

**REVISED ORDINANCE GOVERNING REGULATIONS AND
CURRICULUM OF
BACHELOR OF MEDICAL LABORATORY TECHNOLOGY
COURSE - 2019**



**Rajiv Gandhi University of Health Sciences,
Karnataka, Bangalore**

The Emblem



The Emblem of the Rajiv Gandhi University of Health Sciences is a symbolic expression of the confluence of both Eastern and Western Health Sciences. A central wand with entwined snakes symbolises Greek and Roman Gods of Health called Hermis and Mercury is adapted as symbol of modern medical science. The pot above depicts Amrutha Kalasham of Dhanvanthri the father of all Health Sciences. The wings above it depicts Human Soul called Hamsa (Swan) in Indian philosophy. The rising Sun at the top symbolises knowledge and enlightenment. The two twigs of leaves in western philosophy symbolises Olive branches, which is an expression of Peace, Love and Harmony. In Hindu Philosophy it depicts the Vanaspathi (also called as Oushadi) held in the hands of Dhanvanthri, which are the source of all Medicines. The lamp at the bottom depicts human energy (kundalini). The script "Devahitham Yadayahu" inside the lamp is taken from Upanishath Shanth i Manthram (Bhadram Karnebh i Shrunuyanadev...), which says "May we live the full span of our lives allotted by God in perfect health" which is the motto of the Rajiv Gandhi University of Health Sciences.



ರಾಜೀವ್ ಗಾಂಧಿ ಆರೋಗ್ಯ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕರ್ನಾಟಕ, ಬೆಂಗಳೂರು

RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES, KARNATAKA, BENGALURU
4th T Block, Jayanagar, Bengaluru – 560 041

Ref: ACA/DCD/AHS/B.Sc.MLT/367/2019-20

Date: 28/08/2019

NOTIFICATION

Sub: Revised Ordinance pertaining to Regulation and Curriculum of Bachelor of Medical Laboratory Technology.

Ref: 1) Minutes of BOS Allied Health Sciences held on 13/05/2019
2) Proceedings of Faculty meeting held on 15/05/2019
3) Proceedings of AC meeting held on 17/06/2019
4) Proceedings of Syndicate meeting held on 29/06/2019

In exercise of the powers vested under Section 35(2) of RGUHS Act, 1994, the Revised Ordinance pertaining to Regulation and the curriculum of Bachelor of Medical Laboratory Technology is notified herewith as per Annexure.

The above Regulation shall be applicable to the students admitted to the said course from the academic year 2019-20 onwards.

By Order,

Sd/-

REGISTRAR

To

The Principals of all affiliated Allied Health Sciences Course colleges of RGUHS, Bangalore.

Copy to :

1. The Principal Secretary to Governor, Raj Bhavan, Bangalore - 560001
2. The Principal Secretary Medical Education, Health & Family Welfare Dept., M S Building, Dr.B.R. Ambedkar Veedhi, Bangalore – 01
3. PA to Vice – Chancellor/PA to Registrar/Registrar (Eva.)/Finance Officer, Rajiv Gandhi University Health Sciences, Bangalore
4. All Officers of the University Examination Branch/ Academic Section.
5. Guard File / Office copy.

REVISED ORDINANCE GOVERNING REGULATIONS & CURRICULUM OF BACHELOR OF MEDICAL LABORATORY TECHNOLOGY - 2019

1. Eligibility for admission:

A candidate seeking admission to the BSc. MLT shall have studied English as one of the principal subject during the tenure of the course and shall have passed:

1. Two year Pre-University examination or equivalent as recognized by Rajiv Gandhi University of Health Sciences with, Physics, Chemistry and Biology as subjects of study.

OR

2. Pre-Degree course from a recognized University considered as equivalent by RGUHS, (Two years after ten years of schooling) with Physics, Chemistry and Biology as subjects of study.

OR

3. Any equivalent examination recognized by the Rajiv Gandhi University of Health Sciences, Bangalore for the above purpose with Physics, Chemistry and Biology as subjects of study.

OR

4. The vocational higher secondary education course conducted by Vocational Higher Secondary Education, Government of Kerala with five subjects including Physics, Chemistry, Biology and English in addition to vocational subjects conducted is considered equivalent to plus TWO examinations of Government of Karnataka Pre University Course.

OR

5. Candidates with two years diploma from a recognized Government Board in MLT shall have passed class 12 [10+2] with Physics, Chemistry and Biology, as subjects or candidates with 3 years diploma from a recognized Government Board in MLT should have studied Physics, Biology and Chemistry as subjects during the tenure of the course.

6. Lateral entry to second year of B.Sc.MLT for candidates who have passed diploma program from the Government Boards and recognized by RGUHS, fulfilling the conditions specified above under Sl. No. 5 and these students are eligible to take admission on lateral entry system only in the same subject studied at diploma level from the academic year 2008-09 vide RGUHS Notification no. AUTH/AHS/317/2008-09 dated:01.08.2008.

Note:

- a. The candidate shall have passed individually in each of the subjects.
- b. Candidates who have completed diploma or vocational course through Correspondence shall not be eligible for any of the courses mentioned above.

2. Duration of the course:

Duration shall be for a period of four years including one year of Internship.

3. Medium of instruction:

The medium of instruction and examination shall be in English.

4. Scheme of examination:

There shall be three examinations one each at the end of 1st, 2nd and 3rd year.

5. Attendance

Every candidate should have attended at least 80% of the total number of classes conducted in an academic year from the date of commencement of the term to the last working day as notified by university in each of the subjects prescribed for that year separately in theory and practical. Only such candidates are eligible to appear for the university examinations in their first attempt. Special classes conducted for any purpose shall not be considered for the calculation of percentage of attendance for eligibility. A candidate lacking in prescribed percentage of attendance in any subjects either in theory or practical in the first appearance will not be eligible to appear for the University Examination in that subject

6. Internal Assessment (IA):**1st Year B.Sc. MLT**

Theory - 20 marks

Practicals - 10 marks*. [Lab work- 06 marks and Record-04 marks]

2nd & 3rd year B.Sc. MLT

Theory – 20 Marks

Practicals – 20 Marks

There shall be a minimum of two periodical tests preferably one in each term in theory and practical of each subject in an academic year. The average marks of the two tests will be calculated and reduced to 20. The marks of IA shall be communicated to the University at least 15 days before the commencement of the University examination. The University shall have access to the records of such periodical tests. The marks of the internal assessment must be displayed on the notice board of the respective colleges within a fortnight from the date test is held. If a candidate is absent for any one of the tests due to genuine and satisfactory reasons, such a candidate may be given a re-test within a fortnight.

* There shall be no University Practical Examination in First year.

7. Subject and hours of teaching for Theory and Practicals

The number of hours of teaching theory and practical, subject wise in first year, second year and third year are shown in Table-I, Table-II and Table-III

Main and Subsidiary subjects are common in first year for all the courses in Allied Health Science.

The number of hours for teaching theory and practical for main subjects in first, Second and Third year are shown in Table-I, II and III.

Table - I Distribution of Teaching Hours in First Year Subjects

Main subjects

| Sl. no | Subject | Theory No. of Hours | Practical No. of Hours | Total No. of Hours |
|--------|---|---------------------|------------------------|--------------------|
| 1 | Human Anatomy | 70 | 20 | 90 |
| 2 | Physiology | 70 | 20 | 90 |
| 3 | Biochemistry I | 70 | 20 | 90 |
| 4 | Pathology I (Clinical Pathology, Haematology & Blood Banking) | 70 | 20 | 90 |
| 5 | Microbiology | 70 | 20 | 90 |
| | Total | 350 | 100 | 450 |

The classes in main and subsidiary subjects are to be held from Monday to Thursday. On Fridays and Saturdays students shall work in hospitals in the respective specialty or department chosen by them

Subsidiary Subjects

English 25 Hours

Kannada 25 Hours

Health-Care 40 Hours

Clinical/Lab posting – 470 hours (Friday 9am – 1pm and 2pm - 4-30 pm

Saturday 9am - 1pm)

Table - II Distribution of Teaching Hours in Second Year Subjects**Main Subjects**

| Sl. no | Subject | Theory No. of Hours | Practical No. of Hours | Clinical Postings | Total No. of Hours |
|--------|-----------------|---------------------|------------------------|-------------------|--------------------|
| 1 | Biochemistry II | 100 | 80 | 170 | 350 |
| 2 | Microbiology II | 100 | 80 | 170 | 350 |
| 3 | Pathology II | 100 | 80 | 170 | 350 |
| | Total | 300 | 240 | 510 | 1050 |

Subsidiary Subjects:

Sociology 20 Hours

Constitution of India 10 Hours

Environmental Science & Health 10 Hours

Table - III Distribution of Teaching Hours in Third Year Subjects**Main Subjects**

| Sl. no | Subjects | Theory No. of Hours | Practical No. of Hours | Clinical Posting | Total No. of Hours |
|--------|------------------|---------------------|------------------------|------------------|--------------------|
| 1 | Biochemistry III | 100 | 80 | 170 | 350 |
| 2 | Microbiology III | 100 | 80 | 170 | 350 |
| 3 | Pathology III | 100 | 80 | 170 | 350 |
| | Total | 300 | 240 | 510 | 1050 |

Subsidiary Subjects:

Ethics, Database Management 50 Hours

Research & Biostatistics 20 Hours

Computer application 10 Hours

9. Schedule of Examination:

The university shall conduct two examinations annually at an interval of not less than 4 to 6 months as notified by the university from time to time. A candidate who satisfies the requirement of attendance, progress and conduct as

stipulated by the university shall be eligible to appear for the university examination. Certificate to that effect shall be produced from the Head of the institution along with the application for examination and the prescribed fee.

10. Scheme of Examination

There shall be three examinations, one each at the end of I, II and III year. The examination for both main and subsidiary subjects for all courses in Allied Health Sciences shall be common in the first year. Distribution of Subjects and marks for First Year, Second year & Third year University theory and practical Examinations are shown in the Table – IV, V & VI.

First year examination:

The University examination for 1st year shall consist of only theory examination and there shall be no University Practical Examination.

Second & Third year examination:

The University examination for 2nd and 3rd year shall consist of Written Examination & Practical.

Written Examinations consists of

03papers in the 2nd Year

03 papers in the 3rd Year.

Practical examination:

Three practical examinations, at the end 2nd Year and three practical examinations at the end of the 3rd year.

TABLE-IV

Distribution of Subjects and marks for First Year University theory Examination

| A | Main Subjects* | Written Paper | | I A Theory | Total |
|---|-------------------------------------|---------------|-------|------------|-------|
| | | Duration | Marks | Marks | Marks |
| 1 | Basic Anatomy (Including Histology) | 3 Hours | 80 | 20 | 100 |
| 2 | Physiology | 3 Hours | 80 | 20 | 100 |
| 3 | Biochemistry | 3 Hours | 80 | 20 | 100 |
| 4 | Pathology | 3 Hours | 80 | 20 | 100 |
| 5 | Microbiology | 3 Hours | 80 | 20 | 100 |
| | Subsidiary Subject** | | | | |
| 1 | English | 3 Hours | 80 | 20 | 100 |
| 2 | Kannada | 3 Hours | 80 | 20 | 100 |
| 3 | Health Care | 3 Hours | 80 | 20 | 100 |

Note: I A = Internal Assessment

*Main Subjects shall have University Examination.

There shall be no University Practical Examination.

** Subsidiary subjects: Examination for subsidiary subjects shall be conducted by respective colleges.

TABLE – V

Distribution of Subjects and marks for Second Year Examination of B.Sc. MLT

| Paper | Subject | Theory | | | Practicals | | | Grand Total |
|-------|-----------------|------------|----|-----------|------------|----|-----------|-------------|
| | | Univ. exam | IA | Sub Total | Univ Prac | IA | Sub Total | |
| I | Biochemistry II | 80 | 20 | 100 | 80 | 20 | 100 | 200 |
| II | Microbiology II | 80 | 20 | 100 | 80 | 20 | 100 | 200 |
| III | Pathology II | 80 | 20 | 100 | 80 | 20 | 100 | 200 |

Distribution of Subsidiary Subjects and marks for Second Year Examination of B.Sc. MLT

| B | Subsidiary Subject** | Duration | Marks | I A Theory Marks | Total Marks |
|---|--------------------------------|----------|-------|------------------|-------------|
| 1 | Sociology | 3 Hours | 80 | 20 | 100 |
| 2 | Constitution of India | 3 Hours | 80 | 20 | 100 |
| 3 | Environmental Science & Health | 3 Hours | 80 | 20 | 100 |

** Subsidiary subjects: Examination for subsidiary subjects shall be conducted by respective colleges

TABLE – VI

Distribution of Subjects and marks for Third Year Examination of B.Sc MLT

| Paper | Subject | Theory | | | Practicals | | | Grand Total |
|-------|------------------|------------|----|-----------|------------|----|-----------|-------------|
| | | Univ. exam | IA | Sub Total | Univ Prac | IA | Sub Total | |
| I | Biochemistry III | 80 | 20 | 100 | 80 | 20 | 100 | 200 |
| II | Microbiology III | 80 | 20 | 100 | 80 | 20 | 100 | 200 |
| III | Pathology III | 80 | 20 | 100 | 80 | 20 | 100 | 200 |

Distribution of Subsidiary Subjects and marks for Third Year Examination of

B.Sc. MLT

| B | Subsidiary Subject** | Duration | Marks | I A Theory Marks | Total Marks |
|---|-----------------------------|----------|-------|------------------|-------------|
| 1 | Ethics, Database Management | 3 Hours | 80 | 20 | 100 |
| 2 | Research & Biostatistics | 3 Hours | 80 | 20 | 100 |
| 3 | Computer Application | 3 Hours | 80 | 20 | 100 |

** Subsidiary subjects : Examination for subsidiary subjects shall be conducted by respective colleges

11. Pass criteria

11.1. First year examination

a. Main Subjects: A candidate is declared to have passed in a subject, if he/she secures, 50% of marks in University Theory exam and internal assessment added together.

b. Subsidiary Subjects: The minimum prescribed marks for a pass in subsidiary subject shall be 35% of the maximum marks prescribed for a subject. The marks obtained in the subsidiary subjects shall be communicated to the University before the Commencement of the University examination.

11.2. Second and Third year Examination

a. Main Subjects: A candidate is declared to have passed the examination in a subject if he/she secures 50% of the marks in Theory and 50% in practical separately. For a pass in theory, a candidate has to secure a minimum of 40% marks in the University conducted written examination, and 50% in aggregate in the University conducted written examination and internal assessment added together and for pass in Practical, a candidate has to secure a minimum of 40% marks in the university conducted Practical/Clinical examination and 50% in aggregate i.e. University conducted Practical/Clinical and Internal Assessment.

b. Subsidiary Subjects: The minimum prescribed marks for a pass in subsidiary subject shall be 35% of the maximum marks prescribed for a subject. The marks obtained in the subsidiary subjects shall be communicated to the University before the commencement of the University examination.

12. Carry over benefit

12.1 First year examination:

A candidate who fails in any two of the five main subjects of first year shall be permitted to carry over those subjects to second year. However, he/ she must pass the carry over subjects before appearing for second year examination.

12.2. Second year examination:

A candidate is permitted to carry over any one main subject to the third year but shall pass this subject before appearing for the third year examination.

13. Declaration of Class

a. A candidate having appeared in all the subjects in the same examination and passed that examination in the first attempt and secures 75% of marks or more of grand total marks prescribed will be declared to have passed the examination with Distinction.

b. A candidate having appeared in all subjects in the same examination and passed that examination in the first attempt and secures 60% of marks or more but less than 75% of grand total marks prescribed will be declared to have passed the examination in First Class.

c. A candidate having appeared in all the subjects in the same examination and passed that examination in the first attempt and secures 50% of marks or more but less than 60% of grand total marks prescribed will be declared to have passed the examination in Second Class.

d. A candidate passing the university examination in more than one attempt shall be placed in Pass class irrespective of the percentage of marks secured by him/her in the examination.

e. The marks obtained by a candidate in the subsidiary subjects shall not be considered for award of Class or Rank.

[Please note, fraction of marks should not be rounded off clauses (a), (b) and (c)]

14. Eligibility for the award of Degree:

A candidate shall have passed in all the subjects of first, second and third year to be eligible for a compulsory 12 months of rotational internship. On completion of 12 months of the internship with pass criteria in outgoing clinical assessment exams the candidate is then eligible for the award of degree.

15. Distribution of Type of Questions and Marks for Various Subjects

THEORY

| SUBJECTS HAVING MAXIMUM MARKS= 100 | | |
|------------------------------------|------------------|--------------------------|
| Type of Questions | No. of Questions | Marks for Each Questions |
| Essay Type | 3 (2 x 10) | 10 |
| Short Essay Type | 12 (10 x 5) | 05 |
| Short Answer Type | 12 (10 x 3) | 03 |

| SUBJECTS HAVING MAXIMUM MARKS= 80 (for first year B.Sc) | | |
|---|------------------|--------------------------|
| Type of Questions | NO. of questions | Marks for Each Questions |
| Essay Type | 3 (2 x 10) | 10 |
| Short Essay Type | 8 (6 x 5) | 05 |
| Short Answer Type | 12 (10 x 3) | 03 |

| SUBJECTS HAVING MAXIMUM MARKS= 80 (for second and third year B.Sc) | | |
|--|------------------|--------------------------|
| Type of Questions | No. of Questions | Marks for Each Questions |
| Essay Type | 3 (2 x 10) | 10 |
| Short Essay Type | 8 (6 x 5) | 05 |
| Short Answer Type | 12 (10 x 3) | 03 |

| SUBJECTS HAVING MAXIMUM MARKS= 60 | | |
|-----------------------------------|------------------|--------------------------|
| Type of Questions | No. of Questions | Marks for Each Questions |
| Essay Type | 3 (2 x 10) | 10 |
| Short Essay Type | 7 (5 x 5) | 05 |
| Short Answer Type | 7 (5 x 3) | 03 |

| SUBJECTS HAVING MAXIMUM MARKS= 50 | | |
|-----------------------------------|------------------|--------------------------|
| Type of Questions | No. of Questions | Marks for Each Questions |
| Essay Type | 3 (2 x 10) | 10 |
| Short Essay Type | 5 (3 x 5) | 05 |
| Short Answer Type | 7 (5 x 3) | 03 |

INTERNSHIP

Twelve month compulsory rotational postings during which students have to work under the supervision of experienced staff in the following areas:

1. Clinical Pathology - 1 month
2. Hematology – 1 month
3. Clinical Biochemistry - 2 months
4. Clinical Microbiology – 1 months
5. Blood banking - 1 month
6. Phelbotomy – 1 month
7. Serology – 1 month
8. Histopathology – 1 month
9. Cytology – 1 month
10. Project work – 2 months

Requirements for internship in the department of Clinical pathology and Blood banking-

Haematology-

1. A minimum of 50 haemograms or more per day
2. Bone marrow examination and reporting
3. All special tests for leukemias
4. Immunohistochemistry
5. One MD pathologist should be present

Histopathology

1. All histopathological techniques should be done, both manual or/and automated- 10 specimens per day minimum.
2. All special stains should be done.
3. Immunohistochemistry in histopathology

Cytology

1. Minimum 10 specimens per day
2. All cytological techniques including staining technique- manual and automated should be done.
3. Cytopathologist should be there.

Blood bank

1. Minimum 10 blood collections per day
2. All facilities for testing eg. Automated cell counter, ELISA reader should be there
3. Facilities for component separation and storage should be there eg. Plasma and / or platelet pheresis machine, cooling centrifuge, blood bag refrigerator, deep freezer, platelet agitator etc.

Requirements for internship in the department of Clinical Biochemistry-

1. A medium sized lab performing tests on 100 samples per day or a hospital comprising of 100 beds with a lab performing tests on 100 samples.
2. Tests performed should include- routine tests and higher chemistry
 - a. Glucose
 - b. Calcium
 - c. Phosphorus
 - d. Uric acid
 - e. Electrolytes
 - f. Amylase
 - g. Lipase
 - h. Ig
 - i. Microalbumin
 - j. RFT
 - k. LFT
 - l. Lipid profile
 - m. Cardiac marker
 - n. Diabetic profile including HbA1C

- o. Hypertension profile
- p. Tumor markers
- q. Hormones- LH, FSH, testosterone, prolactin
- r. Thyroid profile
- s. 24hrs urine protein
- t. 24hrs urine creatinine
- u. 24 hrs urine/ creatinine ratio

The lab should include equipments as per mentioned below-

- a. Chemiluminescence/ drug hormone analyser/ ELFA
 - b. HPLC (optional)
 - c. Arterial blood gas analysis (optional)
 - d. ISE electrolyte analyser/ flame photometry
 - e. Electrophoresis / chromatography
 - f. Fully automated analyser
 - g. Semi automated analyser
 - h. Spectrophotometer/ colorimeter
 - i. pH meter
 - j. hot air oven
 - k. distillation unit
- should have facility for performing calibrations for smaller equipments/ pipettes
 - should run quality control materials
 - should have proper guidelines for total quality management

Requirements for internship in the department of Microbiology-

Should learn collection and appropriate processing of various specimens.

1. Routine culture and sensitivity including blood culture- minimum of 10 per day

2. Serology by
 - a. Latex agglutination- 20 per day
 - b. Rapid tests- 20 per day
 - c. ELISA- 5 per day
3. Mycology-
 - a. Wet mount- 10 per day
 - b. Culture- 5 per month
4. Parasitology-
 - a. Wet mount- 20 per month
 - b. Peripheral smear for malaria and filaria- 10 per day
 - c. Quantitative buffy coat- 5 per day
5. Microscopy- minimum 10 per day
 - a. Grams stain
 - b. ZN stain
 - c. Urine wet mount
 - d. CSF India ink preparation

The lab should have the following instruments-

1. Autoclave
2. Hot air oven
3. Incubator
4. Centrifuge
5. Water distillation unit
6. Physical balance
7. Digital balance
8. Refrigerator
9. Microscope- monocular, binocular, fluorescent microscope
10. ELISA reader
11. Micropipettes

12. Laminar air flow

13. Water bath

14. VDRL shaker

The responsibilities that the students should learn during their internship in the department of microbiology-

- Preparation of media
- Sterilization
- Preparation of reagents
- Handling instruments
- Waste disposal
- Maintenance of microscopes
- Calibration of instruments

I YEAR B.Sc. MLT

ANATOMY

Theory: 70hrs

Practicals: 20hrs

Chapter 1

Introduction:

Theory:

- Definition of anatomy and its divisions
- Terms of location, positions and planes
- Epithelium-definition, classification, describe with examples, function
- Glands- classification, describe serous, mucous & mixed glands with examples
- Basic tissues – classification with examples

Practical:

- Histology of types of epithelium
- Histology of serous, mucous & mixed salivary gland

Chapter 2

Connective tissue:

Theory:

- Cartilage – types with example & histology theory
- Bone – Classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, intervertebral disc, fontanelles of fetal skull
- Joints – Classification of joints with examples, synovial joint (in detail for radiology)
- Muscular system: Classification of muscular tissue & histology
- Names of muscles of the body

Practical:

- Histology of the 3 types of cartilage
- Histology of compact bone (TS & LS)

- Histology of skeletal (TS & LS) & cardiac muscle
- Demo of all bones showing parts, radiographs of normal bones & joints
- Demonstration of important muscles of the body

3. Cardiovascular system:

Theory:

- Heart-size, location, chambers, exterior & interior, pericardium
- Blood supply of heart
- Systemic & pulmonary circulation
- Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery
- Inferior vena cava, portal vein, portosystemic anastomosis ,Great saphenous vein, Dural venous sinuses
- Lymphatic system- cisterna chyli & thoracic duct ,Histology of lymphatic tissues, Names of regional lymphatics, axillary and inguinal lymph nodes in brief

Practical:

- Demonstration of heart and vessels in the body
- Histology of large artery & vein, medium sized artery & vein
- Histology of lymph node, spleen, tonsil & thymus
- Radiology: Normal chest radiograph showing heart shadows

4. Gastro-intestinal system

Theory:

- Parts of GIT: Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring), Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas, spleen, peritoneum & reflections

Practical:

- Demonstration of parts of GIT
- Radiographs of abdomen

5. Respiratory system

- Parts of RS: nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments, diaphragm

- Histology of trachea, lung and pleura
- Names of paranasal air sinuses

Practical:

- Demonstration of parts of respiratory system.
- Normal radiographs of chest, X-ray paranasal sinuses
- Histology of lung and trachea

6. Urinary system

Theory:

- Kidney, ureter, urinary bladder, male and female urethra
- Histology of kidney, ureter and urinary bladder

Practical:

- Demonstration of parts of urinary system
- Histology of kidney, ureter, urinary bladder
- Radiographs of abdomen-IVP, retrograde cystogram

7. Reproductive system

Theory:

- Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology)
- Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology)
- Mammary gland – gross

Practical:

- Demonstration of section of male and female pelvis with organs in situ
- Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tubes, ovary
- Radiographs of pelvis – hysterosalpingogram

8. Endocrine glands

Theory:

- Names of all endocrine glands in detail on pituitary gland, thyroid gland & suprarenal gland – (gross & histology)

Practical:

- Demonstration of the glands
- Histology of pituitary, thyroid, parathyroid, suprarenal glands

9. Nervous system

Theory:

- Neuron & Classification of NS
- Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology) Meninges, Ventricles & cerebrospinal fluid, Names of basal nuclei

- Blood supply of brain
- Cranial nerves
- Sympathetic trunk & names of parasympathetic ganglia

Practical:

- Histology of peripheral nerve & optic nerve
- Demonstration of all plexuses and nerves in the body
- Demonstration of all part of brain
- Histology of cerebrum, cerebellum, spinal cord

10. Sensory organs**Theory:**

- Skin: Skin-histology & Appendages of skin
- Eye: Parts of eye & lacrimal apparatus, Extra-ocular muscles & nerve supply
- Ear: parts of ear- external, middle and inner ear and contents

Practical:

- Histology of thin and thick skin
- Demonstration and histology of eyeball
- Histology of cornea & retina

11. Embryology:**Theory:**

- Spermatogenesis & oogenesis
- Ovulation, fertilization
- Fetal circulation
- Placenta

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20

Practicals: record and lab work* 10

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the university.

SCHEME OF EXAMINATION THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Anatomy shall be as given under.

| SUBJECTS HAVING MAXIMUM MARKS= 80 (for first year B.Sc) | | |
|---|------------------|--------------------------|
| Type of Questions | NO. of questions | Marks for Each Questions |
| Essay Type | 3 (2 x 10) | 10 |
| Short Essay Type | 8 (6 x 5) | 05 |
| Short Answer Type | 12 (10 x 3) | 03 |

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | | Grand total |
|--------|-----------|----|-----------|------------|----|-----------|-------------|
| Theory | Viva Voce | IA | Sub Total | Practicals | IA | Sub Total | |
| 80 | - | 20 | 100 | * | | | 100 |

REFERENCE BOOKS:

1. William Davis (P) understanding Human Anatomy and Physiology – McGraw Hill
2. Chaurasia- A Text Book of Anatomy
3. T. S. Ranganathan- A Text Book of Human Anatomy
4. Fattana, Human Anatomy (Description and applied)- Saunder's & C P Prism Publishers, Bangalore
5. ESTER. M. Grishcimer- Physiology & Anatomy with Practical Considerations, J. P. Lippin Cott. Philadelphia
6. Bhatnagar- Essentials of Human Embryology- Revised Edition. Orient Blackswan Pvt. Ltd.

PHYSIOLOGY

Theory 70 hours

Practical 20hours

1. General Physiology

Introduction to cell physiology, transport across cell membrane

Homeostasis, Body Fluid compartment & measurement

2. Blood

Introduction - composition and function of blood

Plasma. proteins, types and functions

Red blood cells - erythropoiesis, stages of differentiation, factors affecting it, function, normal count, physiological variation.

Hemoglobin- function, concentration, types & methods of Hb estimation, fate of hemoglobin

Jaundice-types Anaemia,-types

ESR, PCV, osmotic fragility & blood indices

WBC- morphology, production, functions, normal count, differential count, variation, variation Immunity (in brief)

Platelets- origin, morphology, normal count, function-Platelet plug ,bleeding disorder

Haemostasis - definition, normal haemostasis, clotting factors, mechanism of clotting, anticoagulants disorders of clotting factors.

Blood group-ABO & Rh system, Rh incompatibility blood typing ,cross matching, hazards of mismatched blood transfusion

RES, spleen and lymph

3. Nerve-Muscle

Neuron structure, types, neuroglia-types, nerve fibre classification, properties of nerve fibres, RMP, action potential, wallerian degeneration

NMJ, blockers, Myasthenia gravis

Classification of muscle, structure of skeletal muscle, sarcomere, contractile proteins

Excitation contraction coupling, mechanism of muscle contraction, types of contraction

Motor unit, fatigue, rigor mortis Smooth muscle

4. Respiratory system

Physiological anatomy of respiratory system, muscles of respiration, respiratory & non respiratory functions of lungs, dead space

Mechanics of breathing, intrapulmonary & pleural pressures

Compliance, Surfactant, Hyaline membrane disease

Lung volumes and capacities

Respiratory membrane , transport of O₂ & CO₂

Chemical regulation of respiration

Neural regulation of respiration

Hypoxia, Acclimatization,

Dysbarism. Artificial respiration

Definition-Periodic breathing ,dyspnoea, apnoea, asphyxia,, cyanosis

5. Cardiovascular system

Introduction to CVS & general principles of circulation

Properties of Cardiac muscle

Cardiac cycle, heart sounds, Pulse

Cardiac output, factors and measurement

Heart rate

BP-factors, measurement, Short term regulation

Intermediate and long term regulation of BP

ECG uses and significance, .normal waveform, heart block

Coronary circulation, Cutaneous circulation-Triple response

Shock

Effects of exercise on CVS and Respiratory system

6. Renal system, Skin and body temperature

Kidneys- functions, structure of nephron, type, juxtaglomerular apparatus-structure and function, non-excretory functions of kidney

Glomerular filtration rate (GFR)- Definition ,normal value, factors affecting GFR

Tubular reabsorption - sites, substance reabsorbed, mechanisms of reabsorption

Tubular secretion- sites, substance secreted, mechanisms of reabsorption

Counter current mechanism of concentration of urine

Obligatory and Facultative reabsorption of water

Micturition reflex, Diuretics

Artificial kidney, renal function tests-clearance tests

Skin -structure and function, body temperature measurement, physiological variation,

Regulation of body Temperature by physical, chemical and nervous mechanisms-Role of Hypothalamus

Hypothermia and fever

7. Digestive system

Physiological anatomy, Enteric nervous system & functions of GIT

Saliva- composition, regulation, disorder.

Deglutition- stages & disorders

Stomach-functions, composition and regulation of gastric juice

Gastric motility, MMC, vomiting reflex.

Pancreas- function, composition and regulation of pancreatic juice

Liver & gall bladder-functions, bile- composition, secretion and regulation

Small intestine- Succus entericus-composition, functions & movements

Large intestine- functions, movements and defecation reflex

Digestion & absorption of Carbohydrates, fats and proteins

8. Endocrine system

Classification of Endocrine glands & their hormones & properties-chemistry and receptor, feedback mechanisms of hormone regulation.

Anterior pituitary hormones- secretion, functions , disorders

Posterior pituitary hormones- secretion , functions , disorders

Thyroid hormones- secretion, functions, disorders

Parathyroid hormones- secretion, functions, disorders

Calcium homeostasis & disorders

Pancreatic hormones, -Insulin and Glucagon- . secretion, functions, disorders

Adrenal cortex- Glucocorticoids & Mineralocorticoids, Androgen - secretion, functions, disorders

Adrenal medulla- secretion, functions, disorders Thymus & Pineal gland

9. Reproductive system

Introduction to reproductive system, sex differentiation & Puberty

Male reproductive system, functions of testosterone & Spermatogenesis

Female reproductive system, functions of Estrogen, Progesterone, Oogenesis

Ovulation & Menstrual cycle

Physiological changes during pregnancy, pregnancy tests, parturition & lactation

Male & Female contraceptive methods

10. Central nervous system

Introduction to CNS, Sensory receptors classification, properties

Synapse– classification, properties

Sensory pathways: Anterior spino thalamic tract and Posterior column pathway

Lateral spino thalamic tract, Types of pain, Referred pain, Thalamus; nuclei and function

Classification of reflexes, Monosynaptic reflex- Stretch reflex , muscle spindle ,inverse stretch reflex.
Polysynaptic reflex-Withdrawal reflex

Motor pathways : Pyramidal pathway and functions, UMNL, LMNL

Cerebral cortex (Sensory and motor)-functions, Medulla and Pons-functions

Cerebellum –functions, disorders

Basal ganglia-functions, disorders

Hypothalamus and Limbic system-functions

CSF, lumbar puncture

Sleep, EEG,

Autonomic Nervous System - Sympathetic and parasympathetic distribution and functions

11. Special senses

Vision –Functional anatomy of eye, visual pathway, lesion

Refractive errors, color vision

Audition – Physiological anatomy of ear, Mechanism of hearing, auditory pathway, deafness

Olfaction –modalities, receptor, function, abnormalities

Gustation-modalities, receptor, function, taste pathway, abnormalities

Practicals

Blood pressure Recording

Auscultation for Heart Sounds

Artificial Respiration

Determination of vital capacity

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20

Practicals: record and lab work* 10

*There shall be no university practical examination and internal assessment marks secured in Practical need not be sent to the university.

SCHEME OF EXAMINATION THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Physiology shall be as given under.

| SUBJECTS HAVING MAXIMUM MARKS= 80 (for first year B.Sc) | | |
|---|------------------|--------------------------|
| Type of Questions | NO. of questions | Marks for Each Questions |
| Essay Type | 3 (2 x 10) | 10 |
| Short Essay Type | 8 (6 x 5) | 05 |
| Short Answer Type | 12 (10 x 3) | 03 |

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | | Grand total |
|--------|-----------|----|-----------|------------|----|-----------|-------------|
| Theory | Viva Voce | IA | Sub Total | Practicals | IA | Sub Total | |
| 80 | - | 20 | 100 | * | | | 100 |

REFERENCE BOOKS:

1. Guyton (Arthur) Text Book of Physiology. Latest Ed. Prism Publishers
2. Chatterjee (CC) Human Physiology Latest Ed. Vol. 1, Medical Allied Agency
3. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book
4. Ganong (William F) Review of Medical Physiology. Latest Ed. Appleton

BIOCHEMISTRY I

No. Theory classes: 70 hours

No. Practical classes: 20 hours

1. Carbohydrate Chemistry [3 hours]

- Classification (Definition/ examples for each class)
- Monosaccharides (classification depending upon number of carbon atoms and functional group with examples)
- Disaccharides (Sucrose/ lactose/ maltose and their composition)
- Polysaccharides :
 - a) Homopolysaccharides (Structure of starch and glycogen)
 - b) Heteropolysaccharides (Functions)

2. Lipid Chemistry [3 hours]

- Definition of lipids
- Functions of lipids in the body
- Classification of lipids (subclasses with examples)
- Definition and Classification of fatty acids
- Essential fatty acids
- Phospholipids and their importance

3. Amino-acid and Protein Chemistry [3 hours]

- General structure of D and L amino acids
- Amino acids; Definition and Classification of amino acids with examples.
- Peptides; definition & Biologically important peptides
- Classification of Proteins based on composition, functions and shape (with examples)
- Functions of amino acids and Proteins

4. Nucleotide and Nucleic acid Chemistry [3 hours]

- Nucleosides & Nucleotides
- Nucleic acid Definition & types
- Composition & functions of DNA & RNA
- Structure of DNA (Watson and Crick model)

- Structure of tRNA, & functions of tRNA, rRNA, mRNA
- Difference between DNA and RNA

5. Enzymes [5 hours]

- Definition & Classification of Enzymes with example
- Definitions of Active site, Cofactor (Coenzyme, Activator),
- Proenzyme; Definition and examples (Pepsin & trypsin)

6. Digestion and Absorption [3 Hours]

- General characteristics of digestion and absorption,
- Digestion and absorption of carbohydrates, proteins and lipids.

7. Carbohydrate Metabolism [5 Hours]

- Glycolysis ; Aerobic, Anaerobic, Definition , Site and subcellular site , Steps with all the enzymes and coenzymes at each step , mention the regulatory enzymes , Energetics,
- Citric acid cycle; Pyruvate dehydrogenase complex (reaction and coenzymes) , Site and subcellular site , Reactions with all the enzymes and coenzymes ,Regulatory enzymes , Energetics
- Significance of HMP Shunt pathway.
- Hyperglycemic and hypoglycemic hormones
- Blood Glucose Regulation.
- Diabetes mellitus (definition, classification, signs and symptoms)
- Glycogen metabolism and gluconeogenesis

8. Lipid Metabolism [4 Hours]

- Introduction to lipid metabolism, Lipolysis
- Beta oxidation of fatty acids ; Definition ,Site and subcellular site , Activation of palmitic acid , Transport of activated palmitic acid into mitochondria , Reactions , Energetics.
- Name the different ketone bodies . Note on ketosis

9. Amino acid and Protein Metabolism [3 Hours]

- Introduction, transamination, deamination, Fate of ammonia, transport of ammonia,
- Urea cycle.

10. Vitamins [5 Hours]

- Definition and classification .
- RDA, sources, coenzyme forms, biochemical functions and disorders for the following water soluble vitamins: Thiamine, Niacin, Pyridoxine, Cobalamine, Folic acid, Ascorbic acid
- RDA, sources, coenzyme forms, biochemical functions and deficiency disorders for the following fat soluble vitamins; A and vitamin D

11. Mineral Metabolism [3 Hours]

- Name the macro/ microminerals
- Iron: Sources ,RDA, Functions and Disorders of deficiency and excess
- Calcium and phosphorus: Sources ,RDA, functions, normal serum levels and hormones regulating their levels

12. Nutrition [6 hours]

- Balanced diet (Definition)
- Caloric value ; Definition , Caloric values of carbohydrates, proteins and fats
- Total daily caloric requirements of an adult male and female,
- RDA (Definition, standard values for nutrients)

- Basal metabolic rate(BMR) ; Definition , Magnitude of BMR in men and women, Factors affecting BMR
- Thermic effect/ SDA of food (Definition, values for major macronutrients)
- **Carbohydrates ; Daily dietary requirement. 2. Dietary fibers (Definition, functions, importance and their daily requirements)**
- **Proteins ; Daily requirement , Biological value. a. Definition b. Protein used as a standard for this, Protein sources with high and low biological value , Mutual supplementation of proteins (Definition, examples).**
- **Fats ; Daily requirement , Essential fatty acids (Definition, functions, daily requirement and deficiency manifestations) , Saturated and unsaturated fatty acids (Definition, sources, examples).**
- **Malnutrition**

13. Renal Function Tests [2 hours]

- Name the different tests to asses the kidney functions
- Explain Creatinine clearance & Inulin clearance
- Urinary acidification test

14. Radioactive Isotopes [1 hour]

- Definition, clinical applications
- Biological effects of radiations

15. Clinical Biochemistry [5 hours]

A. Definitions of acid, base, pH and pKa [1 hour]

B. Buffers • Definition [2 hours]

- Henderson Hasselbalch equation,
- Principal buffer systems in the ECF ICF and urine
- Bicarbonate and phosphate buffer systems (pKa value, normal ratio of base/acid in the plasma)
- Acidosis & Alkalosis (Definition, classification, causes and biochemical findings)

C. Normal serum levels and condition where they are altered [2 hour]

- Glucose, Protein, urea, uric acid, and creatinine
- Bilirubin, cholesterol
- Serum Electrolytes

16. Fundamental Chemistry (1 hour)

- Valency, Molecular weight & Equivalent weight of elements and compounds. Normality, Molarity, Molality.

17. Solutions: Definition, use, classification where appropriate, preparation and storage (5 hours)

- Stock and working solutions.
- Molar and Normal solutions of compounds and acids. (NaCl, NaOH, HCl, H₂SO₄, H₃PO₄, CH₃COOH etc.,)
- Preparation of percent solutions – w/w, v/v w/v (solids, liquids and acids), Conversion of a percent solution into a molar solution
- Saturated and supersaturated solutions
- Standard solutions. Technique for preparation of standard solutions and Storage. E.g: glucose, albumin etc.

- Dilutions- Diluting Normal , Molar and percent solutions. Preparing working standard from stock standard.
- Part dilutions: Specimen dilutions. Serial dilutions. Reagent dilution. Dilution factors

ASSIGNMENT TOPICS

- 1. Units of measurement**
2. Hazards - Physical, Chemical, Biological
3. Arterial blood gas analysis
4. Responsibilities of Health care personnel
5. Biomedical waste management

Total theory hours = 70

PRACTICAL DEMONSTRATION [20 hours]

- Color Reactions of Carbohydrates & amino acids.
- Precipitation Reactions of proteins
- Colorimetry
- Estimation of Blood glucose Folin Wu and enzymatic method
- Estimation of Urea by DAM method

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20

Practicals: record and lab work* 10

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the university.

SCHEME OF EXAMINATION THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry I shall be as given under.

| SUBJECTS HAVING MAXIMUM MARKS= 80 (for first year B.Sc) | | |
|---|------------------|--------------------------|
| Type of Questions | NO. of questions | Marks for Each Questions |
| Essay Type | 3 (2 x 10) | 10 |
| Short Essay Type | 8 (6 x 5) | 05 |
| Short Answer Type | 12 (10 x 3) | 03 |

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | | Grand total |
|--------|-----------|----|-----------|------------|----|-----------|-------------|
| Theory | Viva Voce | IA | Sub Total | Practicals | IA | Sub Total | |
| 80 | - | 20 | 100 | * | | | 100 |

Text Book References

- Biochemistry – 3rd revised edition by U Sathyanarayana & U Chakrapani
- Textbook of Medical Biochemistry-6th Edition by MN Chatterjea & Rana Shinde
- Textbook of Medical Laboratory technology 2nd edition by Godkar and Godkar.
- Biochemistry-3rd edition by Pankaja Naik

- Medical Laboratory technology 6th edition by Ramnik Sood.
- Manipal Manual of Clinical Biochemistry for medical laboratory and M.Sc., students-3rd edition by Shivananda Nayak B
- Varley's Practical Clinical Biochemistry, 4th, 5th and 6th editions

PATHOLOGY I

Clinical Pathology, Hematology and Blood Banking

Theory-70 hours

Practicals-20 hours

I. Clinical Pathology- Theory

- Introduction to clinical pathology
- Collection , transport, preservation and processing of various clinical specimens
- Urine examination- collection and preservation, Physical, chemical and microscopic examination for abnormal constituents
- Examination of Body fluids
- Examination of Cerebrospinal fluid (CSF)
- Sputum examination
- Examination of feces

II. Hematology – Theory

- Introduction to hematology
- Normal constituents of Blood, their structure and functions
- Collection of Blood samples
- Various anticoagulants used in Hematology
- Hemoglobin estimation, different methods and normal values
- Packed cell volume
- Erythrocyte sedimentation rate
- Normal Haemostasis
- Bleeding time. Clotting time, prothrombin time, Activated partial Thromboplastin time

III. Blood Bank- Theory

- Introduction blood banking
- Blood group system
- Collection and processing of blood for transfusion
- Compatibility testing
- Blood transfusion reactions

IV General Pathology:

1.Cell injury:

- a. Definition, causes.
- b. Cellular adaptations – Hypertrophy, hyperplasia, atrophy and metaplasia.
- c. Types of cell injury – Reversible and irreversible; morphology of reversible injury.

- d. Necrosis – Definition and patterns of tissue necrosis.
- e. Intracellular accumulations – Lipids, cholesterol, proteins, glycogen and pigments; examples.
- f. Pathologic calcification – Types and examples.
- **2. Inflammation:**
 - a. Definition and signs of inflammation.
 - b. Types – Acute and chronic inflammation.
 - c. Acute inflammation – Causes, morphological patterns and outcome.
 - d. Chronic inflammation – Causes, morphology and examples.
 - e. Regeneration and repair – Mechanism of cutaneous wound healing.
 - f. Factors affecting wound healing.
- **3. Hemodynamic disorders:**
 - a. Edema – Definition, pathogenesis and types: Renal, cardiac, pulmonary and cerebral.
 - b. Difference between transudate and exudate.
 - c. Shock – Definition, types of shock with examples: Hypovolemic, cardiogenic and septic shock, stages of shock: Nonprogressive, progressive and irreversible.
 - d. Thrombosis – Definition, mechanism of thrombus formation (Virchow's triad) and fate of thrombus.
 - e. Embolism – Definition and types: Thromboembolism, fat, air and amniotic fluid embolism.
 - f. Infarction – Definition and examples.
- **4. Immune system:**
 - a. Autoimmune diseases – General features, enumerate systemic and organ specific autoimmune diseases.
 - b. Systemic lupus erythematosus – Manifestations and diagnosis.
- **5. Neoplasia:**
 - a. Definition and nomenclature of tumors.
 - b. Differences between benign and malignant neoplasms.
 - c. Enumerate modes of carcinogenesis: Genes, physical, chemical and microbial agents of carcinogenesis.
 - d. Modes of spread of tumors.
 - e. Clinical aspects of neoplasia.
 - f. Grading and staging of cancers.

- g. Laboratory diagnosis of cancer.

Practicals

1. Urine analysis- Physical, Chemical, Microscopic
2. Blood grouping and Rh typing
3. Hb estimation , packed cell volume (PCV), Erythrocyte Sedimentation rate (ESR)
4. Bleeding time and Clotting time

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20

Practicals: record and lab work* 10

*There shall be no university practical examination and internal assessment marks secured in Practical need not be sent to the university.

SCHEME OF EXAMINATION THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Pathology I shall be as given under.

| SUBJECTS HAVING MAXIMUM MARKS= 80 (for first year B.Sc) | | |
|---|------------------|--------------------------|
| Type of Questions | NO. of questions | Marks for Each Questions |
| Essay Type | 3 (2 x 10) | 10 |
| Short Essay Type | 8 (6 x 5) | 05 |
| Short Answer Type | 12 (10 x 3) | 03 |

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | | Grand total |
|--------|-----------|----|-----------|------------|----|-----------|-------------|
| Theory | Viva Voce | IA | Sub Total | Practicals | IA | Sub Total | |
| 80 | - | 20 | 100 | * | | | 100 |

REFERENCE BOOKS:

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques

3. Koss- Cytology
4. Winifred Diagnostic cytopathology
5. Orell Cytopathology
6. Todd and Sanford- clinical diagnosis by Laboratory Medicine
7. Dacie and Lewis- Practical Hematology
8. Ramnik SOOD. Lab technology, Methods and interpretation, 4 th edition JP Bros New Delhi, 1996
9. Sathish Gupta , Short text book of Medical laboratory techniques for technicians
10. Sachdev K N. Clinical Pathology and Bacteriology, 8 th edi JP Bros, New Delhi, 1996

Microbiology I

Theory: 70 Hours
 Practicals: 20 Hours

Microbiology

1. Introduction (6 hrs)

History of Microbiology,

Classification of microorganisms,

Microscope (Different types and uses)

Morphology of bacterial cell.

2. Growth and nutrition (6 hrs)

Growth and Nutrition

Multiplication of bacteria,

Culture media and Culture methods.

3. Sterilization and disinfection (6 hrs)

Principles and use of equipments of sterilization,

Chemicals used in disinfection

4. Biomedical waste management principle and practice

5. Immunology (8 hrs)

Immunity (Innate and Acquired immunity)

Antigen (Definition, types, factors of antigenicity)

Antibody (Properties, Structures Classes of immunoglobulins)

List Antigen antibody reactions.

Vaccines

Immunization schedule

6. Infection (5hrs)

Definition, types and mode of transmission

Hospital infections – causative agents, mode of transmission and prophylaxis

Antimicrobial susceptibility testing

7. Systematic bacteriology (15 hrs)

Disease caused and lab diagnosis of medically important bacteria.

(Staphylococcus, Streptococcus, Gonococcus, Echerichia coli, Klebsiella, Proteus Salmonella, Shigella, Vibrio, Pseudomonas, Mycobacteria, Treponema,)

(No need of classification, antigenic structure, virulence mechanism)

8. Parasitology (10hrs)

Introduction to Parasitology

List of medically important parasites and diseases

(E.histolytica, Plasmodium, Ascaris, Ancylostoma, W.bancrofti, Tape worm)

Lab diagnosis of parasitic infections

9. Virology (10 hrs)

Introduction to virology

List of medically important viruses and diseases

HIV,

Hepatitis,

Rabies,

Polio,

Arboviruses (Chikungunya,Dengue,KFD,)

Lab diagnosis of viral infections

9. Mycology (9 hrs)

Introduction to Mycology

List of medically important fungi and diseases

(Candidiasis, Cryptococcosis, Dermatophytes, Aspergillosis and Mucor mycosis)

Lab diagnosis of fungal infections

10. Automated techniques

PRACTICALS (20hrs)

Compound Microscope

Demonstration and sterilization of equipments

Demonstration of commonly used culture media and media with growth

Antibiotic susceptibility test

Demonstration of common serological tests –widal, VDRL,

Grams stain, Acid fast staining

Stool exam for Helminthic ova

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20

Practicals: record and lab work* 10

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the university.

SCHEME OF EXAMINATION THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology I shall be as given under.

| SUBJECTS HAVING MAXIMUM MARKS= 80 (for first year B.Sc) | | |
|---|------------------|--------------------------|
| Type of Questions | NO. of questions | Marks for Each Questions |
| Essay Type | 3 (2 x 10) | 10 |
| Short Essay Type | 8 (6 x 5) | 05 |
| Short Answer Type | 12 (10 x 3) | 03 |

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | | Grand total |
|---------------|-----------|----|-----------|-------------------|----|-----------|--------------------|
| Theory | Viva Voce | IA | Sub Total | Practicals | IA | Sub Total | |
| 80 | - | 20 | 100 | * | | | 100 |

Reference Books-

1. Ananthanarayana & Panikar Medical Microbiology- University Press
2. Robert Cruickshank- Medical Microbiology- The Practice of Medical Microbiology
3. Chatterjee- Parasitology- Interpretation to Clinical Medicine
4. Rippon- Medical Mycology
5. Emmons- Medical Mycology
6. Basic Laboratory methods in Parasitology, J P Bros, New Delhi
7. Basic Laboratory procedures in clinical bacteriology, J P Bros, New Delhi
8. Medical Parasitology- Ajit Damle
9. Introduction to medical microbiology- Ananthanarayana- Orient Longman Pvt. Ltd

SUBSIDIARY SUBJECTS

ENGLISH

COURSE OUTLINE

COURSE DESCRIPTION: This course is designed to help the student acquire a good command and comprehension of the English language through individual papers and conferences.

BEHAVIOURAL OBJECTIVES:

The student at the end of training is able to

1. Read and comprehend English language
2. Speak and write grammatically correct English
3. Appreciates the value of English literature in personal and professional life.

UNIT - I: INTRODUCTION:

Study Techniques

Organisation of effective note taking and logical processes of analysis and synthesis

Use of the dictionary

Enlargement of vocabulary

Effective diction

UNIT - II: APPLIED GRAMMAR:

Correct usage

The structure of sentences

The structure of paragraphs

Enlargements of Vocabulary

UNIT - III: WRITTEN COMPOSITION:

Precise writing and summarizing

Writing of bibliography

Enlargement of Vocabulary

UNIT - IV: READING AND COMPREHENSION:

Review of selected materials and express oneself in one's words.

Enlargement of Vocabulary.

UNIT - V: THE STUDY OF THE VARIOUS FORMS OF COMPOSITION:

Paragraph, Essay, Letter, Summary, Practice in writing

UNIT - VI: VERBAL COMMUNICATION:

Discussions and summarization, Debates, Oral reports, use in teaching

Scheme of Examination

Written (Theory): Maximum Marks: –80 marks.

No Practical or Viva voce examination

This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35%

REFERENCE

1. English Grammar Collins, Birmingham University, International Language Data Base, Rupa & Co. 1993
2. Wren and Martin - Grammar and Composition, 1989, Chanda & Co, Delhi
3. Letters for all Occasions. A S Myers. Pub - Harper Perennial
4. Spoken English V. Shasikumar and P V Dhanija. Pub. By: Tata Mcgraw Hill, New Delhi
5. Journalism Made Simple D Wainwright
6. Writers Basic Bookself Series, Writers Digest series
7. Interviewing by Joan Clayton Platkon
8. Penguin Book of Interviews.

HEALTH CARE

Teaching Hours : 40

Introduction to Health

Definition of Health, Determinants of Health, Health Indicators of India, Health Team Concept.

National Health Policy

National Health Programmes (Briefly Objectives and scope)

Population of India and Family welfare programme in India

Introduction to Nursing

What is Nursing ? Nursing principles. Inter-Personnel relationships. Bandaging : Basic turns; Bandaging extremities; Triangular Bandages and their application.

Nursing Position, Bed making, prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.

Lifting And Transporting Patients: Lifting patients up in the bed. Transferring from bed to wheel chair. Transferring from bed to stretcher.

Bed Side Management: Giving and taking Bed pan, Urinal : Observation of stools, urine.

Observation of sputum, Understand use and care of catheters, enema giving.

Methods of Giving Nourishment: Feeding, Tube feeding, drips, transfusion

Care of Rubber Goods

Recording of body temperature, respiration and pulse,

Simple aseptic technique, sterilization and disinfection.

Surgical Dressing: Observation of dressing procedures

First Aid :

Syllabus as for Certificate Course of Red Cross Society of St. John's Ambulance Brigade.

Reference Books:

1. Preventive and Social Medicine by J.Park
2. Text Book of P & SM by Park and Park
3. Counseling & Communicate skills for medical and health, Bayne- Orient Longman Pvt. Ltd.

Scheme of Examination

Written (Theory): Maximum Marks: –80 marks.

No Practical or Viva voce examination

This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35%

II YEAR B.Sc. MLT

BIOCHEMISTRY II

No. Theory classes: 100 hours

No. Practical classes: 80 hours

THEORY SYLLABUS

1. Clinical Laboratory [02 hours]

- Responsibilities of health care personnel
- Laboratory hazards – physical, chemical and biological, laboratory safety measures – safety regulations and first aid in laboratory

2. Laboratory apparatus :Different types, use, care and maintenance (Where appropriate, diagrams to be drawn in practical record) [10 hours]

- **Glass ware in laboratory – Significance of boro silicate glass.**
- Plastic ware in laboratory
- Cleaning of glass ware and plastic ware
- Pipettes - Glass and Automated
- Burettes, Beakers, Petri dishes, Porcelain dish
- Flasks - different types (volumetric, round bottomed, Erlenmeyer, conical etc.,)
- Funnels – different types (Conical, Buchner etc.,)
- Bottles – Reagent, Wash bottles
- Measuring cylinders, reagent dispensers
- Tubes – Test tube, Centrifuge tube, Folin-Wu tube
- Cuvettes and its use in measurements , cuvettes for visible and UV range
- Racks – Bottle, Test tube, Pipette and draining racks
- ☐ Tripod stand, Wire gauze, Bunsen burner, Dessicator, Stop watch, timers

3. Instruments: Use, care and maintenance (Where appropriate, pictures/diagrams and schematic diagrams to be drawn in practical record) [17hours]

- Water bath, Oven & Incubators, Distillation apparatus - water distillation plant and water deionisers, Reflux condenser, Cyclomixers , Magnetic stirrer, Shakers
- Refrigerators, Deep freezers, Cold box
- Centrifuges*: Principle, Svedberg unit, centrifugal force, centrifugal field, rpm, Conversion of G to rpm and vice versa) Components, working. Different types of centrifuges
- Laboratory balances*: Physical and analytical. Mono & double pan, Electronic balances. Weighing different types of chemicals, liquids, hygroscopic compounds etc. Precautionary measures while handling (Diagram)
- Photometry - Colorimeter*- Principle, limitations of Beer-lambert's law, components, working.
- pH meter*- Principle, components- pH measuring electrodes, Working, Precautions taken while handling. (Diagram of pH meter) **(*Diagrams mandatory)**

4. Units of measurement [1 hour]

- Metric system. Common laboratory measurements, Prefixes in metric system
- International system of units- SI units- definition, classification, Conversion of conventional and SI Units

5. Fundamental Chemistry[2 hours]

**Valency, Molecular weight & Equivalent weight of elements and compounds.
Normality, Molarity, Molality.**

6. Solutions: Definition, use, classification where appropriate, preparation and storage [7 hours]

- Stock and working solutions.
- Molar and Normal solutions of compounds and acids. (NaCl, NaOH, HCl, H₂SO₄, H₃PO₄, CH₃COOH etc.,)
- Preparation of percent solutions – w/w, v/v w/v (solids, liquids and acids), Conversion of a percent solution into a molar solution

- Saturated and supersaturated solutions

- Standard solutions. Technique for preparation of standard solutions and Storage. E.g: glucose, albumin etc.
- Dilutions- Diluting Normal, Molar and percent solutions. Preparing working standard from stock standard. Part dilutions: Specimen dilutions. Serial dilutions. Reagent dilution. Dilution factors

7. Chemistry of Carbohydrates; [5 hours]

- **Structural properties- Stereoisomerism, optical activity, cyclic structures, mutarotation, epimers.**
- Monosaccharide's of biological importance .Important chemical reactions – formation of furfural derivatives, enediols, osazones, sugar acids, sugar alcohols , Deoxy sugars, Biomedical importance of Amino sugars, glycosides.
- Disaccharides; Properties of Maltose, Lactose, Sucrose. Invert sugars. Biomedical importance of Lactose, sucrose.
- Polysaccharides; Properties of Starch & Glycogen . Biomedical importance of Inulin. Mucopolysaccharides – composition, tissue distribution and functions.

8. Chemistry of amino acids & Proteins ; [6 hours]

- Properties of amino acids- Isomerism, amphoteric nature, and isoelectric pH. Peptide bond formation, Peptides and functions. Color reactions of amino acids . Use of amino acids analysis in diagnosis of diseases.
- Proteins ; Functions, Structure of proteins- Primary, secondary, tertiary, and quaternary.
- Precipitation reactions of proteins.
- Denaturation of proteins.
- Preparation of protein free filtrate for quantitative analysis.

9. Enzymes; [6 hours]

- Definition, Classification, Properties, Mechanism of action, factors affecting enzyme activity , enzyme inhibition. Coenzymes
- Analytical & therapeutic role of enzymes
- Immobilized enzymes

10. Metabolism of carbohydrates; [6 hours]

- Gluconeogenesis
- Glycogen metabolism
- Diabetes mellitus; diagnosis & management
- Principles and procedures for the determination of plasma glucose levels; reductometric & enzymatic methods

- Urinary glucose

11. Metabolism of lipids [3 hours]

Ketogenesis, ketone bodies utilization, ketosis, Rothera's test and its importance

12. Metabolism of amino acids; [7hours]

- Urea cycle and disorders , Blood urea / blood urea nitrogen – clinical importance
- Biosynthesis of creatinine- formation, clinical importance
- Principles and procedures for the determination of Blood urea nitrogen and Creatinine; Colorimetric & enzymatic methods.

13. Specimen Collection ; [4 hours]

- Capillary, Arterial , Venous blood collection techniques,
- Anticoagulants used
- Various types Urine sample collections (Random, times, 24 hrs etc)
- Preservatives used , storage of samples,
- Disposal

14. .Urine analysis; [4 hours]

- Physical characteristics,
- Chemical examination of normal urine
- Abnormal constituents of urine

15. Techniques ; [10 hours]

- Spectrophotometry-Principle, Instrumentation, Operation, Applications, care & maintenance, Standardization
- Reflectance photometry-Principle, Instrumentation, Applications
- Turbidimetry & Nephelometry-Principle, Instrumentation, Applications
- Glucometers-Principle, Instrumentation, Applications
- Chromatography – Paper & TLC- Principle, Instrumentation, Applications
- Electrophoresis – agarose and SDS-PAGE

ASSIGNMENT TOPIC;

- Oral glucose tolerance test
- Glycated HbA1c

- Microalbuminuria

PRACTICALS;

I. PRACTICAL APPROACH TO BASIC LABORATORY PRACTICES

1. Pipetting techniques

2. Operation of the instruments

- Analytical balance
- pH meter
- Centrifuges
- Urinometer, Esbach' s albuminometer

3. Techniques of preparation of Solutions & reagents;

- Normal, Molar,
- Percent (Na_2CO_3 , NaCl, NaOH, KCl, HCl, H_2SO_4 , H_3PO_4 , CH_3COOH , sodium tungstate
- Buffers (Phosphate buffer, Citrate buffer)
- Standard solutions – Glucose, urea, creatinine, Total protein etc

4. Dilution Techniques;

- Dilution of stock standard ,
- Dilution of acids
- Part Dilution of the body fluids

5. Determination of pH ;

II. QUALITATIVE;

1. Color reactions – known test solution

- Carbohydrates; Glucose, Fructose , Sucrose, Starch, Lactose, Maltose
- NPN- Urea, creatinine, Uric acid
- Albumin, Casein

2. Precipitation reactions

- Albumin, Casein
- Preparation of protein free filtrates for quantitative analysis of - Glucose,

urea, creatinine, uric acid estimations

3. **Identification of unknown carbohydrate**
4. **Identification of unknown protein**
5. **Urine Analysis; normal and Abnormal**

III. QUANTITATIVE;

1. **Operation of colorimeter / spectrophotometer;**
2. **Quantitative estimations by manual methods- Preparation of calibration curve, & estimation of unknown analyte concentration.**
 - **Blood glucose by Glucose oxidase – peroxidase method**
 - Blood urea by DAM method
 - Serum & urine creatinine by Jaffe’s method. Determination of creatinine clearance
 - Serum uric acid by commercially available kit method

PRACTICAL DEMONSTRATION;

1. Paper chromatography of amino acids
2. Dipsticks for urine analysis

Total theory hours; 100

INTERNAL ASSESSMENT

| | |
|-------------------------------------|----|
| Theory-average of 2 exams conducted | 20 |
| Practicals: record and lab work* | 20 |

SCHEME OF EXAMINATION -THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry II shall be as given under.

| TYPE OF QUESTION | NUMBER OF QUESTIONS | MARKS | SUB-TOTAL |
|------------------|---------------------|-------|-----------|
|------------------|---------------------|-------|-----------|

| | | | |
|--------------|-----------------|--------|----|
| Long essay | 3 (attempt 2) | 2 x 10 | 20 |
| Short essay | 8 (attempt 6) | 6 x 5 | 30 |
| Short answer | 12 (attempt 10) | 10 x 3 | 30 |
| GRAND TOTAL | | | 80 |

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for Biochemistry II Practical shall be as follows: Distribution of marks

| Type of Question | Marks allotted |
|-------------------------|----------------|
| Quantitative estimation | 30 |
| Qualitative estimation | 30 |
| Urine examination | 20 |
| Total | 80 |

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | | Grand total |
|--------|-----------|----|-----------|------------|----|-----------|-------------|
| Theory | Viva Voce | IA | Sub Total | Practicals | IA | Sub Total | |
| 80 | - | 20 | 100 | 80 | 20 | 100 | 200 |

Text Book References

- Biochemistry – 3rd revised edition by U Sathyanarayana & U Chakrapani
- Textbook of Biochemistry (For Medical Students)-5th Edition by DM Vasudevan & Sreekumari S
- Textbook of Medical Biochemistry-6th Edition by MN Chatterjea & Rana Shinde
- Textbook of Medical Laboratory technology 2nd edition by Godkar and Godkar.
- Biochemistry-3rd edition by Pankaja Naik
- Medical Laboratory technology 6th edition by Ramnik Sood.
- Manipal Manual of Clinical Biochemistry for medical laboratory and M.Sc., students-3rd edition by Shivananda Nayak B
- Varley's Practical Clinical Biochemistry, 4th, 5th and 6th editions
- Clinical Chemistry, Theory, Analysis, Correlation-4th edition by Lawrence A Kaplan
- Tietz Textbook of Clinical Chemistry 3rd edition by Burtis, Ashwood and Bruns
- Clinical Chemistry-Principles, procedures, correlations- 5th edition by Michael L. Bishop, Edward P. Fody and Larry Schoeff.
- Practical Clinical Biochemistry, methods and interpretation –2nd edition by Ranjna Chawla

MICORBIOLOGY II

Theory - 120 hrs.

(IMMUNOLOGY,SYSTEMATIC BACTERIOLOGY AND PARASITOLOGY)

I IMMUNOLOGY

(40hrs)

1. Immune system

- Cell development
- B lymphocytes(general knowledge of their role)
- T lymphocytes

- Natural killer cells

-

2. Immune responses

- Humoral immunity
- Cell mediated immunity
- Antigen and antibody
- Primary and secondary responses
- Theories of antibody productions
- Monoclonal antibodies(production and applications)

3. Antigens

- Antigen(definition,types,factors of antigenicity)

4. Antibodies

- Properties of antibodies(immunoglobulins)
- Structures of immunoglobulin
- Classes of immunoglobulins

5. Antigen-antibody reactions

- Precipitation
- Agglutination
- ELISA
- Immunofluorescence and miscellaneous tests

6. Complement system

- Classical pathway
- Alternative pathway
- Biological effects of complement
- Regulation of complement activation

7. Hypersensitivity reactions

Immediate and delayed type

8. Autoimmunity

9. Transplantation and malignancy

10. Immunodeficiency diseases

II Systematic bacteriology

(50hrs)

Biochemical reactions for identification of bacteria

Antimicrobial susceptibility testing

Normal flora of the human body

Gram positive bacteria: systematic study of the following bacteria with special reference to morphology, cultural characteristics, pathogenicity, lab diagnosis and prophylaxis-

- Staphylococcus
- Streptococcus
- Pneumococcus
- Corynebacterium
- Bacillus
- Mycobacterium
- Clostridium
- Actinomycetes

Gram negative bacteria:

- Neisseria
- Haemophilus, Bordetella, Brucella
- Enterobacteriaceae, Salmonella, Shigella
- Vibrio, Campylobacter, Helicobacter
- Pseudomonas, Burkholderia and non fermenters
- Yersinia

Spirochetes:

- Treponemes, Leptospira & Borrelia

Bacteriology of water, milk and air

III PARASITOLOGY

(30 hrs.)

1. Protozoology

Entamoeba, Balantidium coli

Trichomonas, Giardia, Leishmania, Trypanosoma

Malaria, Toxoplasma

Cryptosporidium, Microsporidium, Isospora, Cyclospora

2. Helminthology

- **Cestodes**-Taenia, Echinococcus, D. latum, H. nana
- **Trematodes**-Schistosoma, Fasciola
- **Nematodes**-
Ascaris, Ancylostoma, Enterobius, Strongyloides, Trichuris, Trichinella, Dracunculus, Wuchereria and other filarial worms

Lab diagnosis of parasitic infections

Arthropods of medical importance

PRACTICALS: (20 hrs.)

1. Gram staining, ZN stain, Albert stain
2. Hanging drop preparation
3. Culture methods
4. Introduction to biochemical reactions
5. Identifications of pure culture based on morphology, colony characteristics, motility, biochemical reaction and anti biogram
6. Antibiotic sensitivity testing- Kirby-Bauer method
7. Stool examination
8. Saline mount
9. Iodine mount
10. Peripheral smear examination for malaria and filariasis

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20

Practicals: record and lab work* 20

SCHEME OF EXAMINATION -THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology II shall be as given under.

| TYPE OF QUESTION | NUMBER OF QUESTIONS | MARKS | SUB-TOTAL |
|------------------|---------------------|--------|-----------|
| Long essay | 3 (attempt 2) | 2 x 10 | 20 |
| Short essay | 8 (attempt 6) | 6 x 5 | 30 |
| Short answer | 12 (attempt 10) | 10 x 3 | 30 |
| GRAND TOTAL | | | 80 |

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for Microbiology II Practical shall be as follows: Distribution of marks

| Type of Question | Marks allotted |
|------------------------------|----------------|
| Spotters | 20 |
| ZN staining | 10 |
| Pure culture of the organism | 25 |
| Stool examination | 15 |
| Record | 10 |
| Total | 80 |

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | | Grand total |
|--------|-----------|----|-----------|------------|----|-----------|-------------|
| Theory | Viva Voce | IA | Sub Total | Practicals | IA | Sub Total | |
| 80 | - | 20 | 100 | 80 | 20 | 100 | 200 |

B.Sc Medical Laboratory Technology

2nd year

PATHOLOGY II

No. Theory classes: 100 hours

No. Practical classes: 80 hours

Theory:-

Histopathology and Hematology

Histopathology 40 hours

- Introduction to Histopathology
- Receiving specimens in the laboratory
- Grossing techniques
- Mounting techniques- various mountants
- Maintenance of records and filing of slides
- Various fixatives, mode of action, preparation and indications
- Section cutting
- Tissue processing for routine paraffin sections
- Decalcification of tissues
- Staining of tissues-H & E Staining
- Freezing microtome and Cryostat
- Automatic slide stainer

Staining techniques: Special stains for Carbohydrates, Connective tissue, Nervous tissue, Bone tissue, Collage fibers, Elastic Fibers, Lipids, Organisms, fungi, parasites, pigments and deposits in tissues

HAEMATOLOGY 30 hrs

1. Anaemia: Definition and classification, Red cell indices.
2. Determination of haemoglobin by various method
3. PCV and ESR 1hr
4. WBC Count, Absolute Eosinophil count and platelet count 2hr
5. Preparation of Peripheral smear 1hr
6. Leishman's stain and Differential Leucocyte count 1hr
7. Description of Poikilocytes and RBC Inclusions 1hr

8. Microcytic Hypochromic anaemia: causes and investigations 1hr
 - i. Stages of iron deficiency anaemia
 - ii. Peripheral smear in iron deficiency anaemia
 - iii. Laboratory diagnosis
9. Macrocytic anaemia: Megaloblastic anaemia 1hr
 - i. Causes
 - ii. Blood and bone marrow picture
 - iii. Laboratory diagnosis
10. Hemolytic anaemia: classification and approach to the diagnosis. 1hr
11. Reticulocyte count 1hr
12. Osmotic Fragility test 1hr
13. Coomb's test 1hr
14. Sickling test and Hb Electrophoresis 1hr

15. Normal bone marrow, Indications and methods of collection(Aspiration and trephine Biopsy) Including dry tap 1hr

| | |
|--|-----|
| 16. Methods of preparation of Bone marrow smear and definition of; | 1hr |
| i. Imprint smear | |
| ii. Direct smear | |
| iii. Crushed smear | |
| iv. Cell block | |
| 17. Leukaemia: Definition and FAB & WHO Classification | 1hr |
| 18. Blood picture & BM picture in Acute Leukemia. | 1hr |
| i. WHO Criteria | |
| ii. Morphology of myeloblast & Auer rods | |
| iii. Sub Leukaemia & aleukaemia Definition | |
| 19. Blood picture in chronic leukaemia | 1h |
| 20. Cytochemistry in Leukemias. | 1h |
| 21. Demonstration of LE cells. | 1hr |

Practicals:

1. Paraffin section cutting
2. Staining by Hematoxylin & Eosin and other special stains
3. Determination of Hemaglobin and Hematocrit
4. Red blood cell count
5. Total white blood cell count
6. Platelet count
7. Differential count of white blood cells
8. Absolute Eosinophil count
9. Reticulocyte count
10. Calculation of red cell indices
11. Determination of ESR
12. Determination of BT, CT, Whole blood clotting time
13. Determination of PT and PTT
14. Blood smear preparation and staining

INTERNAL ASSESSMENT

| | |
|-------------------------------------|----|
| Theory-average of 2 exams conducted | 20 |
| Practicals: record and lab work * | 20 |

Scheme of examination: Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Pathology II shall be as given under.

| TYPE OF QUESTION | NUMBER OF QUESTIONS | MARKS | SUB- TOTAL |
|-------------------|---------------------|--------|------------|
| LONG ESSAY (LE) | 3 (to attempt 2) | 2 x 10 | 20 |
| SHORT ESSAY (SE) | 8 (to attempt 6) | 6 x 5 | 30 |
| SHORT ANSWER (SA) | 12 (to attempt 10) | 10 x 3 | 30 |
| GRAND TOTAL | | | 80 |

Scheme of Examination: Practical

Distribution of marks

| Type of Question | Marks allotted |
|---|----------------|
| Haematoxylin and eosin or a special stain | 10 |
| Haemoglobin or PCV | 10 |
| Total count | 10 |
| Differential count | 10 |
| ESR | 10 |
| PS preparation and staining | 10 |
| Record | 10 |
| Spotters | 10 |
| Total | 80 |

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | | Grand total |
|--------|-----------|----|-----------|------------|----|-----------|-------------|
| Theory | Viva Voce | IA | Sub Total | Practicals | IA | Sub Total | |
| 80 | - | 20 | 100 | 80 | 20 | 100 | 200 |

SUBSIDIARY SUBJECTS

SOCIOLOGY

Teaching Hours: 20

Course Description

This course will introduce student to the basic sociology concepts, principles and social process, social institutions [in relation to the individual, family and community and the various social factors affecting the family in rural and urban communities in India will be studied.

Introduction:

Meaning – Definition and scope of sociology

Its relation to Anthropology, Psychology, Social Psychology

Methods of Sociological investigations – Case study, social survey, questionnaire, interview and opinion poll methods.

Importance of its study with special reference to health care professionals

Social Factors in Health and Disease:

Meaning of social factors

Role of social factors in health and disease

Socialization:

Meaning and nature of socialization

Primary, Secondary and Anticipatory socialization

Agencies of socialization

Social Groups:

Concepts of social groups, influence of formal and informal groups on health and sickness. The role of primary groups and secondary groups in the hospital and rehabilitation setup.

Family:

The family, meaning and definitions

Functions of types of family

Changing family patterns

Influence of family on individual's health, family and nutrition, the effects of sickness in the family and psychosomatic disease and their importance to physiotherapy

Community:

Rural community: Meaning and features – Health hazards to rural communities, health hazards to tribal community.

Urban community – Meaning and features – Health hazards of urbanities

Culture and Health:

Concept of Health

Concept of culture

Culture and Health

Culture and Health Disorders

Social Change:

Meaning of social changes
Factors of social changes
Human adaptation and social change
Social change and stress
Social change and deviance
Social change and health programme
The role of social planning in the improvement of health and rehabilitation
Social Problems of disabled:
Consequences of the following social problems in relation to sickness and disability remedies to prevent these problems
Population explosion
Poverty and unemployment
Beggary
Juvenile delinquency
Prostitution
Alcoholism
Problems of women in employment

Social Security:

Social Security and social legislation in relation to the disabled

Social Work:

Meaning of Social Work
The role of a Medical Social Worker

Reference Books:

1. Sachdeva & Vidyabhushan, Introduction to the study of sociology
2. Indrani T.K., Text book of sociology for graduates nurses and Physiotherapy students, JP Brothers, New Delhi 10

Scheme of Examination

Written (Theory): Maximum Marks: –80 marks.

No Practical or Viva voce examination

This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35%

INDIAN CONSTITUTION

Prescribed for the First Year students of all degree classes

Unit-I: Meaning of the term 'Constitution'. Making of the Indian Constitution 1946-1950.

Unit-II: The democratic institutions created by the constitution Bicameral system of Legislature at the Centre and in the States.

Unit-III: Fundamental Rights and Duties their content and significance.

Unit – IV: Directive Principles of States Policies the need to balance Fundamental Rights with Directive Principles.

Unit – V: Special Rights created in the Constitution for: Dalits, Backwards, Women and Children and the Religious and Linguistic Minorities.

Unit-VI: Doctrine of Separation of Powers legislative, Executive and Judicial and their functioning in India.

Unit – VII: The Election Commission and State Public Service commissions.

Unit – VIII: Method of amending the Constitution.

Unit – IX: Enforcing rights through Writs:

Unit – X: Constitution and Sustainable Development in India.

Reference Books: 1. J.C. Johari: The Constitution of India- A Politico-Legal Study-Sterling Publication, Pvt. Ltd. New Delhi.

2. J.N . Pandey: Constitution Law of India, Allahbad, Central Law Agency, 1998.

3. Granville Austin: The Indian Constitution – Corner Stone of a Nation-Oxford, New Delhi, 2000.

ENVIRONMENT SCIENCE AND HEALTH

Introduction to Environment and Health

Sources, health hazards and control of environmental pollution

Water

The concept of safe and wholesome water.

The requirements of sanitary sources of water.

Understanding the methods of purification of water on small scale and large scale.

Various biological standards, including WHO guidelines for third world countries.

Concept and methods for assessing quality of water.

Domestic refuse, sullage, human excreta and sewage their effects on environment and health, methods and issues related to their disposal.

Awareness of standards of housing and the effect of poor housing on health.

Role of arthropods in the causation of diseases, mode of transmission of arthropods borne diseases, methods of control

Recommended Books.

1.Text Book of Environmental Studies for under gradute courses By Erach

Bharucha Reprinted in 2006, Orient Longman Private Limited /Universities Press India Pvt. Ltd.

III year - B.Sc. MLT

Biochemistry III

No. Theory classes: 100 hours

No. Practical classes: 80 hours

THEORY SYLLABUS

1. Laboratory Management [6 hours]

- **Soft skills in patient handling**
- Clinical automation- different types of automation
- Quality assurance in clinical laboratory- control of Pre analytical, analytical & post analytical variables
- General approach to quality control . Commonly used terms; accuracy, precision specificity, sensitivity, mean , standard deviation, co-efficient variation ,bias, errors etc
- Preparation of quality control sera, internal quality control, control charts & Westgard rules
- External quality control
- Biological reference intervals

2. Techniques: Principle, instrumentation, application [14 hours]

- Atomic absorption spectrophotometry
- Potentiometry, Ion selective electrodes
- Agarose gel electrophoresis
- Immunochemical assays; RIA, ELISA, Chemiluminescence
- Osmometry
- Arterial Blood Gas analyzer
- HPLC, Mass Spectrometry
- Capillary Electrophoresis

3. Clinical enzymology [4 hours]

- Sources of Plasma enzymes. Units of enzyme activity
- Diagnostic importance of enzymes
- Isoenzymes, cardiac troponins

4. Plasma proteins [4 hours]

- Total proteins
- Functions & clinical importance of- albumin , Globulins – acute phase proteins (CRP, Ceruloplasmin, AAT, Immunoglobulins) . Genetic deficiency & disorders
- Electrophoretic separation of plasma proteins .-pattern, interpretation , reference intervals etc

5. Metabolism of Carbohydrates; [8 hours]

- HMP shunt Pathway & its significance
- Uronic acid pathway
- Metabolism of Galactose & Fructose and associated disorders
- Glycogen storage disorders
- Sorbitol pathway
- OGTT, OGCT, HbA1c

6. Lipid metabolism [6 hours]

- Cholesterol pool; Body cholesterol & and cellular. Excretion of cholesterol.
- Lipoproteins;
 - Classification based on separation and Electrophoretic mobility.
 - Functions & Metabolism
 - Hyperlipoproteinemias
 - Lipid profile, atherosclerosis & coronary artery diseases

7. Amino acid metabolism [6 hours]

- Catabolism of Branched chain amino acids, Phenyl alanine / tyrosine metabolism .
- Pathway disorders; Phenyl ketonuria, Alkaptonuria, Maple syrup urine diseases

8. Metabolism of nucleic acids [4 hours]

- Outline of Purine metabolism and associated disorders

- Outline of Pyrimidine metabolism and associated disorders

9. Molecular genetics [10 hours]

- Salient features of genetic code
- Protein biosynthesis – eukaryotic
- Semiconservative DNA replication, Transcription , Translation
- Mutations & cancer

10. Tumor markers [4 hours]

- Definition, Classification, and clinical applications.
- Overview of specific tumor markers; AFP, CEA, CA-125, PSA, ALP, hCG

11. Acid base balance [6 hours]

- Regulation of pH
- Disorders
- Blood gases; symbols, reference intervals for arterial blood gasses, procedure for arterial blood collection , preanalytical variables

12. Liver function tests [4 hours]

- Role of liver in metabolism , functions of liver
- Liver enzymes
- Formation of Bilirubin
- Jaundice
- Panel of Liver function tests in clinical laboratory
- Formation & analysis of gall stones.

13. Pancreatic function tests [2 hours]

- Functions of pancreas, Composition of Pancreatic juice
- Clinical utility of enzyme determination in pancreatitis

14. Thyroid function tests [2 hours]

- Overview of Functions of Thyroid Hormones
- Clinical utility and methods for the measurement of Circulating thyroid hormones.

15. Renal function tests & Renal Calculi [4 hours]

- Glomerular function test ; Clearance tests (Urea, creatinine, Inulin clearance tests)
- Tests for tubular function ; Concentration and dilution tests, Measurement of specific gravity and osmolality
- Urinary acidification tests; ammonium chloride loading test.
- Microalbuminuria and it's importance

- Formation & analysis of Renal calculi

16. Cardiac markers [2 hours]

- Chemistry & overview of cardiac markers
- Diagnostic & prognostic use of cardiac markers
- Laboratory evaluation.

17. Overview of Body Fluids ; [1 hour]

- Quantitative analysis of different types of fluids; CSF, Synovial, peritoneal, Pleural, pericardial and Ascitic fluids.

18. Measurements in clinical laboratory ; [6 hours]

- Quantitative estimations; Selecting a method, linearity of a method, end point and rate reaction methods.
- Checking accuracy & precision.
- Calibration; Preparation of calibration curve, importance of calibration curve
- Techniques of preparation of calibration curve using stock standard solutions.
- Graphic representation of calibration.

19. Specimen collection; [1 hour]

- Color Codes of vacutainer tubes and its uses
- Order of sample draw

ASSIGNMENT TOPIC; [6 hours]

- Laboratory design
- Laboratory safety & first aid in laboratory
- Point care of testing

PRACTICALS;

I. QUALITATIVE;

- 1. Renal calculi**
- 2. Gall stone analysis**
- 3. Urine Analysis;** normal and Abnormal
- 4. Spot test for; Phenyl ketonuria , Alkaptonuria, MSUD**

II. QUANTITATIVE;

- 1. Concept of preparation of buffered substrate, use of control serum**
- 2. Quantitative estimations by manual methods- Preparation of calibration curve, & estimation of unknown analyte concentration.**
 - Total protein & albumin by Biuret method & calculation of A/G ratio**
 - Albumin by BCG (Bromo cresol green) method.
 - Total & conjugated bilirubin by Malloy & Evelyn method
 - AST and ALT by IFCC kit method
 - ALP by DEA kit method.
 - Serum amylase by (CNP3) substrate method
 - Serum calcium by kit method
 - Phosphate in the serum by Fiske Subbarow method(care & cleaning of tubes before and after analysis)
 - Serum Chloride by method of Schales & Schales

III. PRACTICAL DEMONSTRATION;

1. Electrolyte & Arterial blood gas measurements
2. Agarose gel electrophoresis for serum proteins
3. Automated analyzers
4. Semi automated and automated methods for
 - Lipid profile,
 - T3, T4, TSH
 - Troponin T or I , CK, Ck-MB

IV. CASE REPORTS;

- Inborn errors of Galactose, pentose, Fructose.
- OGTT curves
- Jaundice
- Acid base imbalances
- Electrophoretogram- normal, abnormal
- Cardiac markers
- Lipid disorders
- Tumor markers

Total theory hours; 100

Practical; 80

SCHEME OF EXAMINATION THEORY;

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry II shall be as given under.

| TYPE OF QUESTION | NUMBER OF QUESTIONS | MARKS | SUBTOTAL |
|--------------------|---------------------|--------------|-----------|
| Long essay type | 3 (attempt 2) | 2x 10 | 20 |
| Short essay type | 8 (attempt 6) | 6x5 | 30 |
| Short answer | 12 (attempt 10) | 10x3 | 30 |
| GRAND TOTAL | | | 80 |

SCHEME OF EXAMINATION PRACTICAL

The scheme of examination for Biochemistry II practical shall be as follow ;

Distribution of Marks

| TYPE OF QUESTION | MARKS ALLOTTED |
|-------------------------|----------------|
| Quantitative estimation | 30 |
| Renal calculi | 20 |
| Urine examination | 20 |
| Case reports | 10 |

| | |
|--------------|-----------|
| Total | 80 |
|--------------|-----------|

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | |
|--------|-----------|----|-----------|------------|----|-----------|
| Theory | Viva Voce | IA | Sub total | Practicals | IA | Sub total |
| 80 | ---- | 20 | 100 | 80 | 20 | 100 |

Text Book References

- Biochemistry –by U Sathyanarayana & U Chakrapani
- Textbook of Medical Biochemistry by D.M Vasudeva & Sreekumari S
- Textbook of Medical Biochemistry- by MN Chatterjea & Rana Shinde
- Textbook of Medical Laboratory technology by Godkar and Godkar.
- Biochemistry- by Pankaja Naik
- Medical Laboratory technology by Ramnik Sood.
- Manipal Manual of Clinical Biochemistry for medical laboratory and M.Sc., students- by Shivananda Nayak B
- Varley's Practical Clinical Biochemistry
- Clinical chemistry ,theory, analysis, correlation , by Lawrence A Kaplan

- Tietz textbook of clinical chemistry by Burtis , Ashwood and Burns .

- Biophysical chemistry – principles & techniques by Uphadhay
- Clinical diagnosis and management by laboratory methods, John Bernald Henry

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20

Practicals: record and lab work* 20

SCHEME OF EXAMINATION -THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry III shall be as given under.

| TYPE OF QUESTION | NUMBER OF QUESTIONS | MARKS | SUB-TOTAL |
|------------------|---------------------|--------|-----------|
| Long essay | 3 (attempt 2) | 2 x 10 | 20 |
| Short essay | 8 (attempt 6) | 6 x 5 | 30 |
| Short answer | 12 (attempt 10) | 10 x 3 | 30 |
| GRAND TOTAL | | | 80 |

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for Biochemistry III Practical shall be as follows: Distribution of marks

| Type of Question | Marks allotted |
|---|----------------|
| Quantitative estimation | 30 |
| Renal Calculi | 20 |
| Spotters (from the practical demonstration section) | 10 |
| Case Reports | 20 |
| Total | 80 |

Split up fo marks for experiments:

Qualitative:

Carrying out color reactions of the given solution + Bench viva

| | |
|----------------------|-----------------------|
| II yr B.Sc., | 8 mks + 2 mks |
| III yr B.Sc., | 15 mks + 5 mks |

Quantitative:

a. Writing principle & procedure before conducting the experiment

| | |
|----------------------|--------------|
| II yr B.Sc., | 3 mks |
| III yr B.Sc., | 5 mks |

b. Standardisation of expt & determining unknown concentration+ Bench viva

| | |
|----------------------|-----------------------|
| II yr B.Sc., | 25mks + 2 mks |
| III yr B.Sc., | 40 mks + 5 mks |

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | | Grand total |
|--------|-----------|----|-----------|------------|----|-----------|-------------|
| Theory | Viva Voce | IA | Sub Total | Practicals | IA | Sub Total | |
| 80 | - | 20 | 100 | 80 | 20 | 100 | 200 |

Text Book References

- Biochemistry – 3rd revised edition by U Sathyanarayana & U Chakrapani
- Textbook of Biochemistry (For Medical Students)-5th Edition by DM Vasudevan & Sreekumari S
- Textbook of Medical Biochemistry-6th Edition by MN Chatterjea & Rana Shinde
- Textbook of Medical Laboratory technology 2nd edition by Godkar and Godkar.
- Biochemistry-3rd edition by Pankaja Naik
- Medical Laboratory technology 6th edition by Ramnik Sood.
- Practical Clinical Biochemistry, methods and interpretation –2nd edition by Ranjna Chawla
- Varley's Practical Clinical Biochemistry, 4th, 5th and 6th editions
- Clinical Chemistry, Theory, Analysis, Correlation-4th edition by Lawrence A Kaplan
- Tietz Textbook of Clinical Chemistry 3rd edition by Burtis, Ashwood and Bruns
- Clinical Chemistry-Principles, procedures, correlations- 5th edition by Michael L. Bishop, Edward P. Fody and Larry Schoeff.
- Biophysical chemistry-Principles and Techniques by Upadhyay, Upadhyay and Nath
- Clinical Diagnosis and management by laboratory methods 20th edition by John Bernard Henry
- Mark's Basic Medical Biochemistry- A clinical approach 2nd Edition by Smith, Marks and Lieberman

MICROBIOLOGY III

Theory - 100 hrs.

(Virology, Mycology and Clinical Microbiology)

1.Virology

(50 hrs)

- General properties of virus,cultivation of viruses
- Virus host interaction
- Bacteriophage
- Pox viruses
- Herpes viruses(HSV,Varicella-Zoster,Cytomegalo virus,Epstein-B arr virus)
- Adeno viruses
- Picornaviruses
 - a) Enteroviruses(Polio virus,Echo viruses)
 - b) Rhinoviruses
- Orthomyxo viruses(Influenza virus)
- Paramyxo viruses(Parainfluenza virus,Mumps,Measles,RSV)
- Arboviruses
 - a) Discuss in detail Chikungunya,Dengue,KFD
 - b) Enumerate remaining arbovirus with disease caused
 - Rhabdoviruses
 - Hepatitis viruses
 - HIV
 - Papova virus,Parvovirus,Corona virus
 - Rubivirus,Reoviridae

- Viruses causing gastroenteritis
- Rotavirus
- Viral haemorrhagic fevers, SARS, Slow viruses
- Oncogenic viruses

II Mycology

(30 hrs)

1.Introduction to Mycology,Classification

2.Lab diagnosis of fungal infections

3.Mycoses

a. Superficial Mycoses

Malassezia furfur,T.nigra,T.piedra

b.Dermatophytes

c.Subcutaneous mycoses

Mycetoma,Rhinosporidiosis,Sporotrichosis,Chromomycosis

d.Systemic mycoses

Histoplasmosis,Blastomycosis,Coccidioidomycosis,Paracoccidioidomycosis

e.Opportunistic fungi

Aspergillosis,Penicillosis,Zygomycosis,Pneumocystis

f.Candidiasis ,Cryptococcosis

4.Mycotoxins and antifungal agents

III Clinical Microbiology

(20 hrs)

- Normal microbial flora of the human body
- UTI,Diarrhoeal diseases and food poisoning,Meningitis,Sexually transmitted diseases,pyogenic infections,Hospital infections
- Biomedical waste management
- Automated techniques in diagnosis of microorganism

PRACTICALS

20 hrs.

1.Immunology: Serological tests

Principle,procedure,normal values,significant titre,interpretation and limitation of the following tests

WIDAL, Brucella

VDRL,RPR

ASO,CRP,RF

ELISA for HbsAg,HIV

2.Virology

Demonstration of embryonated egg inoculation/animals/inclusion bodies

Virology exercise

ELISA(HIV,HBV)

Western blot

Spot test(Tri dot/immune comb test)

3.Mycology

Slide culture technique

KOH mount

Identification of fungal culture

Macroscopic and microscopic examination of Candida, Cryptococcus/ Dermatophytes, Aspergillus,Rhizopus, Mucor, Penicillium

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20

Practicals: record and lab work* 20

SCHEME OF EXAMINATION -THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology III shall be as given under.

| TYPE OF QUESTION | NUMBER OF QUESTIONS | MARKS | SUB-TOTAL |
|------------------|---------------------|--------|-----------|
| Long essay | 3 (attempt 2) | 2 x 10 | 20 |
| Short essay | 8 (attempt 6) | 6 x 5 | 30 |
| Short answer | 12 (attempt 10) | 10 x 3 | 30 |
| GRAND TOTAL | | | 80 |

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for Microbiology III Practical shall be as follows: Distribution of marks

| Type of Question | Marks allotted |
|-----------------------------|----------------|
| Virology exercise | 10 |
| Mycology 2 exercise | 15 |
| Serology(Widal/ Brucella) | 15 |
| Serology (ASO/ CRP RPR/ RF) | 10 |
| Spotters | 20 |
| Record | 10 |
| Total | 80 |

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | | Grand total |
|--------|-----------|----|-----------|------------|----|-----------|-------------|
| Theory | Viva Voce | IA | Sub Total | Practicals | IA | Sub Total | |
| 80 | - | 20 | 100 | 80 | 20 | 100 | 200 |

PATHOLOGY III

Cytology, Hematology , Immunohaematology and Blood transfusion

No. Theory classes: 100 hours

No. Practical classes: 80 hours

Cytology

1. Normal cell structure, functions, cytologic criteria of malignancy
2. Types of specimens, methods of collection & preparation of cell block
3. Different fixatives and methods of fixation
4. Staining : (a) Papanicolaou's stain- principle , preparation and staining techniques
(b) May Grunwald Giemsa stain
5. PAP smear techniques and clinical significance.

HAEMATOLOGY (10 HRS)

- | | |
|--|-----|
| 1. Normal Haemostasis and coagulation pathway | 1hr |
| 2. Classification of bleeding disorders. | 1hr |
| 3. Investigations of Haemostatic mechanism | 1hr |
| i. Anticoagulants used. | |
| ii. BT & CT | |
| 4. PT , APTT and INR | 1hr |
| 5. DIC | 1hr |
| 6. Test for fibrinolytic activity : Euglobulin , clot lysis test & FDP | 2hr |
| 7. Platelet function test :different tests and indications | 1hr |

BLOOD BANKING (15HRS)

- | | |
|--|-----|
| 8. Blood bank organisation and legal requirements. | 1hr |
| 9. Blood group systems & terminologies used in major and minor blood group systems | 1hr |

| | |
|---|-----|
| 10. Principles of blood grouping | 2hr |
| . Landsteiner's Law | |
| i. Forward & Reverse grouping. | |
| 11. Pre transfusion testing: Cross matching –Saline, coomb's ,enzyme, Albumin | 2hr |
| 12. Coomb's test: Direct & Indirect | 1hr |
| 13. Test for Transfusion transmitted diseases | 1hr |
| 14. Blood Components: Preparation, storage and shelf life | 1hr |
| 15. Blood transfusion reactions: Definition ,Classification &workup | 2hr |
| 16. Autologous transfusion | 1hr |
| 17. HDN | 1hr |
| 18. Hemovigilance | 1hr |

QUALITY CONTROL (3HRS)

| | |
|---|-----|
| 19. Quality Control in Haematology ; Discuss on | 1hr |
| i. IQC | |
| ii. EQAS | |
| iii. Quality assurance | |
| iv. Calibration | |
| 20. Quality control in blood bank | 2hr |
| i. Whole blood, PRBC, FFP, Platelet | |
| ii. Avidity and Sensitivity | |

Cytogenetics

1. Introduction to cytogenetics, terminology , classification and nomenclature of human chromosomes
2. Methods of karyotypic analysis

- (a) Culture of bone marrow cells, peripheral blood lymphocytes, solid tumors & skin fibroblasts
 Direct preparation from tumor materials
 3. Characterization of human chromosomes by various banding techniques
 4. Sex chromatin identification
 5. Chromosomes in neoplasia and oncogenes

Tissue culture

1. Equipments for Tissue culture studies
 (a) Laminar air flow equipment
 (b) Carbon dioxide incubator
 (c) Inverted microscope
 2. Derivation of culture from tissue- in brief
 3. Characterization of cell lines-in brief
 4. Preservation of Immortalized cell lines- in brief

Practicals

- Preparation of various cytology smears and fixation
 1. Papanicolaou's and May Grunwald Geimsa staining
 2. Hormonal cytology study
 3. Blood grouping and Rh typing
 4. Cross matching techniques
 5. Screening of Donor's blood for infective agents
 6. Transfusion reaction work up
 7. Preparation of blood components

INTERNAL ASSESSMENT

- Theory-average of 2 exams conducted 20
 Practicals: record and lab work* 20

SCHEME OF EXAMINATION -THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Pathology III shall be as given under.

| TYPE OF QUESTION | NUMBER OF QUESTIONS | MARKS | SUB-TOTAL |
|------------------|---------------------|--------|-----------|
| Long essay | 3 (attempt 2) | 2 x 10 | 20 |
| Short essay | 8 (attempt 6) | 6 x 5 | 30 |

| | | | |
|--------------|-----------------|--------|----|
| Short answer | 12 (attempt 10) | 10 x 3 | 30 |
| GRAND TOTAL | | | 80 |

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for Pathology III Practical shall be as follows: Distribution of marks

| Type of Question | Marks allotted |
|---------------------------|----------------|
| Pap stain | 20 |
| Blood grouping and typing | 10 |
| Cross matching | 15 |
| Coomb's test | 15 |
| Spotters | 10 |
| Record | 10 |
| Total | 80 |

Distribution of Marks for University Theory and Practical Exam

| Theory | | | | Practicals | | | Grand total |
|---------------|-----------|----|-----------|-------------------|----|-----------|--------------------|
| Theory | Viva Voce | IA | Sub Total | Practicals | IA | Sub Total | |
| 80 | - | 20 | 100 | 80 | 20 | 100 | 200 |

SUBSIDIARY SUBJECTS

BIO STATISTICS

Time Allotted: 20 Hours

Course Description:

Introduction to basic statistical concepts: methods of statistical analysis; and interpretation of data

Behavioral Objectives:

Understands statistical terms.

Possesses knowledge and skill in the use of basic statistical and research methodology.

Unit – I : Introduction

Meaning, definition, characteristics of statistics.

Importance of the study of statistics.

Branches of statistics.

Statistics and health science including nursing.

Parameters and estimates.

Descriptive and inferential statistics.

Variables and their types.

Measurement scales

Unit – II : Tabulation of Data

Raw data, the array, frequency distribution.
Basic principles of graphical representation.
Types of diagrams - histograms, frequency polygons, smooth frequency polygon,
cumulative frequency curve, ogive.
Normal probability curve.

Unit - III : Measure of Central Tendency

Need for measures of central tendency
Definition and calculation of mean - ungrouped and grouped
Meaning, interpretation and calculation of median ungrouped and grouped.
Meaning and calculation of mode.
Comparison of the mean, and mode.
Guidelines for the use of various measures of central tendency.

Unit - IV : Measure of Variability

Need for measure of dispersion.
The range, the average deviation.
The variance and standard deviation.
Calculation of variance and standard deviation ungrouped and grouped.
Properties and uses of variance and SO

Unit -V : Probability and Standard Distributions.

Meaning of probability of standard distribution.
The Binominal distribution.
The normal distribution.
Divergence from normality - skewness, kurtosis.

Unit - VI : Sampling Techniques

Need for sampling - Criteria for good samples.
Application of sampling in Community.
Procedures of sampling and sampling designs errors.
Sampling variation and tests of significance.

Unit - VII : Health Indicator

Importance of health Indicator.
Indicators of population, morbidity, mortality, health services.
Calculation of rates and rations of health.

Recommended Books.

B.K. Mahajan & M. Gupta (1995) Text Book of Preventive & Social Medicine, 2002,17th Edition Jaypee Brothers.

BASICS IN COMPUTER APPLICATIONS

Time allotted: 20 hours

The course enables the students to understand the fundamentals of computer and its applications.

Introduction to Data processing :

Features of computers, Advantages of using computers. Getting data into / out of computers. Role of computers. What is Data processing? Application areas of computers involved in Data processing. Common activities in processing. Types of Data processing, Characteristics of information. What are Hardware and Software?

Hardware Concepts :

Architecture of computers, Classification of computers, Concept of damage. Types of storage devices. Characteristics of disks, tapes, Terminals, Printers, Network. Applications of networking concept of PC System care, Floppy care, Data care.

Concept of Software.

Classification of software : System software. Application of software. Operating system. Computer system. Computer virus. Precautions against viruses. Dealing with viruses. Computers in medical electronics
Basic Anatomy of Computers

Principles of programming

Computer application - principles in scientific research ; work processing, medicine, libraries, museum , education, information system.

Data processing

Computers in physical therapy - principles in EMG, Exercise testing equipment, Laser.

No Practical or Viva voce examination

BMLT IV YEAR - INTERNSHIP

1. Project

Submission of a Project work is a compulsory requirement for the B Sc MLT –course. Each student can choose a topic for the project in any one of the subjects – Microbiology/Biochemistry/Pathology which would be approved by his/her supervising teacher. The topics for project shall be divided equally among total number of students from the three main subjects Microbiology/Biochemistry/Pathology.

The option for topics selection for the project will be based on the following criteria

Total marks obtained in all the previous university examinations up to 3rd year.

If total marks obtained equal for more than one student then marks obtained for the optional subject may be considered.

The supervising Teacher should have minimum 3 years full time teaching experience in the concerned subject. The student should be under the guidance of the supervising staff, carry out the work on the topic selected and prepare a project report including results and references. The project report duly certified by the supervising staff and head of the department of MLT one month prior to fourth year university practical examination should be submitted to the fourth year B Sc MLT University practical examination of concerned subject.

The project report evaluation will be conducted by the concerned subject internal and external examiners together in the Fourth year B Sc MLT University practical examination.