

**REVISED ORDINANCE GOVERNING  
REGULATIONS & CURRICULUM FOR BACHELOR OF SCIENCE DEGREE  
COURSES IN  
ALLIED HEALTH SCIENCE FOR FIRST YEAR  
B.Sc Medical Laboratory Technology**

**1. Title of the Courses offered in Allied Health Sciences:**

1. Bachelor of Science in Medical Laboratory Technology [B.Sc. (M.L.T)]
2. Bachelor of Science in Operation Theatre Technology [ BSc .O.T. Technology]
3. Bachelor of Science in Cardiac Care Technology [ B.Sc Cardiac Care Technology ]
4. Bachelor of Science in Perfusion Technology [ BSc. Perfusion Technology ]
5. Bachelor of Science in Neuro Science Technology [ BSc. Neuro Science Technology]
6. Bachelor of Science in. Renal Dialysis Technology [ BSc. Renal Dialysis Technology]
7. Bachelor of Science in Respiratory Care Technology [ BSc. Respiratory Care Technology]
8. Bachelor of Science in Anaesthesia Technology [ BSc. Anaesthesia Technology]
9. Bachelor of Science in Imaging Technology [ BSc. Imaging Technology]
10. Bachelor of Science in Radiotherapy Technology [ BSc. Radiotherapy Technology ]

**2. Eligibility for admission:**

A candidate seeking admission to the Bachelor of Science Degree Courses in the Allied Health Sciences course from Sl.No. 1 to 10 shall have studied English as one of the principal subject during the tenure of the course and for those seeking admission to the Bachelor of Science Degree Courses in the Allied Health Sciences courses from Sl.No. 1 to 8 mentioned above except for B.Sc. Imaging Technology and B.Sc. Radiotherapy Technology 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 principal 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 principal 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 principal 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 a subject for which the candidate desires to enroll, in the respective Allied Health Sciences course mentioned in Sl. No. 1 to 10 shall have passed plus 12 [10+2] with Physics, Chemistry and Biology, as principle subjects or candidates with 3 years diploma from a recognized Government Board in a subject for which the candidate desires to enroll, in the respective Allied Health Sciences course mentioned in Sl. No. 1 to 10 should have studied Physics, Biology and Chemistry as principal subjects during the tenure of the course.
6. Lateral entry to second year for allied health science courses 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.
7. In case of admission to B.Sc. Imaging Technology Or B.Sc.Radiotherapy Technology the candidate should have passed Pre-University or equivalent examination with Physics, Chemistry, Biology and Mathematics, as principal subjects of study.

**Note:**

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

**3. Duration of the course:**

Duration shall be for a period of three and half years including six months of Internship.

**4. Medium of instruction:**

The medium of instruction and examination shall be in English.

**5. Scheme of examination:**

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

## **6. 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

## **7. Internal Assessment (IA):**

1<sup>st</sup> Year B.Sc. MLT

Theory - 20 marks.

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

2<sup>nd</sup> & 3<sup>rd</sup> 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 with in 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.

## **8. 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**

S L 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	70	20	90
5	Microbiology I	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

S L No	Subject	Theory No. of Hours	Practical No. of Hours	Clinical /Lab posting	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

S L No	Subject	Theory No. of Hours	Practical No. of Hours	Clinical /Lab 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 1<sup>st</sup> year shall consist of only theory examination and there shall be no University Practical Examination.

**Second & Third year examination:**

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

**Written Examinations consists of**

03papers in the 2<sup>nd</sup> Year  
03 papers in the 3<sup>rd</sup> Year.

**Practical examination:**

Three practical examinations, at the end 2<sup>nd</sup> Year and three practical examinations at the end of the 3<sup>rd</sup> 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	3hours	80	20	100
5	Microbiology	3 hours	80	20	100
B	Subsidiary Subject**				Total
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. Practicals	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. Practical	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; otherwise he/she shall not be permitted to proceed to third year.

#### 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 award of degree.

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

##### THEORY

<b>SUBJECTS HAVING MAXIMUM MARKS = 100</b>		
<b>TYPE OF QUESTION</b>	<b>NUMBER OF QUESTIONS</b>	<b>MARKS FOR EACH QUESTION</b>
ESSAY TYPE	3 (2x10)	10
SHORT ESSAY TYPE	12 (10 × 5)	5
SHORT ANSWER TYPE	12 (10 × 3)	3

<b>SUBJECTS HAVING MAXIMUM MARKS = 80</b>		
<b>TYPE OF QUESTION</b>	<b>NUMBER OF QUESTIONS</b>	<b>MARKS FOR EACH QUESTION</b>
ESSAY TYPE	3 (2x10)	10
SHORT ESSAY TYPE	8 (6 × 5)	5
SHORT ANSWER TYPE	12(10 × 3)	3

<b>SUBJECTS HAVING MAXIMUM MARKS = 60</b>		
<b>TYPE OF QUESTION</b>	<b>NUMBER OF QUESTIONS</b>	<b>MARKS FOR EACH QUESTION</b>
ESSAY TYPE	3 (2x10)	10
SHORT ESSAY TYPE	7(5×5)	5
SHORT ANSWER TYPE	7(5×3)	3

<b>SUBJECTS HAVING MAXIMUM MARKS = 50</b>		
<b>TYPE OF QUESTION</b>	<b>NUMBER OF QUESTIONS</b>	<b>MARKS FOR EACH QUESTION</b>
ESSAY TYPE	3 (2x10)	10
SHORT ESSAY TYPE	5(3×5)	5
SHORT ANSWER TYPE	7(5×3)	3

**RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES, KARNATAKA,  
BANGALORE.**

**SYLLABUS FOR FIRST YEAR DEGREE COURSES IN ALLIED HEALTH  
SCIENCE**

**B.Sc Medical Laboratory Technology**

**ANATOMY**

No. of theory classes: 70 hours

No. of practical classes: 20 hours

**1. Introduction: human body as a whole**

**Theory:**

Definition of anatomy and its divisions

Terms of location, positions and planes

Cell and its organelles

Epithelium-definition, classification, describe with examples, function

Glands- classification, describe serous & mucous glands with examples

Basic tissues – classification with examples

**Practical:** Histology of types of epithelium

Histology of serous, mucous & mixed salivary gland

**2. Locomotion and support**

**Theory:**

Cartilage – types with example & histology

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

Demo of all bones showing parts, radiographs of normal bones & joints

Histology of compact bone (TS & LS)

Demonstration of all muscles of the body

Histology of skeletal (TS & LS), smooth & cardiac muscle

**3. Cardiovascular system**

**Theory:**

Heart-size, location, chambers, exterior & interior

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

Peripheral pulse

Inferior venacava, 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, medium sized artery & vein, large vein  
Microscopic appearance of large artery, medium sized artery & vein, large vein pericardium  
Histology of lymph node, spleen, tonsil & thymus  
Normal chest radiograph showing heart shadows  
Normal angiograms

**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  
Radiographs of abdomen

**5. Respiratory system**

Parts of RS, nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments  
Histology of trachea, lung and pleura  
Names of paranasal air sinuses

**Practical :** Demonstration of parts of respiratory system.

Normal radiographs of chest  
Histology of lung and trachea

**6. Peritoneum**

**Theory:** Description in brief

**Practical:** Demonstration of reflections

**7. Urinary system**

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

**8. 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

## 9. Endocrine glands

### **Theory:**

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

**Practical:** Demonstration of the glands  
Histology of pituitary, thyroid, parathyroid, suprarenal glands

## 10. 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

## 11. 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

## 12. Embryology:

### **Theory:**

Spermatogenesis & oogenesis

Ovulation, fertilization

Fetal circulation  
Placenta

Internal Assessment

Theory - Average of two exams conducted. 20  
Practicals: Record & 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 Anatomy shall be as given under.

Type of Questions	No. 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
Total Marks			80

NO PRACTICAL EXAMINATION  
REFERENCE BOOKS

Anatomy

- 1 William Davis (P) understanding Human Anatomy and Physiology MC Graw Hill
2. Chaurasia –A Text book of Anatomy  
T.S. Ranganathan – A text book of Human Anatomy
3. Fattana, Human anatomy  
(Description and applied)  
Saunders & C P Prism Publishers, Bangalore – 1991
4. ESTER . M. Grishcimer,  
Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia
5. Bhatnagar  
Essentials of Human embryology – Revised Edition  
Orient Blackswan Pvt. Ltd.

## **SYLLABUS FOR FIRST YEAR ALLIED SCIENCE COURSES - RGUHS**

### **B.Sc Medical Laboratory Technology**

#### **PHYSIOLOGY**

Theory 70 hours

Practical 20hours

#### **Introduction – composition and function of blood**

Red blood cells – Erythropoiesis, stages of differentiation function, count physiological Variation.

Haemoglobin –structure, function, concentration physiological variation

Methods of Estimation of Hb

White blood cells – Production, function, life span, count, differential count

Platelets – Origin, normal count, morphology functions.

Plasma Proteins – Production, concentration, types, albumin, globulin, Fibrinogen, Prothrombin functions.

Haemostasis & Blood coagulation

Haemostasis – Definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting factors.

Blood Bank

Blood groups – ABO system, Rh system

Blood grouping & typing

Crossmatching

Rh system – Rh factor, Rh incompatibility.

Blood transfusion – Indication, universal donor and recipient concept.

Selection criteria of a blood donor. transfusion reactions

Anticoagulants – Classification, examples and uses

Anaemias : Classification – morphological and etiological. Effects of anemia on body

Blood indices – Colour index, MCH, MCV, MCHC

Erythrocyte sedimentation Rate (ESR) and Packed cell volume

Normal values, Definition. Determination,

Blood Volume -Normal value, determination of blood volume and regulation of blood volume Body fluid – pH, normal value, regulation and variation

Lymph – lymphoid tissue formation, circulation, composition and function of lymph

#### **Cardiovascular system**

Heart – Physiological Anatomy, Nerve supply

Properties of Cardiac muscle, Cardiac cycle-systole, diastole. Intraventricular pressure curves.

Cardiac Output – only definition

Heart sounds Normal heart sounds Areas of auscultation.

Blood Pressure – Definition, normal value, clinical measurement of blood pressure.

Physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension.

Pulse – Jugular, radial pulse, Triple response

Heart sounds – Normal heart sounds, cause characteristics and signification. Heart rate  
Electrocardiogram (ECG) –significance.

**Digestive System** - Physiological anatomy of Gastro intestinal tract, Functions of digestive system

Salivary glands - Structure and functions. Deglutination –stages and regulation

Stomach – structure and functions

Gastric secretion – Composition function regulation of gastric juice secretion

Pancreas – structure, function, composition, regulation of pancreatic juice

Liver – functions of liver

Bile secretion, composition, function, regulation of bile secretion. Bilirubin metabolism types of bilirubin, Vandernberg reaction, Jaundice- types, significance.

Gall bladder – functions

Intestine – small intestine and large intestine

Small intestine –Functions- Digestion, absorption, movements.

Large intestine – Functions, Digestion and absorption of Carbohydrates, Proteins, Fats, Lipids.

Defecation

## **Respiratory system**

Functions of Respiratory system, Physiological Anatomy of Respiratory system, Respiratory tract, Respiratory Muscles, Respiratory organ-lungs, Alveoli, Respiratory membrane, stages of respiration.

Mechanism of normal and rigorous respiration. Forces opposing and favouring expansion of the lungs. Intra pulmonary pleural pressure, surface tension, recoil tendency of the wall. H

Transportation of Respiratory gases:

Transportation of Oxygen: Direction, pressure gradient, Forms of transportation, Oxygenation of Hb. Quantity of Oxygen transported.

Lung volumes and capacities

Regulation of respiration what? Why? How? Mechanisms of Regulation, nervous and chemical regulation. Respiratory centre. Hearing Brier, Reflexes.

Applied Physiology and Respiration : Hypoxia, Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiration, Apnoea.



## **Endocrine System –**

Definition, Classification of Endocrine glands & their Hormones Properties of Hormones.

Thyroid gland hormone – Physiological, Anatomy, Hormone secreted, Physiological function, regulation of secretion. Disorders – hypo and hyper secretion of hormone

Adrenal gland, Adrenal cortex physiologic anatomy of adrenal gland, Adrenal cortex, cortical hormones – functions and regulation

Adrenal medulla – Hormones, regulation and secretion. Functions of Adrenaline and nor adrenaline

Pituitary hormones – Anterior and posterior pituitary hormones, secretion, function

Pancreas – Hormones of pancreas

Insulin – secretion, regulation, function and action

Diabetes mellitus – Regulation of blood glucose level

Parathyroid gland – function, action, regulation of secretion of parathyroid hormone.

Calcitonin – function and action

## **Special senses**

Vision – structure of eye. Function of different parts.

Structure of retina

Hearing structure and function of can mechanism of hearing

Taste – Taste buds functions. Smell physiology, Receptors.

## **Nervous system**

Functions of Nervous system, Neuron structure, classification and properties. Neuroglia, nerve fiber, classification, conduction of impulses continuous and saltatory. Velocity of impulse transmission and factors affecting. Synapse – structure, types, properties. Receptors – Definition, classification, properties. Reflex action – unconditioned properties of reflex action. Babinski's sign. Spinal cord nerve tracts. Ascending tracts, Descending tracts –

**Pyramidal tracts** – Extrapyramidal tracts. Functions of Medulla, pons, Hypothalamic disorders. Cerebral cortex lobes and functions, Sensory cortex, Motor cortex, Cerebellum functions of Cerebellum. Basal ganglion-functions. EEG.

Cerebro Spinal Fluid(CSF) : formation, circulation, properties, composition and functions lumbar puncture.

**Autonomic Nervous System:** Sympathetic and parasympathetic distribution and functions and comparison of functions.

Excretory System

Excretory organs

**Kidneys:** Functions of kidneys structural and functional unit nephron, vasarecta, cortical and juxtamedullary nephrons – Comparison, Juxta Glomerular Apparatus –Structure and function. Renal circulation peculiarities.

Mechanism of Urine formation: Ultrafiltration criteria for filtration GFR, Plasma fraction, EFP, factors effecting EFR. Determination of GFR selective reabsorption – sites of reabsorption, substance reabsorbed, mechanisms of reabsorption Glucose, urea.

H + Cl aminoacids etc. TMG, Tubular load, Renal threshold % of reabsorption of different substances, selective secretion.

Properties and composition of normal urine, urine output. Abnormal constituents in urine, Mechanism of urine concentration.

Counter – Current Mechanisms : Micturition, Innervation of Bladder, Cystourethrogram.  
Diuretics : Water, Diuretics, osmotic diuretics, Artificial kidney Renal function tests – plasma clearance Actions of ADH, Aldosterone and PTH on kidneys. Renal function tests

### **Reproductive system**

Function of Reproductive system, Puberty

Male reproductive system- Functions of testes, spermatogenesis site, stages, factors influencing semen. Endocrine functions of testes

Androgens – Testosterone structure and functions.

Female reproductive system. Ovulation, menstrual cycle. Physiological changes during pregnancy, pregnancy test.

Lactation : Composition of milk factors controlling lactation.

### **Muscle nerve physiology**

Classification of muscle, structure of skeletal muscle, Sarcomere contractile proteins, Neuromuscular junction. Transmission across, Neuromuscular junction. Excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue Rigour mortis

### **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.

### **Practicals**

Haemoglobinometry

White Blood Cell count

Red Blood Cell count

Determination of Blood Groups

Leishman's staining and Differential WBC count

Determination of packed cell Volume

Erythrocyte sedimentation rate [ESR]

Calculation of Blood indices

Determination of Clotting Time, Bleeding Time

Blood pressure Recording

Auscultation for Heart Sounds

Artificial Respiration

Determination of vital capacity

### Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & 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 Physiology shall be as given under.

Type of Questions	No. 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
Total Marks			80

### **NO PRACTICAL EXAMINATION**

### **REFERENCE BOOKS**

#### **Physiology**

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

**SYLLABUS FOR ALLIED HEALTH SCIENCE COURSES RGUHS**  
**B.Sc. Medical Laboratory Technology**

**BIOCHEMISTRY**

No. Theory classes: 70hours

No. of practical classes: 20 hours

Theory:

Specimen collection: Pre-analytical variables

Collection of blood

Collection of CSF & other fluids

Urine collection

Use of preservatives

Anticoagulants

**1. Introduction to Laboratory apparatus**

Pipettes- different types (Graduated, volumetric, Pasteur, Automatic etc.,)

Calibration of glass pipettes

Burettes, Beakers, Petri dishes, depression plates.

Flasks - different types )Volumetric, round bottomed, Erlenmeyer conical etc.,)

Funnels – different types (Conical, Buchner etc.,)

Bottles – Reagent bottles – graduated and common, Wash bottles – different type

Specimen bottles etc.,

**2. Measuring cylinders, Porcelain dish**

Tubes – Test tubes, centrifuge tubes, test tube draining rack

Tripod stand, Wire gauze, Bunsen burner.

Cuvettes, significance of cuvettes in colorimeter, cuvettes for visible and UV range,

cuvette holders Racks – Bottle, Test tube, Pipette

Dessicator, Stop watch, rimers, scissors

Dispensers – reagent and sample

Any other apparatus which is important and may have been missed should also be covered

Maintenance of lab glass ware and apparatus:

Glass and plastic ware in Laboratory

\*use of glass: significance of boro silicate glass; care and cleaning of glass ware, different cleaning solutions of glass

\* care and cleaning of plastic ware, different cleaning solution

**3. Instruments (Theory and demonstration) Diagrams to be drawn**

Water bath: Use, care and maintenance

Oven & Incubators : Use, care and maintenance.

Water Distillation plant and water deionisers. Use, care and maintenance

Refrigerators, cold box, deep freezers – Use, care and maintenance

Reflux condenser : Use, care and maintenance

Centrifuges (Theory and demonstration) Diagrams to be drawn

Definition, Principle, svedberg unit, centrifugal force, centrifugal field rpm,

ref. Conversion of G to rpm and vice versa.  
Different types of centrifuges  
Use care and maintenance of a centrifuge  
Laboratory balances (Theory & Practicals) Diagrams to be drawn  
Manual balances: Single pan, double pan, trip balance  
Direct read out electrical balances.  
Use care and maintenance. Guideline to be followed and precautions to be taken while weighing  
Weighing different types of chemicals, liquids. Hygroscopic compounds etc.  
Colorimeter and spectrophotometer (Theory and Practicals) Diagrams to be drawn  
Principle, Parts Diagram.  
Use, care and maintenance.  
pH meter (Theory & practicals) Diagrams to be drawn  
principle, parts, Types of electrodes, salt bridge solution.  
Use, care and maintenance of Ph meter and electrodes  
Guidelines to be followed and precautions to be taken while using pH meter

#### **4. Safety of measurements**

#### **5. Conventional and SI units**

#### **6. Atomic structure**

Dalton's theory, Properties of electrons, protons, neutrons, and nucleus, Rutherford's model of atomic structure, Bohr's model of atomic structure, orbit and orbital, Quantum numbers, Heisenberg's uncertainly principle.

Electronic configuration – Aufbau principle, Pauli's exclusion principle, etc.

Valency and bonds – different types of strong and weak bonds in detail with examples

Theory & Practicals for all the following under this section

Molecular weight, equivalent weight of elements and compounds, normality, molarity

Preparation of molar solutions (mole/litre solution) eg: 1 M NaCl, 0.15 M NaCl

1 M NaOH, 0.1 M HCl, 0.1 M H<sub>2</sub>SO<sub>4</sub> etc.,

Preparation of normal solutions. eg., 1N Na<sub>2</sub>CO<sub>3</sub>, 0.1N Oxalic acid, 0.1 N HCl, 0.1N H<sub>2</sub>SO<sub>4</sub>, 0.66 N H<sub>2</sub>SO<sub>4</sub> etc.,

Percent solutions. Preparation of different solutions – v/v w/v (solids, liquids and acids)

Conversion of a percent solution into a molar solution

#### **Dilutions**

Diluting solutions: eg. Preparation of 0.1 N NaCl from 1 N NaCl from 2 N NaCl etc.,  
Preparing working standard from stock standard, Body fluid dilutions, Reagent dilution techniques, calculating the dilution of a solution, body fluid reagent etc.,

Saturated and supersaturated solutions. Standard solutions. Technique for preparation of standard solutions eg: Glucose, urea, etc., Significance of volumetric flask in preparing standard solutions. Volumetric flasks of different sizes, Preparation of standard solutions of deliquescent compounds (CaCl<sub>2</sub>, potassium carbonate, sodium hydroxide etc.,)

Preparation of standards using conventional and SI units  
Acids, bases, salts and indicators.

**Acids and Bases:** Definition, physical and chemical properties with examples. Arrhenius concept of acids and bases, Lowery – Bronsted theory of acids and bases classification of acids and bases. Different between bases and alkali, acidity and basicity, monoprotic and polyprotic acids and bases. Concepts of acid base reaction, hydrogen ion concentration, Ionisation of water, buffer, Ph value of a solution, preparation of buffer solutions using Ph meter.

Salts: Definition, classification, water of crystallization – definition and different types, deliquescent and hygroscopic salts

**Acid- base indicators: (Theory and Practicals)**

**Theory** – Definition, concept, mechanism of dissociation of an indicator, colour change of an indicator in acidic and basic conditions, use of standard buffer solution and indicators for pH determinations, preparation and its application, list of commonly used indicators and their pH range, suitable pH indicators used in different titrations, universal indicators

**Practicals** – Titration of a simple acid and a base (Preparation of standard solution of oxalic acid and using this solution finding out the normality of a sodium hydroxide solution. Acid to be titrated using this base) Calculation of normality of an acid or a base after titration, measurement of hydrogen ion concentration

**Quality control:**

- Accuracy
- Precision
- Specificity
- Sensitivity
- Limits of error allowable in laboratory
- Percentage error

Normal values and Interpretations

**Special Investigations:**

- Serum Electrophoresis
- Immunoglobulins
- Drugs: Digitoxin, Theophyllines

Regulation of Acid Base status:

- Henderson Hasselback Equations
- Buffers of the fluid

- pH Regulation
- Disturbance in acid Base Balance
- Anion Gap
- Metabolic acidosis

Metabolic acidosis  
 Metabolic alkalosis  
 Respiratory acidosis  
 Respiratory alkalosis  
 Basic Principles and estimation of Blood Gases and pH  
 Basic principles and estimation of Electrolytes  
     Water Balance  
 Sodium regulation  
 Bicarbonate buffers  
 Nutrition, Nutritional support with special emphasis on parental nutrition.  
     Calorific Value  
     Nitrogen Balance  
     Respiratory Quotient  
     Basal metabolic rate  
     Dietary Fibers  
     Nutritional importance of lipids, carbohydrates and proteins  
     Vitamins

## **PRACTICALS**

Analysis of Normal Urine  
 Composition of urine  
 Procedure for routine screening  
 Urinary screening for inborn errors of metabolism  
 Common renal disease  
     Urinary calculus  
 Urine examination for detection of abnormal constituents  
 Interpretation and Diagnosis through charts  
 Liver Function tests  
 Lipid Profile  
 Renal Function test  
 Cardiac markers  
 Blood gas and Electrolytes  
 Estimation of Blood sugar, Blood Urea and electrolytes  
 Demonstration of Strips  
 Demonstration of Glucometer

## **Internal Assessment**

**Theory** - Average of two exams conducted.                      20

**Practicals:** Record & 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 shall be as given under.

Type of Questions	No. 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
Total Marks			80

### **NO PRACTICAL EXAMINATION**

#### REFERENCE BOOKS

##### **Biochemistry**

1. Varley – Clinical chemistry
2. TEITZ – Clinical chemistry
3. Kaplan – Clinical chemistry
4. Ramakrishna(S) Prasanna(KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient longman Bombay –1980
5. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students ,Latest Ed
  
6. DAS(Debajyothi) Biochemistry Latest ED Academic, Publishers, Calcutta – 1992
7. Rajagopal G & Ramakrishna - 1983 Practical Biochemistry for Medical Students Oriental Blackswan Pvt. Ltd.



Syllabus for first year Allied science courses RGUHS  
**B.Sc Medical Laboratory Technology**

**PATHOLOGY**

**Histo Pathology ,Clinical Pathology, Haematology and Blood Banking**

Theory – 70 hours

Practical – 20 hours

**HistoPathology - Theory**

- Introduction to Histo Pathology
- Receiving of Specimen in the laboratory
- Grossing Techniques
- Mounting Techniques – various Mountants
- Maintenance of records and filing of the slides.
- Use & care of Microscope
- Various Fixatives, Mode of action, Preparation and Indication.
- Bio-Medical waste management
- Section Cutting
- Tissue processing for routine paraffin sections
- Decalcification of Tissues.
- Staining of tissues - H& E Staining
- Bio-Medical waste management
- Clinical Pathology – Theory
- Introduction to Clinical Pathology
- Collection, Transport, Preservation, and Processing of various clinical specimens
- Urine Examination – Collection and Preservation of urine.  
Physical, chemical, Microscopic Examination
- Examination of body fluids.
- Examination of cerebrospinal fluid (CSF)
- Sputum Examination.
- Examination of feces

**Haematology – Theory**

- Introduction to Haematology
- Normal constituents of Blood, their structure and function.
- Collection of Blood samples
- Various Anticoagulants used in Haematology
- Various instruments and glassware used in Haematology, Preparation and use of glassware
- Laboratory safety guidelines
- SI units and conventional units in Hospital Laboratory
- Hb, PCV
- ESR
- Normal Haemostasis

Bleeding Time, Clotting Time, Prothrombin Time, Activated Partial Thromboplastin Time.

### **Blood Bank**

- Introduction
- Blood grouping and Rh Types
- Cross matching

### **PRACTICALS**

- Urine Examination.
  - Physical
  - Chemical
  - Microscopic
- Blood Grouping, Rh typing.
- Hb Estimation, Packed Cell Volume [PCV], Erythrocyte Sedimentation rate [ESR]
- Bleeding Time, Clotting Time.
- Histopathology – Section cutting and H & E Staining. [For BSc MLT only ]

### **Internal Assessment**

Theory - Average of two exams conducted. 20

Practicals: Record & 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 Pathology shall be as given under.

Type of Questions	No. 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
Total Marks			80

### **NO PRACTICAL EXAMINATION**

## **REFERENCE BOOKS**

### **Pathology –**

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques
3. Koss – cytology
4. Winifred greg – Diagnostic cytopathology
5. Orell – Cyto Pathology
6. Todd & Sanford Clinical Diagnosis by laboratory method
7. Dacie & Lewis – Practical Haematology
8. Ramanic Sood, Laboratory Technology (Methods and interpretation) 4<sup>th</sup> Ed.  
J.P. Bros, New Delhi –1996)
9. Satish Gupta Short text book of Medical Laboratory for technician  
J.P. Bros, New Delhi – 1998
10. Sachdev K.N. Clinical Pathology and Bacteriology 8<sup>th</sup> Ed, J.P. Bros,  
New Delhi-1991.
11. Krishna - Text book of Pathology, Orient Longman PVT Ltd.

## **Syllabus for BSc. Allied Science Courses - RGHUS**

### **B.Sc Medical Laboratory Technology Microbiology**

Objective : - This course introduces the principles of Microbiology with emphasis on applied aspects of Microbiology of infectious diseases particularly in the following areas  
Principles & practice of sterilization methods.

Collection and dispatch of specimens for routine microbiological investigations.

Interpretation of commonly done bacteriological and serological investigations.

Control of Hospital infections

Biomedical waste management

Immunization schedule

Theory - 70 hours

#### **1. Morphology**

4 hours

Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.

#### **2. Growth and nutrition**

4 hours

Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.

#### **3. Sterilisation and Disinfection**

4 hours

Principles and use of equipments of sterilization namely Hot Air oven, Autoclave and serum inspissator. Pasteurization, Antiseptic and disinfectants.

Antimicrobial sensitivity test

- 4. Immunology** 6 hours  
Immunity Vaccines, Types of Vaccine and immunization schedule  
Principles and interpretation of commonly done serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA. Rapid tests for HIV and HbsAg(Technical details to be avoided)
- 5. Systematic Bacteriology** 20 hours  
Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria( the classification, antigenic structure and pathogenicity are not to be taught)  
Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, Esch coli, Klebsiella, Proteus, Vibrio cholerae, Pseudomonas & Spirochetes
- 6. Parasitology** 10 hours  
Morphology, life cycle, laboratory diagnosis of following parasites  
E. histolytica, Plasmodium, Tape worms, Intestinal nematodes
- 7. Mycology** 4 hours  
Morphology, diseases caused and lab diagnosis of following fungi.  
Candida, Cryptococcus, Dermatophytes ,opportunistic fungi.
- 8. Virology** 10 hours  
General properties of viruses, diseases caused, lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.
- 9. Hospital infection** Causative agents, transmission methods, investigation, prevention and control Hospital infection. 4 hours
- 10. Principles and practice Biomedical waste management** 4 hours

**Practical** 20 hours

Compound Microscope.

Demonstration and sterilization of equipments – Hot Air oven, Autoclave, Bacterial filters.

Demonstration of commonly used culture media, Nutrient broth, Nutrient agar, Blood agar, Chocolate agar, Mac conkey medium, LJ media, Robertson Cooked meat media, Potassium tellurite media with growth, Mac with LF & NLF, NA with staph  
Antibiotic susceptibility test

Demonstration of common serological tests – Widal, VDRL, ELISA.

Grams stain

Acid Fast staining  
 Stool exam for Helminthic ova  
 Visit to hospital for demonstration of Biomedical waste management.  
 Anaerobic culture methods.

**Internal Assessment**

Theory - Average of two exams conducted. 20  
 Practicals: Record & 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 shall be as given under.

Type of Questions	No. 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
Total Marks			80

**NO PRACTICAL EXAMINATION**

REFERENCE BOOKS

Microbiology

1. Anathanarayana & Panikar Medical Microbiology – Revised 8<sup>th</sup> Edition 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, 1<sup>st</sup> Ed, J P Bros, New Delhi – 199
7. Basic laboratory procedures in clinical bacteriology, 1<sup>st</sup> Ed, J P Brothers, New Delhi
8. Medical Parasitology – Ajit Damle

**B.Sc Medical Laboratory Technology**  
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:**

1. 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

## 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 summarising  
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.

### 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, commulative 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, 17<sup>th</sup> Edition Jaypee Brothers.

## 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

## 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.

- 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 graduate courses By Erach Bharucha Reprinted in 2006, Orient Longman Private Limited /Universities Press India Pvt. Ltd.

## ***BASICS IN COMPUTER APPLICATIONS***

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.

### Scheme of Examination for *MEDICAL ELECTRONICS including COMPUTER APPLICATIONS*

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

No Practical or Viva voce examination

## **B.Sc Medical Laboratory Technology 2<sup>nd</sup> year BIOCHEMISTRY II**

### **THEORY**

1. Blood chemistry (Its constituents)
2. Urine chemistry (Its constituents)
3. Biomolecules:
  - a. Carbohydrate: Metabolism & disorder of carbohydrate
  - b. Lipids: Metabolism & disorders lipids.
4. Vitamins: sources, functions, deficiency, requirements,
5. Enzymes – Introduction, Activation energy, classification, activity, specificity, kinetics v max, Km, Michaelis Menten equation
6. Biophysics-surface tension, osmolarity and viscosity.
7. Photometry, spectrometry, turbidometry, flame photometry and atomic absorption spectroscopy.
8. MPNB - Urea, Uric Acid, Creatinine of these importance
9. Nutrition
  - a. Calorific value, Respiratory Quotient
  - b. Nitrogen balance, Basal Metabolic Rate
  - c. Dietary fibres
  - d. Nutritional importance of carbohydrates, lipid, proteins and vitamins
  - e. Diseases associated with nutrition
  - f. Prescription of diet
10. Special investigations
  - Demonstration - Serum electrophoresis  
Immunoglobulins  
Drug estimation - Digitoxin, Theophyllin, Amphetamines,  
Sympathomimetics, Cannabinoids, Barbiturates

## PRACTICALS

1. Qualitative analysis of carbohydrates, proteins, amino acids.
2. Estimation blood sugar and Blood Urea
3. Quantitative test for urine glucose and GTT.
4. Qualitative screening test for normal and abnormal urine sample.
5. Estimation of non-protein nitrogenous compounds of blood: Blood urea, Creatinine, Creatinine clearance test (CCT)
6. Protein precipitation, dialysis and separation of proteins, electrophoresis of serum, CSF and urine proteins.

### 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 Questions	No. 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 Answers ( SA)	12 ( to attempt 10)	10 X 3	30
<b>Grand Total</b>			<b>80</b>

### 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

## B.Sc Medical Laboratory Technology

2<sup>nd</sup> year

### MICROBIOLOGY II

**Topics:** Parasitology, Mycology and Virology

**1. Introduction of Mycology.** Terms & Classification.

**2. Lab Diagnosis of Fungal Infections** 2 Hrs.

**3. Mycology** 14 Hrs.

a. Superficial Mycoses

Malsezzia furfur, T.nigra, T.piedra

b. Subcutaneous Mycoses

i. Mycetoma

ii. Rhinosporidium

iii.Sporotrichosis

- c. Dermatophytes
- d. Systemic Mycoses
  - i. Histoplasmosis
  - ii. Blastomycosis
  - iii. Coccidioidosis
  - iv. Paracoccidioidosis
- e. Opportunistic Fungi
  - 1. Aspergillosis
  - 2. Penicillosis
  - 3. Zygomycosis
  - 4. Pneumocystis
  - 5. Mycotoxins

#### 4. Parasitology

- 1. Protozoology-
  - Entamoeba histolytica
  - Balantidium coli
  - Giardia
  - Toxoplasma
  - Malaria
  - Leishmania
- 2. Helminthology
  - Cestodes - Taenia, Echinococcus, D.latum, H.nana
  - Trematodes - Schistosoma, Fasciola
  - Nematodes – Ascaris, hookworm, Strongyloides, Trichuris, Trichinella, Dracunculus, Filarial worms

**5. Virology-** General properties of virus, cultivation of viruses, Pox viruses, Herpesviruses, Adenoviruses, Picornaviruses, Orthomyxovirus, Paramyxoviruses, Arboviruses, Rhabdoviruses, Hepatitis viruses, Oncogenic viruses, HIV, Parvovirus, Viral haemorrhagic fevers, SARS, Rotavirus, Norwalk virus, Astrovirus, Corona virus

#### PRACTICALS for II year:

##### Parasitology:

- 1. Stool examination
  - a. Saline mount
  - b. Iodine mount

##### Mycology:

- 1. Slide culture technique
- 2. KOH mount



3. Identification of fungal cultures
  - a. Colony characteristics and Microscopic examination of Candida, Cryptococcus, Trichophyton, Microsporium, Aspergillus niger, Asp fumigatus, Rhizopus, Fusarium, Penicillium.

### **Virology**

1. Demonstration of embryonated egg inoculation
2. Virology exercise:
  - a. Spots test, ELISA (HBV, HCV, HIV), HI, Paul Bunnell test
  - b. Applied exercise – Rabies, Infantile Diarrhoea, Herpes, HBV, HIV, Influenza.

### **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 Questions	No. 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 Answers ( SA)	12 ( to attempt 10)	10 X 3	30
<b>Grand Total</b>			<b>80</b>

### **Scheme of Examination Practical**

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

Types of Questions	Marks
<b>Spotters</b>	<b>10</b>
<b>Mycology</b>	<b>15</b>
<b>Virology Test</b>	<b>15</b>
<b>Virology Applied Exercise</b>	<b>15</b>
<b>Stool Examination</b>	<b>15</b>
<b>Record</b>	<b>10</b>
<b>Total Marks</b>	<b>80</b>

**B.Sc Medical Laboratory Technology**  
2<sup>nd</sup> year  
PATHOLOGY II

**Theory:-**

**Histopathology and Hematology**

**Histopathology**

**Instrumentation :** (a) Automated Tissue Processor  
(b) Microtomes, Knives, Knife sharpners  
and Ultramicrotome  
(c) Freezing microtome and Cryostat  
(d) Automatic slide stainer

**Techniques :** (a) Routine paraffin section cutting  
(b) Frozen section and Cryostat section studies

**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

**Mounting techniques:** Various mounts and mounting techniques

.  
Electron Microscope, Scanning electron microscope, Dark ground and  
Florescent microscope  
Museum technology  
Microphotography and its applications  
Maintenance of records and filing of slides  
ICDS Classification and coding  
Application of computers in Pathology

**Hematology**

Hemopoiesis, Stem cells, formed elements and their functions

Anticoagulants used in various hematological studies

Routine hematological tests and normal values:

- (a) Determination of Hemoglobin and Hematocrit
- (b) Enumeration of RBC, WBC & Platelets
- (c) Absolute Eosinophil count
- (d) Reticulocyte count
- (e) Calculation of Red cell Indices
- (f) Preparation of staining of blood film for morphology of  
red cells and differential count

### **Special Hematological tests:**

- (a) Sickling tests
- (b) Osmotic fragility test
- (c) Determination HbF and HbA2
- (d) Hemoglobin Electrophoresis
- (e) Investigation of G6PD deficiency
- (f) Plasma haptoglobin and demonstration of hemosiderin in urine
- (g) Tests for Autoimmune hemolytic anemia
- (h) Measurement of abnormal Hb pigments

### **Hemostasis and Coagulation**

- (a) Normal hemostasis, mechanism of blood coagulation and normal fibrinolytic system
- (b) Collection of blood and anticoagulants used in coagulation studies
- (c) Investigation of hemostatic mechanism-BT, CT, whole blood coagulation time test, PT, PTT
- (d) Assay of clotting factors
- (e) Tests for fibrinolytic activity- Euglobulin , clot lysis test and FDP
- (f) Platelet function tests

### **Investigation of Megaloblastic anemia and Iron deficiency anemia**

- (a) B12 and Folate assay and Schilling test
- (b) Estimation of serum iron and iron binding capacity

### **Bone marrow biopsy study**

- (a) Needle aspiration and surgical biopsy technique
- (b) Preparation of smears and staining

### **Demonstration of LE cells**

### **Cytochemistry**

### **Administration in Hematology and Quality control**

### **Practicals:**

1. Paraffin section cutting
2. Staining by Hematoxylin & Eosin and other special stains
3. Determination of Hemoglobin 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
15. Osmotic fragility test
16. Sickling test
17. LE cell preparation

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 Questions	No. 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 Answers ( SA)	12 ( to attempt 10)	10 X 3	30
<b>Grand Total</b>			<b>80</b>

#### **Scheme of Examination *Practical***

Distribution of marks

Type of Question	Marks allotted
Hematoxylin and eosin or a special stain	10
Hemoglobin or PCV	10
Total count	10
Differential count	10
ESR	10
PS preparation and staining	10
Record	10
spotters	10
Total	80

### **B.Sc Medical Laboratory Technology 3<sup>RD</sup> year BIOCHEMISTRY III SYLLUBUS FOR BMLT III YEAR**

#### **THEORY**

1. Liver Function tests. Role of the Liver in metabolism, formation of bilirubin and mode of excretion.
2. Gastric Analysis: Composition of gastric juice, concepts of free and bound acids, gastric acid secretions stimulations.
3. Renal function, Renal function test and renal clearance test.
4. Calculi: Theory of formation and analysis, Renal clearance concentration and application of Phenolsulfonaphthalein.
5. Acid – Base balance and its disturbances.
6. Inorganic ions: Calcium metabolism, phosphate metabolism, sodium-potassium balance and trace element (Fe, CU).
7. Metabolism of proteins and amino acids.

8. Over view & replication, translation, transcription and genetic engineering.
9. Metabolic disorders:
  - a. Amino acids
  - b. Proteins
  - c. Inborn errors of metabolic disorders.
11. Clinical enzymology.
12. Radio isotope techniques: Principle, definition of units, measurement of radiation standards, crystal counting. Resources and applications.
13. Immunoassay: Different methods, principle and applications.
14. Biostatistics: Population mean, Correlation Coefficient, Standard deviation, Standard error.

**PRACTICALS:**

1. Specimen Collections: Urine, Blood, Gastric juice,
2. Accuracy, precision and quality control – Demonstration and preparation of two methods using histogram, F-test and Barr test.
3. Enzymes: amylase (salivary and Pancreatic), Alkaline Phosphatase, Acid Phosphatase, SGOT, SGPT, LDH and CPK- demonstration on auto analyzer.
4. Liver function tests: estimation of Bilirubin – total and conjugates, Urobilinogen,
5. Gastric analysis: Determination of free and total acid, gastric stimulation.
6. Lipid determination of serum lipids – cholesterol, triglycerides and lipoprotein fractionation.
7. Inorganic ions – Determination of calcium in serum and urine, serum phosphates, chloride sodium and potassium.
8. Analysis of calculi
9. Urine – screening for inborn errors of metabolism
10. RFT
11. Cardiac markers  
(Relevant charts on the above topics for interpretation and diagnosis)

**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 Questions	No. 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 Answers ( SA)	12 ( to attempt 10)	10 X 3	30
<b>Grand Total</b>			<b>80</b>

**Scheme of Examination Practical**

Distribution of marks

Type of Question	Marks allotted
Quantitative estimation	30
Renal calculi	30
Urine examination	20
Total	80

**B.Sc Medical Laboratory Technology**  
3<sup>RD</sup> year  
**MICROBIOLOGY III**  
**SYSTEMIC BACTERIOLOGY, IMMUNOLOGY, APPLIED**  
**BACTERIOLOGY**

**IMMUNOLOGY**

01. Infection 2hrs
02. Immunity 4 Hrs.
  - A. Innate immunity
  - B. Acquired immunity (adaptive immunity)
  - C. Active and passive immunity
    1. Natural acquired active immunity
    2. Artificial acquired active immunity
    3. Natural acquired passive immunity- breast feeding
    4. Artificial acquired passive immunity
03. Immune System
  - A.
    1. Cell development
    2. B lymphocytes(general knowledge of their role)
      - a. Bursa of Fabricius
      - b. Stem cell differentiation
      - c. Gut-associated lymphoid tissue (GALT)
    3. T lymphocytes
      - a. Stem cell differentiation (general knowledge of their role)
      - b. Cytotoxic T (T<sub>C</sub>) cells
      - c. Delayed-type hypersensitivity T (T<sub>D</sub>) cells
      - d. Helper T (T<sub>H</sub>) cells
      - e. Suppressor T (T<sub>S</sub>) cells
    4. Natural killer cells
  - B. Dual nature of the immune system
    - i. Humoral immunity
    - ii. Cell-mediated immunity
  - C. General properties of immune responses
    1. Recognition of self versus nonself
      - a. Clonal selection theory B-cells
      - b. Tolerance
      - c. Clonal deletion
    2. Specificity
      - a. Definition
      - b. Cross-reactions
    3. Heterogeneity
    4. Memory
      - a. Memory cells
      - b. Anamnestic response

#### 04. Humoral Immunity

##### General characteristics

1. Antigen types
2. Antigen sensitization
3. Plasma cells

#### 05. Antigen & Antibody 04 Hrs.

1. Antigens
2. Epitopes (antigenic determinants)
3. Hapten
4. Antibodies consequences of antibody binding
5. Titer

#### 06. Immune Response

##### A. Properties of Antibodies (immunoglobulins)\*

1. Light chains \*
2. Heavy chains\*
3. Constant and variable regions\*
4. Antigen binding sites\*  
Fab and Fc regions \*

##### B. Classes of immunoglobulins\*

1. IgG\*
2. IgM\*
3. IgA\*
  - a. J chain
  - b. Secretory piece
4. IgE\*
5. IgD\*
6. Antibody titer

##### C. Primary and secondary responses \*

##### D. Kinds of antigen-antibody responses \*

##### E. How humoral responses eliminate foreign antigens \*

1. Basic mechanisms\*
  - a. Agglutination\*
  - b. Opsonization\*
  - c. Activation of complement\* Do not worry about the detailed mechanism of complement. Know that it makes a membrane attack complex and what that is.
  - d. Neutralization

2. Summary of humoral immunity

**07. Monoclonal Antibodies**

- A. Production
  - 1. Hybridoma formation \*
  - 2. Cloning of cells
- B. Uses\*
  - 1. Research tools\*
  - 2. Diagnostic uses\*
  - 3. Therapy\*

**08. Cell-Mediated Immunity \***

- A. General characteristics\*
- B. The cell-mediated immune reactions
  - 1. Antigen processing
  - 2. Helper T ( $T_H$ ) cells
    - a.  $T_{H1}$  (inflammatory T) cells
    - b.  $T_{H2}$  cells
  - 3. Suppressor T ( $T_S$ ) cells
    - 5. Cytotoxic (killer) T ( $T_C$ ) cells
  - 6. Natural killer (NK) cells
  - 7. Memory T cells
  - 8. Lymphokine release
- C. Superantigens

**09. Factors That Modify Immune Responses**

- A. Compromised host
- B. Modifying factors
  - 1. Age
  - 2. Stress
  - 3. Diet
  - 4. Exercise
  - 5. Injuries
  - 6. Environmental factors

**10. Hypersensitivity reactions**

**11. Autoimmune disorders**

**12. Transplantation immunology**

**13. Antimicrobial Sensitivity.**

Disk diffusion and Dilution 3 Hrs.

**14. Bacteriology of Water, Milk and Air 5 Hrs.**



**15. Systematic Bacteriology 75 Hrs.**

Classification, Morphology, Genotypic & Phenotypic characteristics, Pathogenesis, Disease caused, Lab Diagnosis & Prophylaxis

**A. Gram Positive Bacteria**

- i. Staphylococcus
- ii. Streptococcus
- iii. Pneumococcus
- iv. Corynebacteria
- v. Clostridia
- vi. Bacillus
- vii. Listeria
- viii. Actinomyces
- ix. Nocardia

**B. Gram Negative Bacteria**

- i. Neisseria
- ii. Enterobacteriaceae
- iii. Escherichia
- iv. Klebsiella
- v. Enterobacter
- vi. Proteus
- vii. Salmonella
- viii. Shigella
- ix. Yersinia
- x. Pseudomonas
- xi. Haemophilus
- xii. Brucella
- xiii. Pasturella
- xiv. Legionella
- xv. Bordetella
- xvi. Burkholderia
- xvii. Gardnerella
- xviii. Vibrio
- xix. Campylobacter
- xx. Helicobacter
- xxi. Bacteroides
- xxii. Fusobacterium

**C. Spirocheates**

- i. Treponema
- ii. Borrelia
- iii. Leptospira

**D. Mycobacteria**

- i. M.tuberculosis
- ii. M.leprae
- iii. Atypical Mycobacteria

**C. Mycoplasma**

**D. Chlamydiae**

**E. Rickettsiaceae**

F. Applied microbiology- Diseases.

**G** Molecular techniques in diagnostic microbiology- PCR, DNA hybridisation

**Desirable to know:** (There will be no main questions or short notes from this portion.

One paper may have only one question under short answers i.e. 3 marks)

**a.** Erysipelothrix

1. Propionibacteria

2. Rhodococcus

3. Tropheryma

4. Moraxella

5. Serratia

6. Stenotrophomonas

7. Acinetobacter

8. Streptobacillus

9. Parvobacteria

**PRACTICALS FOR 3<sup>rd</sup> YEAR**

**BACTERIOLOGY**

1. Staining-

a. Grams staining

b. ZN staining

c. Alberts staining

2. Hanging drop preparation

3. Culture methods

4. Introduction to biochemical reactions

5. Identification of bacterial culture

a. Colony characteristics

b. Morphological characteristics

c. Motility study

d. Interpretation of biochemical reactions

6. Antibiotic sensitivity testing- Kirby Bauer method

1. **Applied bacteriology- exercise**

7. Immunology: Serological tests:
- a. **Specimen collection**
  - b. **Principle**
  - c. **Methods.**
  - d. **Procedure**
  - e. **Normal values/ Significant titer**
  - f. **Interpretations**
  - g. **Limitations** : of all the following tests
    - i. **Widal**
    - ii. **ASO**
    - iii. **CRP**
    - iv. **RPR/VDRL/TRUST**
    - v. **RA**
    - vi. **HBsAg /anti HIV detection**
    - vii. **ELISA**

#### **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 Questions	No. 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 Answers ( SA)	12 ( to attempt 10)	10 X 3	30
<b>Grand Total</b>			<b>80</b>

#### **Scheme of Examination Practical**

The schem of examination for **Microbiology III Practical** shall be as follows:

Types of Questions	Marks
<b>Grams Staining</b>	<b>10</b>
<b>ZN Staining</b>	<b>10</b>
<b>Bacteriology Identification Organism one</b>	<b>10</b>
<b>Organism two</b>	<b>10</b>
<b>Serology Test one</b>	<b>10</b>
<b>Test two</b>	<b>10</b>
<b>Spotters</b>	<b>10</b>
<b>Record</b>	<b>10</b>
<b>Total Marks</b>	<b>80</b>

### **B.Sc Medical Laboratory Technology 3<sup>RD</sup> year**

## **PATHOLOGY III**

### **Cytology, Automation in cytology, Cytogenetics, Cytochemistry Immunohematology and Blood transfusion**

#### **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  
(c) May Grunwald Giemsa stain  
(d) Shorr's stain  
(e) Aceto orcin stain

#### **Female Genital tract**

1. Anatomy, Histology, Physiology & normal cytology
2. Techniques of collection of specimen for cervical cytology study
3. Hormonal cytology and cytological indices
4. Cervical cytology screening for malignant and nonmalignant conditions ,  
Radiation changes & follow up
5. Cytology of Endometrium – normal , nonmalignant and in malignant  
conditions
6. Cytology in Ovarian cancers

#### **Respiratory tract, Gastrointestinal tract and Urinary tract**

1. Anatomy, Histology and Physiology
2. Collection of sample, preparation of smears and staining
3. Cytology of normal, nonmalignant & malignant conditions

#### **C S F and Effusions**

1. Cytology of CSF in inflammatory, nonmalignant & malignant  
Conditions
2. Cytology of effusions in nonmalignant and malignant conditions

#### **Glands – Breast, Thyroid, Salivary glands and Lymph nodes**

1. Anatomy , Histology and Physiology
2. Fine needle aspiration cytology of glands and other soft tissue mass
3. Cytologic features in nonmalignant and malignant conditions of  
different glands and nipple discharges

### **Automation in Cytology**

1. Flow cytometry
2. Image Analysis
3. Principles, Equipments, procedures & Evaluation

### **Tissue culture and Immunohistochemistry**

1. Equipments for Tissue culture studies
  - (a) Laminar air flow equipment
  - (b) Carbon dioxide incubator
  - (c) Inverted microscope
2. Derivation of culture from tissue
  - (a) Enzymatic digestion of tissue using collagenase, protease
  - (b) Plating in tissue culture media
  - (c) Observation of cells in Invertoscope
  - (d) Subculturing & derivation of cell lines
3. Characterization of cell lines
  - (a) Determination of biochemical markers in cells
  - (b) Chromosomal & DNA content of cells
  - © Immunological properties of cells
4. Preservation of Immortalized cell lines
  - (a) Storage in Glycerol in Liquid Nitrogen
  - (b) Storage in Dimethyl sulfoxide in Liquid Nitrogen

### **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

### **Immunocytochemistry**

1. Basics concepts, monoclonal antibodies & preparation
2. Fluorescence reactions

### **Immunohematology and Blood transfusion**

1. ABO Blood group and Rh system
2. Subgroups of A and B , Other blood groups and Bombay group
3. HLA antigens and their significance

4. Principles of Blood transfusion:
- Blood donor selection
  - Methods of bleeding donors
  - Blood containers, anticoagulants and storage of blood
  - Coomb's test and its significance
  - Screening of blood for infective material
  - Blood components, preparation & component therapy
  - Autologous transfusion
  - Transfusion reactions and work up
  - Blood bank organization, standards, procedures, techniques and quality control

**Practicals**

Preparation of various cytology smears and fixation

- Papanicolaou's and May Grunwald Geimsa staining
- Hormonal cytology study
- Blood grouping and Rh typing
- Cross matching techniques
- Screening of Donor's blood for infective agents
- Transfusion reaction work up
- Preparation of blood components

**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 Questions	No. 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 Answers ( SA)	12 ( to attempt 10)	10 X 3	30
<b>Grand Total</b>			<b>80</b>

**Scheme of Examination Practical**

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
Record	10
Spotters	10
Total	80