOK: **10 Marks**

Maximum marks for	Theory	Practical	Viva-Voce+ Pedagogy (80 + 20)	Total
			100	
MD Biochemistry	400	200		700

Recommended Books and Journals

1. Berg JM, Tymoczko JL, Stryer L, Biochemistry – WH Freeman and Company, New York, 6th Edition, 2006.
2. Devlin TM, Textbook of Biochemistry with clinical correlations- Wiley-Liss, New York, 5th Edition, 2002.
3. Colleen Smith, Allan D Marks, Michael Lieberman, Marks Basic Medical Biochemistry- A clinical approach; Lippincot Williams; 2nd edition; 2005.
4. Abraham White Emil Smith and Philip Handler; Principles of Biochemistry; Mc Graw Hill; 8th Edition; 2007.
5. Wilson & Walker; Principles and Techniques of Biochemistry & Molecular Biology; Cambridge low price edition; 6th edition; 2006.
6. Bishop, Foxy and Schoeff; Clinical Chemistry: Techniques, Principles and correlations; Wolters Kluber; 6th edition; 2010.
7. Scriver; Beaudet; Valle Sly et al ;The metabolic and molecular basis of

- inherited diseases; McGraw Hill; 8th Edition; 2001.
8. Robert F. Dons and Frank H Wians; Endocrine and Metabolic Disorders; Clinical laboratory testing; CRC Press; 4th edition; 2009.
 9. Pamela c. Champe; Lippincots Illustrated Biochemistry; 5th Edition;
 10. Burtis CA and Ashwood ER, Tietz Fundamentals of Clinical Chemistry, Harcourt (India) Ltd., 4th Edition, 2006.
 11. Kaplan LA and Pesce AG, Clinical Chemistry: Theory, analysis and correlation – CV Mosby and Co. St.Louis, MO., 4th edition, 2003.
 12. Voet D and Voet J, Biochemistry – John Wiley and Sons, New York, 2nd Edition, 2006.
 13. Gowenlock and Bell, Varley's Practical Clinical Biochemistry - CBS, New Delhi, 6th Edition, 1988.
 14. Lehninger AL, Nelson DL and Cox MM, Lehninger – CBS Publishers, New Delhi, 5th Edition, 2008.
 15. Harper's Illustrated Biochemistry, Murray RK, Grannar DK, Mayes PA, Rodwell VW, 28th Edition, McGraw-Hill, 2009.
 16. Medical Biochemistry, N.V.Bhagvan, Academic Press, 4th Edition, 2002.

Journals and other periodicals:

1. Annual Review of Biochemistry
2. Clinical Chemistry (J).
3. Trends in Biochemical Sciences.
4. Clinical Chemistry Reviews.
5. Medical Biochemistry (J).
6. Recent Advances in Endocrinology and Metabolism.
7. Essays in Biochemistry, Biochemical Society, UK.
8. Indian Journal of Clinical Biochemistry (J).
9. Indian Journal of Medical Research (J).
10. Indian Journal of Biochemistry and Biophysics.



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