

**Raja Narendra Lal Khan Women's College (Autonomous)**



**BACHELOR OF MEDICAL LABORATORY  
TECHNOLOGY  
(B.M.L.T.)**

**Under Graduate Syllabus  
(Semester System)**

**2019-2020**

**Gope palace  
PaschimMidnapore 721102  
West Bengal**

**Raja Narendra Lal Khan Women's College (Autonomous)**  
**Bachelor Of Medical Laboratory Technology(B.M.L.T)**

1ST Year Total marks (600)  
 for each unit: 50 (40+Internal Assessment)

No. Semester	Subject	Marks Allotted In Theoretical Part	Marks Allotted In Practical Part	Total
<b>1<sup>st</sup> Semester</b>	Communicative English Paper I, Unit 1	50	--	50
	Basic Instrumentation and Application (Theory) Paper II, Unit 2	50	--	50
	Environment & Health (Theory), Paper III, Unit 3	50	--	50
	Community health care(Theory), Paper IV, Unit 4	50	--	50
	Human anatomy(Theory), Paper V, Unit 5.  Human anatomy (Practical) Paper VI, Unit 6	50	--  50	100
Total	250	50	300	

No. Semester	Subject	Marks Allotted In Theoretical Part	Marks Allotted In Practical Part	Total
<b>2<sup>nd</sup> Semester</b>	Human Physiology Paper: VII, Unit: 7 (Theo)  Prac, Paper: VIII, Unit 8	50	50	100

	Biochemistry and Biophysics Paper IX, Unit: 9 (Theo)  (Prac) Paper: X, Unit 10	50	50	100
	Medical Entomology, Parasitology & Virology, Paper: XI, Unit 11(Theo)  (Prac) Paper: XII, Unit 12	50	50	100
	Total	150	150	300

2nd Year Total marks (600)

No. Semester	Subject	Marks Allotted In Theoretical Part	Marks Allotted In Practical Part	Total
<b>3<sup>rd</sup> Semester</b>	Immuno-Haematology,  Paper: XIII, Unit 13(Theo)  (Prac) Paper: XIV, Unit 14	50	50	100
	Clinical Immunology, Paper: XV, Unit 15 (Theo)  (Prac), Paper: XVI, Unit: 16	50	50	100
	Serology, Paper: XVII, Unit: 17 (Theo)  (Prac), Paper: XVIII, Unit: 18	50	50	100

	Total	150	150	300
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No. Semester	Subject	Marks Allotted In Theoretical Part	Marks Allotted In Practical Part	Total
<b>4<sup>th</sup> Semester</b>	Clinical Pathology and Oncopathology, Paper XIX, Unit 19(Theo)  (Prac), Paper XX, Unit 20	50	50	100
	Clinical Bio-Chemistry, Paper:XXI, Unit21(Theo)  (Prac), Paper XXII, Unit 22	50	50	100
	Cyto-Technology & Histotechnology, Paper: XIII, Unit 23(Theo)  (Prac), Paper: XIV, Unit 24	50	50	100
	Total	150	150	300

3rd Year Total marks (600)

No. Semester	Subject	Marks Allotted In Theoretical Part	Marks Allotted In Practical Part	Total
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<b>5<sup>th</sup> Semester</b>	Clinical Endocrinology, Toxicology and Andrology, Paper: XXV, Unit 25(Theo)  (Prac) Paper: XXVI, Unit 26	50	50	100
	Clinical Microbiology, Paper: XXVII,Unit 27(Theo)  (Prac), Paper XXVIII, Unit 28	50	50	100
	Blood transfusion and Blood bank, Paper: XXIX  Unit 29(Theo)  (Prac), Paper XXX, Unit 30	50	50	100
	Total	150	150	300

No. Semester	Subject	Marks Allotted In Theoretical Part	Marks Allotted In Practical Part	Total
<b>6<sup>th</sup> Semester</b>	Research Methodology and Medical Statistics, Paper: XXXI, Unit 31(Theo)  (Prac) Paper: XXXII, Unit 32	50	50	100
	Computer Application, Biomedical and Health Care system, Paper: XXXIII, Unit 33  (Prac), Paper: XXXIV, Unit 34	50	50	100
	Project Preparation, Paper: XXXV, Unit-35	50		100

	Project Presentation ,Paper: XXXVI, Unit-36		50	
	Total	150	150	300

**Internship: 6 Months: Report submission & evaluation:200 Marks-16 Credit**

**Total Marks- 2000 and Total Credit-160 (4credit=50marks)**

## **Semester - I**

### **Communicative English**

**Paper 1, Unit 1**  
**Theory**  
**Full Mark 50**  
**CREDIT POINT: 4**

1. Listening: Listening to the texts CDS.
2. Reading: Techniques of reading, Identifying the contest & the central idea.
3. Writing: Rewriting a story from a point of view of different characters with given statements, Technical report writing, resume writing, An application writing for employment etc.
4. Basic Grammar: Vocabulary- distinction words having related meaning, Descriptive approaches, use of antonym. Grammar in spoken & written. Making statements.
5. Practice: Exercise on the use of different grammatical constructions in context. Identification of the use of above given grammatical devices from different text like newspaper, poems, stories etc.
6. Dialogues, Public speech, Telephonic conversation, Project on TV programme & newspaper.

#### **Recommended readings:**

1. Guide of patters and usages in English, A S Hornby
2. English Vocabulary in use, Michael Mc Carth and Felicity O ' Dell
3. Better pronunciation, O Conner.
4. Hand Book of Practical Communication skills, Chrissie Wright.

## **Basic Instrumentation and Application**

**PAPER II, Unit 2**  
**Full Mark: 50**  
**CREDIT POINT: 4**  
**(THEORY)**  
**PAPER CODE: 102**

1. Basic laboratory principles, Safety measure rules and regulation of BSL and biosafety cabinets.
2. Code of conduct of medical laboratory personnel.
3. Organization of clinical laboratory and role of medical laboratory technician
4. Medical laboratory professional - professionalism in laboratory workers, Code of conduct, communication between physician and lab technician.
5. Common Lab accidents and ways for its prevention, First aid in the clinical laboratory, Common Laboratory hazards, Waste disposal in the labs

6. Introduction to basic pathology of body fluids
7. Microscope: Light microscope, Compound microscope, Phase Contrast microscope, Fluorescent and Polarized microscope.
8. Instrumentation: Working Principle, components and application. Spectrophotometer, Colorimeter, Centrifuges, Autoclave, Laminar flow, Incubator, Blood cell counter, ELISA, Semi and full autoanalyzer, HPLC, Electrophoresis, RT-PCR, Flow Cytometry
9. Introduction to Quality control, Total quality management framework.
10. Quality laboratory processes, Quality assurance, Quality assessment, Quality control, External quality control
11. Quality planning and Quality improvement, Quality control programme, intrinsic and extrinsic and random errors.
12. Costs of conformance and non-conformance, appraisal costs, prevention costs
13. Internal quality control, basic steps, sources of error and their correction methods, CAPA - corrective action & preventive action
14. Quality control charts, Levy- Jennings and CUSUM charts
15. Current trends in laboratory accreditation, ISO certificate, West guard Rules
16. Demonstration of various methods of quality control.

## **Environment & Health**

**PAPER III, Unit: 3**

**Full Mark: 50**

**(THEORY)**

**CREDIT POINT: 4**

1. Basic idea about macro and micro environment, components of environment. Environmental air water, noise, radiation and food pollutions and pollutants. Pollutant and health hazards. Managements of environmental pollution- arsenic, fluoride, lead and mercury pollution of environment.
2. Occupational health hazards in special reference to heat, cold, light, noise, vibration and dust. Occupational disease like silicosis, asbestosis, farmer's lung.
3. Human excreta disposal system. Health disorders due to mismanaged extra disposal standards of ventilations and types. Good lighting and its importance on health.
4. Communicable disease and role of environment for such transmission. Management of such communicable disease. Special reference to malaria, diarrhoea, cholera, HIV, Hepatitis, Typhoid.
5. Non-communicable diseases and role of environment for such diseases. Management of non-communicable diseases. Diabetes, CVD, Gout, Asthma.

## **Community Health Care**

**PAPER IV, Unit: 4**

**Full Mark: 50**

**(THEORY)**

**CREDIT POINT: 4**

1. Concept of dimension of health. Concept of community & community health. Concept of disease and control of disease.
2. Determinants of health, responsibility of health. Sources of health information system.
3. Community health & nutritional indicators with their measurement. Health care of pregnant and lactating mother and infant in India.

4. Primary idea about present community health care ecosystem.
5. Primary health care and Programs in India – mother –child health care system – village level, sub centre level primary health centre, community health centres.
6. Non- Governmental agencies in community health care system.
7. System of health care awareness in community in rural and urban areas. Community nutrition programs for community health care.
8. Health Education and Communication system.
9. National strategies for community health upgradation.

## **Human Anatomy**

**PAPER:V, Unit: 5**

**Full Mark:50**

**(THEORY)**

**CREDIT POINT: 4**

### **1. System of the human body**

1. Parts of blood vascular system,
2. Anatomy of upper and lower respiratory tract,
3. Anatomy of Gastro intestinal tract, urogenital system,
4. Endocrine system including reproductive organs,
5. Integumentary system, CNS & PNS of human body and surface anatomy.

### **2. Musculo- skeletal Anatomy**

- A) Basic idea about the Fascia and muscles of head, neck face, trunk, upper limb and lower limb, muscles of eye
- B) General structure of all bones of skeleton and their attachment,  
Classification of joints, joint of head, neck, trunk, upper limb, shoulder girdle and pelvic girdle.

## **Human Anatomy**

**(Practical)**

**Paper-VI,Unit:6**

**Full mark: 50**

**CREDIT POINT: 4**

1. Identification of surface land marks of a human body.
2. Study on muscles of trunk, lower and upper extremities and face on a dissected human body.
3. Study on bone on human body with special reference to the origin and insertion of muscles and ligaments.
4. Study on gross anatomy of respiratory, digestive, endocrine, urinary and genital system on a dissected human body.
5. Study on the anatomy of CNS and PNS on a dissected human body.



# Semester - II

## Human Physiology

PAPER: VII, Unit: 7

Full Mark: 50

(THEORY)

CREDIT POINT: 4

- 1. Cell and tissue introduction:** Basic concept of cell structure, structure of cellular contents and transport across membranes, Different type of tissues, distribution and function.
- 2. Cardiovascular system:** Cardiac cycle, cardiac output, blood pressure, heart rate and their regulation. Coronary circulation, renal circulation, hepatic circulation, cerebral circulation. Erythropoiesis, stem cell concept in bone marrow, haemoglobin and their functions, blood coagulation, blood groups, regulation of blood PH.
- 3. Respiration:** Mechanism of inspiration, expiration, gaseous transport through blood, breathing rate regulation, hypoxia, asphyxia, dyspnoea and oxygen therapy.
- 4. Endocrine system:** Different hormones in endocrine system. Action of pituitary, thyroid, parathyroid, adrenal and gonadal hormones.
- 5. Digestive system:** Digestion of carbohydrate, protein, fat, egg, milk and absorption of different food stuffs. Absorption of water. Movement of small intestinal tract and their role.
- 6. Skin and body temperature:** Structure of the skin, function of the skin. Body temperature regulatory process in human - role of endocrine and nervous system.
- 7. Neurophysiology:** Reflex system, automatic nervous system, parts of brain and function of each part. Nerve tract and their role.
- 8. Muscle Physiology:** Structure of skeletal muscle. Muscle contraction and relaxation. Types of muscle contraction.
- 9. Special senses:** Structure of retina, rhodopsin and iodopsin cycle, visual tract, accommodation. Auditory tract, mechanism of audition. Structure of taste bud, taste pathway, Olfaction and its physiology.
- 10. Renal physiology:** Structure and function of renal system. Urine formation, micturition, renal clearance test, renal buffer system.
- 11. Reproductive system:** Male and female reproductive organs, Gamatogenesis, Ovulation, Menstrual Cycle.

## **Human Physiology**

**Paper – VIII, Unit 8**

**Full Mark:50**

**(Practical)**

**CREDIT POINT: 4**

1. Staining of Squamous epithelium.
2. Measurement of Heart rate and Blood pressure, PFI (Harvard Step Test) in different posture.
3. Blood group determination.
4. Identification of blood cells and TC, DC. Separation of acellular and cellular components.
5. Study on Superficial and Deep reflexes.
6. Haemoglobin estimation by Sahli's or Drabkin's method.
7. ESR by Westergren method.
8. Muscle striation study by Methelene blue.
9. Study of nodes of Ranvier by Silver chloride method
10. To demonstrate microscopic structure of Tongue, Oesophagus, Stomach, Small intestine, Duodenum, jejunum, Ileum, parotid gland, large intestine, Pancreas, Liver, Lungs, Skin, kidney, Spleen, Lymph gland, Thyroid gland, Uterus, Testis, Ovary, Spinal cord, Cerebrum, Cerebellum, with permanent slides.

## **Biochemistry & Biophysics**

**Paper – IX, Unit 9**

**Full Mark:50**

**(THEORY – 50)**

**CREDIT POINT: 4**

1. **Carbohydrate** – Definition, Source, Classification, Functions and Importance, Physiological importance of major type of carbohydrates.
2. **Protein** – Definition, Source, Classification, Function and Importance of major type of proteins.
3. **Lipids** - Definition, Source, Classification, Function of major type of lipids. Saturated and Unsaturated type of fatty acids, Essential fatty acids and their importance. Phospholipids and their importance.
4. **Nucleic acid** – Structure and function of DNA & RNA. Nucleosides and Nucleotides, Genetic code, Biologically important nucleotides.
5. **Vitamins** – Fat-soluble and water-soluble vitamins, Daily requirements, Physiological functions and diseases of vitamin deficiency.

6. **Bioenergetics** – Energy rich compounds. Respiratory chain and biological oxidation.
7. **Carbohydrate metabolism** – Glycolysis, HMP shunt, TCA cycle, Glycogenesis, Glycogenolysis, Neoglucogenesis, Blood sugar level.
8. **Lipid metabolism** – Fatty acid oxidation, Ketone bodies, Metabolism of cholesterol, Arteriosclerosis and Obesity.
9. **Protein metabolism** – Transamination, Transmethylation, Deamination, Urea synthesis, Inborn error of metabolism.
10. **Enzymes** – Definition, Classification, Mode of action, Factors affecting enzyme action, Chemical importance of enzyme.

## **Biochemistry & Biophysics**

**Paper: X, Unit 10**

**Full Mark:50**

**(Practical)**

**CREDIT POINT: 4**

1. Qualitative identification of Glucose, Fructose, Lactose, Maltose, Sucrose, Starch, Peptone, Glycerol, Cholesterol, Acetone, Bile salt in sample by biochemical tests.
2. PH determination of a solution by titration.
3. Quantification of Glucose, Lactose and Sucrose in a specific sample.
4. Preparation of different buffers used in pathological laboratory and their pH determination.

## **Medical Entomology, Parasitology & Virology**

**Paper: XI, Unit 11**

**Full Mark:50**

**(Theory)**

**CREDIT POINT: 4**

1. **Basic concept of Medical Entomology and Parasitology in relation of this course.**
2. Arthropods of medical importance. Arthropods borne disease and their transmission. Principle of arthropod control.
3. **Mosquito:** Role of this arthropod in disease transmission, Diseases types, Controlling measures.
4. **Houseflies:**Role of disease transmission and controlling measures. And Sandflies.
5. **Flea:**Role of disease transmission and controlling measure & itch mite.
6. **Filaria:** Causes, Symptoms and controlling measures.
7. **Taeniasis:** Causes, Symptoms and controlling measures.
8. Introduction to Virology,Classification, Structure and General properties of viruses, Bacteriophage, lytic cycle, lysogenic cycle,
9. Brief idea of Pox virus, Myxovirus, Arbovirus, Herpes virus, Enterovirus, Rabies virus, Rota virus, HIV virus, SARS - COV- 2

## **Medical Entomology, Parasitology & Virology:**

**Paper: XII, Unit 12**

**Full Mark:50**

**(Practical-50)**

**CREDIT POINT: 4**

1. Collection, Presentation & Identification of different disease causing Arthropods (Housefly, Mosquito etc.), and Whole mount preparation of slide of different disease causing arthropods for their detailed anatomical studies.
2. Identification of different disease causing Helminth and Protozoan parasites.
3. Identification of different phases of life cycle of arthropods protozoa, helminth, having medical importance for causing disease.
4. Slide identification of microfilaria, *Taeniasolium*, *ascaris*, and deferent stages of malaria.
5. Examination of stool for OPV(Ova parasite Cyst)
6. Laboratory diagnosis of viral Infections-Specimens collected, Processing of specimens, Different methods of diagnosis.

**Semester-III**  
**IMMUNO-HAEMATOLOGY,**  
**Paper: XIII, Unit 13**  
**Full Mark:50**  
**(Theory)**  
**CREDIT POINT: 4**

1. Basic requirements of haematology laboratory, cleaning of laboratory glassware in Haematology, Sterilization process.
2. Genetics in blood banking, Blood collection & preservation including cryopreservation, Coombs tests-significance.
3. Haemoglobin, its synthesis and types, normal and abnormal haemoglobins, extravascular and intravascular haemolysis.
4. Haemolytic anaemia, pathogenesis and laboratory investigations, principle and procedure of special test, G-6-PD
5. Haemolytic disease of new born, Haemostasis, Idea about Thalassaemia and sickle cell anaemia. Blood donor selection, screening, Transfusion transmitted diseases & their lab diagnosis.
6. HLA- theory importance in transplantation, disease associations & basic techniques used in tissue typing.
7. Automation in Haematology Laboratory.

**IMMUNO-HAEMATOLOGY**  
**PAPER: XIV, Unit 14**  
**(Practical)**  
**Full mark: 50**  
**CREDIT POINT: 4**

1. Specimens, Blood collection & preservation using different anticoagulants & preservative solutions.
2. Experiments on TC & DC, PCV, MCV, MCH, MCHC and ESR. (Wintrob method)
3. Determination of haemoglobin by haemoglobin meter and by colorimetric method.
4. Determination of Bleeding time and clotting time, PT
5. Screening test for sickle cell anemia and slide identification of Thalassemia.

# Clinical Immunology

**Paper-XV, Unit 15**

**Full Mark:50**

**(Theory)**

**CREDIT POINT: 4**

1. Basic concept of Immune system. Types of immunity, cellular, humoral, active, passive, natural, and acquired immunity. Primary immune organs.
2. Antibody formation and antigen-antibody reaction, type of reactions
3. Basic concept of immunization. Primary and secondary response of immunization. Vaccination and Booster dose.
4. Immunoglobins—type, structure and their specific importance.
5. Immunodeficiency diseases.
6. Immunosuppression - role of organ transplantation.
7. Auto immune disease: Hashimoto disease, myasthenia gravis, RA and Lupus erythematosus, Erthoblastosisfoetslis.
8. Antibiotics, Definition, types and properties, mode of action, use

# Clinical Immunology

**Paper-XVI, Unit 16**

**Full Mark:50**

**(Practical)**

**CREDIT POINT: 4**

1. Determination of 'ABO' blood grouping and 'Rh' typing.
2. Antibody measurement by ELISA, Flow Cytometry, Radial immuno-diffusion (RID) technique.
3. Antigen-Antibody reaction testing by precipitating ring. Ouchterlony test.
4. Qualitative and Quantitative assay of Immunoglobins in plasma. (IgG,IgM)

# SEROLOGY

**PAPER-XVII, Unit 17**

**Full Mark:50**

**(Theory)**

**CREDIT POINT: 4**

1. Collection and preparation of specimen material for Culture-Urine, Blood, CSF, Throat Swab, Faeces, Body fluids separation of Sera, Preservation & Transport for serological test.
2. Principle of Sero-diagnostic tests, precipitation, Flocculation, Agglutination,neutralization and coagulation.
3. Serological test for syphilis (STS) and VDRL, CRP, RPR test.
4. WIDAL test for *Salmonella Typhi*.
5. Sero-diagnosis test for AIDS, Rubella, Toxoplasmosis, Leishmaniasis, Trypanosomiasis. TORCH panel test.
6. Immunological test for pregnancy.(Direct and Indirect)
7. Intradermal hypersensitivity test – Montoux Test.
8. ASO (Antistreptolysin O) test.

# **SEROLOGY**

**PAPER-XVIII, Unit 18**

**Full Mark:50**

**(PRACTICAL)**

**CREDIT POINT: 4**

1. Collection and preparation of specimen material for Sero Diagnosis and Preservation & Transport for serological specimen.
2. Diagnosis of viral infections-isolation& serological test advanced serological techniques-ELISA, Immuno-electrophoresis, Immunodiffusion, Serological diagnosis for viruses
3. VDRL test, WIDAL test, RPR, ASO test.
4. CRP test, RA test, AIDS test, STS test.
5. Immunological test for Pregnancy.(direct and indirect)
6. Montoux test.

## **Semester-IV**

### **Clinical Pathology and Oncopathology,**

**PAPER-XIX, Unit 19**

**Full Mark:50**

**(THEORY)**

**CREDIT POINT: 4**

1. Collection of urine and stool specimen, types of urine and stool specimen and preservation of urine and stool. Routine examination of urine – physical and Microscopic examination. Routine test for stool and occult blood test.
2. Chemical test of urine for glucose, protein, Ketone bodies, bilirubin, urobilinogen & blood.
3. Laboratory investigation, Serous fluid and Gastric juice.
4. Collection and processing of CSF and its laboratory investigation.
5. Hallmarks of Cancer, Incidence and Etiology of Cancer, Cancer and metabolism, Crisper cas9
6. The Carcinogens-definition, Oncogene-definition Mechanism of action of Oncogenes (outline), Characteristics of growing tumor cells-general and morphological changes, biochemical changes,
7. Tumor Markers Introduction and definition, Clinical applications of tumor markers, Enzymes as tumor markers, Alkaline Phosphatase (ALP), Creatine kinase (CK), Lactate dehydrogenase (LDH), Prostatic acid phosphatase (PAP), Prostate specific antigens (PSA), Hormones as tumor markers (introduction of each type in brief), Oncofetalantigensm Alpha fetoprotein (AFP) , Carcino embryonic antigen (CEA), Squamous cell carcinoma (SCC) antigen, Carbohydrate markers (brief introduction of each type) CA 15-3, CA 125 ,Bladder cancer markers (introduction in brief) - Bladder tumor antigen (BTA) , Fibrin- Fibrinogen degradation product (FDP)m Nuclear matrix protein (NMP22). Biomarkers still in research (introduction in brief)- Telomeres, TRAP assay, hyaluronic acid and Hyaluronidase

### **Clinical Pathology and Oncopathology**

**Paper – XX, Unit 20**

**Full Mark:50**

**(PRACTICAL)**

**CREDIT POINT: 4**

1. Physical and Microscopic examination of Urine.
2. Bio-chemical estimation of glucose in urine.
3. Bio-chemical estimation of protein and ketone bodies in urine, bile salt, bile pigment, urobilinogen and blood in urine.

4. Laboratory testing of CSF, Serus fluid, Gastric juice, and Synovial fluid.
5. Collection and processing of CSF and its laboratory investigation.
6. Routine test and microscopical test for stool and occult blood test.

## **Clinical Bio-chemistry**

**Paper: XXI, Unit 21**

**Full Mark:50**

**(Theory)**

**CREDIT POINT: 4**

1. Specimens processing for biochemical analysis – preparation of serum specimen, protein free filtrate and urine.
2. Principles of Immuno Chemistry – RIA & ELISA.
3. Determination of glucose, urea, creatinine, uric acid, bilirubin, Triglyceride, cholesterol and Phospholipids, LDL, VLDL, HDL, Troponine T test in blood.
4. Liver function tests. (Total protein, Albumin, Globulin ratio, ALP, ALT, AST, conjugated and unconjugated bilirubin)
5. Gastric function tests: Free acidity, Total acidity, total acidity, gastric pH, gastric enzyme analysis.

## **Clinical Bio-Chemistry**

**Paper – XXII, Unit 22**

**Full Mark:50**

**(Practical)**

**CREDIT POINT: 4**

1. Preparations of plasma, serum, and protein free filtrate from blood for biochemical analysis.
2. Determination of Blood glucose, total protein in serum, blood urea, blood creatinine, serum uric acid, serum TG, blood cholesterol and blood Phospholipids and Ketone bodies.
3. Estimation of Hepatitis – A, B, C, E.
4. Experiment on Glucose tolerance test.
5. LFT, LP, Renal Profile
6. Determination of G-6-PD
7. Sodium and Potassium estimation in Serum

## **Cytotechnology & Histotechnology,**

**Paper-XXIII, Unit 23**

**Full Mark:50**

**(Theory)**

**CREDIT POINT: 4**

1. Equipments used in Cytotechnology and Histotechnology.
2. Specimen preparation in Cytotechnology and Histotechnology – fixation, dehydration, clearing, embedding, section cutting, mounting staining.
3. Stain preparation. Haematoxylin, eosin, trichrome stain, PAS stain.
4. Techniques followed in routine Haematoxylin – Eosin staining, Trichrome staining, PAS staining, Geimsa staining.
5. Idea about frozen section techniques and automation of biotechnology laboratory.

# **Cytotechnology & Histotechnology:**

**Paper-XXIV, Unit 24**

**Full Mark:50**

**(Practical)**

**CREDIT POINT: 4**

1. Tissue collection and fixation, Idea about Grossing
2. Dehydration of collected tissue sample in the graded alcohol.
3. Stain preparation – Haematoxylin, eosin, PAS, Trichrome, iron,haematoxylin.
4. Staining techniques using above stains.
5. Preparation of specimen for cytological evaluation by papaniculas, staining, crystal violet staining.
6. Characterization of benign and malignant cells.

## **Semester - V**

### **Clinical Endocrinology, Toxicology and Andrology:**

**Paper –XXV, Unit 25**

**(Theory)**

**Full Mark:50**

**CREDIT POINT: 4**

1. Information on pituitary-gonadal axis, pituitary –thyroid axis, pituitary – Adrenocortical axis, feedback system. Information on pancreatic hormones.
2. Hormonal disorders in Diabetes mellitus and insipidus, hypertension, goiter, obesity and infertility.
3. Techniques followed in hormone assay – ELISA / RIA cross reaction, inter assay, intra assay variation.
4. Spermatogenesis and its hormonal control, semen physiology, sperm count, sperm motility, sperm morphology, fructose estimation of semen. Sperm viability test.
5. Primary idea on Assisted Reproductive Technology (ART).Acid phosphatase in semen.
6. Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Spot tests, hair and urine test, Immunoassay for drugs.

### **Clinical Endocrinology, Toxicology and Andrology:**

**Paper –XXVI, Unit 26**

**(Practical)**

**Full Mark:50**

**CREDIT POINT: 4**

1. Demonstration of male and female infertility test.
2. Hormone assay by ELISA reader – Estrogen, Testosterone, T3 and T4, LH, FSH, PRL, Insulin, Glucagon, Glucocorticoids, GH.
3. Sperm count, sperm motility, sperm morphology, fructose assay in semen, Acid Phosphatase in semen. Sperm viability test.

## **Clinical Microbiology**

**Paper: XXVII, Unit 27**

**Full Mark:50,**

**CREDIT POINT: 4**



**(Theory)**

1. Specimen collection and handling in microbiological laboratory; safety regulation of the laboratory, basic laboratory procedures of diagnostic laboratory.
2. Microscopic examination techniques, culture media and quality control in microbiology.
3. Diagnostic bacteriology – Grouping, characteristics of common pathogen bacteria.
4. Laboratory diagnosis of mycotic infections.
5. Virology of following diseases: Influenza, measles, Rabies, Kalazar, Swain-flu.
6. Antiseptics & Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants.
7. Chemical disinfectants: phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound. use and abuse of disinfectants. precautions while using the disinfectants.

**Clinical Microbiology:**

**Paper –XXVIII, Unit 28**

**Full Mark:50**

**CREDIT POINT: 4**

**(PRACTICAL)**

1. Sterilization techniques and cleaning of glassware.
2. Preparation of culture media, biochemical test for bacterial differentiation.
3. Examination of skin scapper fungi and Acid fast bacilli and examination of sputum for Acid fast bacilli.
4. Biochemical test for bacterial differentiation.
5. Gram staining: (gram positive and gram negative)
6. RNA & DNA analysis by Gel and PCR Technique.
7. Demonstration of Hot air oven and sterilization of glass wares.
8. Preparation of Antibiotics and perform antibiotic sensitivity test.
9. To perform gram staining, staining of bacterial spores
10. Basic techniques of collections of specimens for direct examination of pathogenic fungi KOH Lactophenol cotton blue method cultivation of fungi basic techniques of collection & transport of specimens for serological tests

**Blood Transfusion and Blood Bank:**

**Paper- XXIX, Unit 29**

**(Theory)**

**Full Mark:50**

**CREDIT POINT: 4**

1. Principles of blood grouping, Blood transfusion in total or in fractionated part. Blood group antigen: their importance in blood transfusion.
2. Condition of blood transfusion, basic principles followed for such case.
3. Disorders of mismatched blood transfusion, Transmission of diseases in relation to blood transfusion (HIV, Hepatitis, Jaundice, Malaria, Syphilis).
4. Introduction of blood collection and basic concept for storage of blood and it's transportation. Donor's selection.
5. Preparation of reagents for blood Banking.
6. Fractionation of blood storage.
7. QC
8. Blood Components, Preparation, Indications, Storage, difficulties and autologous transfusions.

# **Blood Transfusion and Blood Bank**

**Paper- XXX, Unit 30**

**Full Mark:50**

**(Practical)**

**CREDIT POINT: 4**

1. Reagent Preparation of Blood Bank.
2. Determination of Blood groups.(forward grouping and reverse grouping)
3. Determination of cross matching by blood group testing techniques,Coomb's test.(direct and indirect)
4. Fraction collection from Blood and it's storage.
5. Pre & Post transfusion reaction screening:
6. Apheresis
7. Investigation of transfusion reactions Investigation of haemolytic disease of new born HBsAg& HIV antibody testing in blood bank,
8. Auditing in blood banks how to store blood.
9. Test Compatibility testing cross matches.

## **Semester- VI**

### **Research Methodology and Medical Statistics:**

**Paper: XXXI,Unit 31**

**(Theory)**

**Full Mark:50**

**CREDIT POINT: 4**

1. Concepts of Research and it's types.
2. Concepts of hypothesis.
3. Basic idea about Project formation.
4. Data collection.
5. Experimental design.
6. Mean, median, mode, Percentile, Variance, SEM, SD.
7. 't' test, Chi-Square test and One way ANOVA, correlation of coefficient.

### **Research Methodology and Medical Statistics:**

**Paper: XXXII,Unit 32**

**(Practical)**

**Full Mark:50**

**CREDIT POINT: 4**

1. Assignment for project formulation. (at list one)
2. Problem solving on mean, median, SEM, SD.
3. Problem solving on't' test: match group, single group study, population mean study.
4. Problem solving on Chi-square test for association.

## **Computer Application,Biomedical Informatics and Health care system**

**Paper: XXXIII, Unit 33**

**(Theory)**

**Full Mark: 50**

**CREDIT POINT: 4**

1. Study on various components of a personal computer, hardware and software.
2. Computer Applications in pathological laboratory to recording and data presentation.
3. Basic knowledge and utility in multimedia in laboratories.
4. Application of the digital computer in patient maintaining, Basic knowledge on MSoffice, Floppy recording, Storage of data in pathological laboratory.
5. Interactive patient's education and counselling
6. Basic Idea of Tele medicine
7. Communication skills through an interview with an professional development.
8. Basic Idea of biomedical instrumentation (USG, ECG, EEG, X-ray etc)
9. Biomedical waste management

## **Computer Application AND Biomedical Informatics**

**Paper: XXXIV, Unit 34**

**(Practical)**

**Full Mark: 50**

**CREDIT POINT: 4**

1. Operation of personal computer.
2. Data storage, reporting, data presentation in computer.
3. Application of MS-office, MS-excel in pathological laboratories.

## **Project Preparation**

**Paper: XXXV**

**Full Mark: 50 Marks**

**CREDIT POINT: 4**

(An independent research project work undertaken by student under the guidance of a teacher, can either be a survey or Laboratory oriented research. The research should be submitted at the end of session in the form of a dissertation. The project work can be undertaken at University departments, affiliated research institutions, quality control laboratories, food industries or other institutions with prior approval)

## **Project Presentation**

**Paper: XXXVI**

**Full Mark: 50 Marks**

**CREDIT POINT: 4**

(The student should appear before examiners board and the dissertation shall be evaluated by means of presentation and viva – voce).

**Internship: 6 Months Report submission & evaluation: 200 Marks**

### **Recommended Books:**

1. Guide of patters and usages in English, A S Hornby
2. English Vocabulary in use, Michael Mc Carth and Felicity O ' Dell
3. Better pronunciation, O Conner.
4. Hand Book of Practical Communication skills, Chrissie Wright.
5. History of Science, Samarendra Nath Sen.
6. Science and Society in Ancient India, D P Chattopadhyay.
7. Environment and Health, Goutam Pal.
8. Preventive and Social Medicine, Park and Park.
9. Fundamentals of Human Anatomy, Dr. N Chakraborty and Dr. D Chakraborty.
10. Anatomy, Gray
11. Clinical Anatomy for Medical students, Snell
12. Human Anatomy, Dutta
13. Essentials of Anatomy, Singh.
14. Concise Medical Physiology, Choudhury.
15. Text book of Medical Physiology, Guyton.
16. Review of Medical Physiology, Ganong.
17. Biochemistry, D Das.
18. Biochemistry for students, Malthotra.
19. Review of Biochemistry, Harper.
20. Biophysics, D.Das. 21. Biophysics, R.N.Roy.
22. TB of Medical Parasitology, Panikar.
23. Medical Parasitology, Bhatia.
24. Text book of Pathology, N. C. Deb & T. K. Roy.
25. Practical Pathology, P. Chakraborty.
26. Medical Laboratory Technology, K. L. Mukherjee.
27. Basic Pathology, Kumar. 28. Practical Pathology, Parulekar.
28. Introduction Medical Laboratory Technology, Baker.
29. Modern Blood Banking & Blood Transfusion Practical, Harmening.
30. Text Book of Modern Immunology, Dasgupta.
31. Essential Immunology, Roitt.
32. Hand Book of Ultrasound, Garkal.