**Dr. Qadri’s College of Medical Laboratory Technology**

***(Affiliated with University of Kashmir)***

***SYLLABUS***

***FOR B.Sc MEDICAL LABORATORY TECHNOLOGY (B.Sc.- MLT)***

***ACADEMIC PROGRAMME***

***DURATION: 3YEAR & 4 MONTHS INTERSHIP***

***DURATION OF COURSE:***

* B.Sc in Medical Laboratory Technology course will be a full time course.
* Duration will be three years followed by compulsory 4 months rotatory internship
* This course will be divided into three professional examinations namely B.Sc in Medical Laboratory Technology (B.Sc.-MLT) Part – I at the end of 1st academic year. B.Sc. – MLT Part –II at the end of second academic year & B.Sc.-MLT Par-t III at the end of third academic year.

***EXAMINATION:***

* There shall be an annual university examination at the end of each academic year in the form of theory papers & practical examination. The candidates shall be required to appear in every subject as specified in the course structure for each year.

***DURATION OF EXAMINATION:***

Each theory paper shall be of three hours duration.

**SCHEME OF EXAMINATION**

**B.Sc in Medical Laboratory Technology Part- I (First year) university examination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S.No. | Subject | Sub Code | **THEORY MARKS** | | | | **PRACTICAL MARKS** | | | | | **Total**  **Marks** |
| Theory paper | Internal Assessment | Total | Minimum marks | Practical | Internal Assessment | Total | Minimum marks | |
| 1 | Fundamentals of Anatomy & Physiology | MLT-101 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | | 25 | 100 |
| 2 | General pathology | MLT-102 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | | 25 | 100 |
| 3 | Hematology- Blood transfusion-General | MLT-103 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | | 25 | 100 |
| 4 | Basic concepts of Biochemistry | MLT-104 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | | 25 | 100 |
| **Grand Total** | | | | | | | | | | | | 400 |

**B.Sc in Medical Laboratory Technology Part- II (2nd year) university examination**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S.No. | Subject | Sub Code | **THEORY MARKS** | | | | **PRACTICAL MARKS** | | | | **Total**  **Marks** |
| Theory paper | Internal Assessment | Total | Minimum marks | Practical | Internal Assessment | Total | Minimum marks |
| 1 | Biochemistry | MLT-201 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | 25 | 100 |
| 2 | Pathology | MLT-202 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | 25 | 100 |
| 3 | General microbiology, pharmacology & immunology/mol biology | MLT-203 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | 25 | 100 |
| 4 | Hematology & blood transfusion | MLT-204 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | 25 | 100 |
| **Grand Total** | | | | | | | | | | | 400 |

**B.Sc in Medical Laboratory Technology Part-III (3rd year) university examination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S.No. | Subject | Sub Code | **THEORY MARKS** | | | | **PRACTICAL MARKS** | | | | | **Total**  **Marks** |
| Theory paper | Internal Assessment | Total | Minimum marks | Practical | Internal Assessment | Total | Minimum marks | |
| 1 | Biochemistry | MLT-301 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | | 25 | 100 |
| 2 | Pathology | MLT-302 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | | 25 | 100 |
| 3 | General microbiology, pharmacology & immunology/mol biology | MLT-303 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | | 25 | 100 |
| 4 | Hematology & Blood transfusion | MLT-304 | 40 | 10 | 50 | 25 | 40 | 10 | 50 | | 25 | 100 |
| **Grand Total** | | | | | | | | | | | | 400 |

**INTERNAL ASSESSMENT**

* It will be for theory & practical both
* It will be done throughout the whole year
* Candidates must obtain at least 35% marks in theory &practicals separately in internal assessment to be eligible for the annual university examination
* Internal assessment (Theory)will be don as follows:

1. Mid-term & term examination. = 10marks
2. Assignment/Projects/Class test/Clinical presentation = 05marks
3. Attendance = 05marks

**TOTAL = 20marks**

* Internal assessment (Practical) will be don as follows:

1. Laboratory manual = 10marks
2. Day today performance = 05marks
3. Attendance = 05marks

**TOTAL = 20marks**

**CRITERIA FOR PASSING:**

* A candidate is declared to have passed university examination in a subject, if he/she secures 50% of the marks in theory & 50% in practical separately. For computation of 50% marks in theory. The marks secured in the internal assessment (theory) shall be added to the university conducted written examination and for passing in practical the marks scored in university practical examination and internal assessment (Practical) shall be added together.
* **GRACE MARKS:**
* If candidate fails in one subject (Theory only) in the annual university examination, five grace marks will be given to the candidate by the university before the declaration of the result.
* Candidate failing in practical examination will be considered as failed.
* **SUPPLEMENTARY EXAMINATION:**
* A candidate failing in the subject but securing at least 30% aggregate marks will be required to appear in the university examination after 3 months in that subject/subjects, while attending classes of the next year. Those who secure less than 30% aggregate marks will be required to appear in all the subjects.
* If the candidate fails in supplementary examination his/her subjects will be shifted by one year. The candidate will have to take admission in the previous year and pay the tuition fee for the academic year. He/she will have to appear in all the subjects in the examination.
* Supplementary examinations will be held not earlier than 3 months and later than 6 months for the date of annual university examination.
* **DIVISION:**
* Candidate will be awarded division at the end of third academic year as follows:

1. Distinction -80 % and above marks in any subject.
2. 1st division -60% and above in the aggregate of marks of all subjects.
3. 2nd division-50% or more but less than 60% in the aggregate of marks of all subjects.

**INTERNSHIP:**

A candidate will have to undergo internship for a period of 4 calendar months in a modern pathology laboratory, fully equipped & laboratory must be participating in External Quality Control (EQAS) also.

**DEGREE:**

The degree of B.Sc in Medical Laboratory technology (B.Sc-MLT) course of the university shall be conferred on the candidates who have pursued the prescribed course of study for not less than three academic years & have passed examination as prescribed under the relevant scheme and completed 4 months of compulsory rotator internship.

**INTERNSHIP:**

* There shall be 4 months of internship after the final year examination for candidate declared to have passed the examination in all the subjects.
* During the internship candidate shall have to work full time average 8 hours per day (each working day) for 4 calendar months.
* Each candidate is allowed maximum of 6 holidays during entire internship program and in case of any exigencies during which the candidate remains absent for a period more than 4 days, he/she will have to work for the extra days during which the candidate has remained absent.
* The internship should be rotator & cover Hematology, Histology & Cytopathology, Biochemistry, Microbiology, hormones & Automatic section of pathology laboratory.
* Based on the attendance and work done during posting

**B. Sc Medical Lab. Technology**

**Course of study/Training Programme:**

**SUBJECT (Theory Lectures) 1ST YEAR 2ND YEAR 3RD YEAR**

Introductory period 1 weeks -- --

Anatomy/ physiology 5 weeks -- --

Pharmacology ---- 1 week 1 week

Biochemistry 10 weeks 8 weeks 8 weeks

Pathology 8 weeks 6 weeks 6 weeks

Hematology 9 weeks 6 weeks 6 weeks

Blood transfusion 3 weeks 3 weeks 3 weeks

Immunology/Mol Biology ---- 4 weeks 4 weeks

Microbiology ---- 7 weeks 7 weeks

Computer sciences in relation to Lab 2 week 1 week 1 week

Total Quality Management -- 2 week 2 weeks

Annual Examination 4 weeks 4 weeks 4 weeks

**TOTAL\* 42 WEEKS 42 WEEKS 42WEEKS**

**\*excluding winter (3 weeks) & summer (2 weeks) vacations but including gazetted holidays.**

**2 theory lectures/seminars/interactive sessions per day & practical training of 3 hours daily during 1st year & 2nd year (BSc MLT-I & BSc MLT -2).**

**1 theory lecture daily & 4 hours practical/wet training in a modern pathology Laboratory (participating in Quality Control Program) during BSc MLT-Part 3.**

Syllabus

**First Year (BSc MLT-part 1):**

**PAPER – 1** [Anatomy & Physiology]

**Theory:**

**Anatomy**

* Various kinds & types of bones with example.
* Bones of upper limb, lower limb, pelvis & thorax.
* Anatomical parts of brain.
* Major blood vessels & vessels for Phlebotomy.

**Physiology**

* Respiration
* Digestion
* Skeletal system
* Excretory system
* Circulation
* Nervous system
* Hormones (endocrine glands)
* Blood system

**Practicals:**

* Identification of bones.

**PAPER –II**  [Pathology]

**a:Theory**

* Principles of microcopy.
* Principles of instruments used in the lab.
* Urine examination**.**
* Stool examination**.**
* Examinationof sputum
* Examination of CSF & other fluids.
* Exudate/ Transudates.
* Semen analysis
* Pregnancy test
* Health & safety in the laboratory**.**
* Collection & reporting of specimens.
* General guideline for storing & handling of chemicals &equipments.
* Automation in clinical pathology laboratory.
* Computer –basics (Hardware & software)

**b: Practicals**

* Microscope.
* Instruments in common use
* Urine examination - collection, physical examination & routine chemical examination & microcopy
* Stool examination & sputum examination - collection. Physical & microscopy.
* Examination of body fluids & semen analysis.
* CSF, collection, chemical examination & microcopy.
* Bal Fluid examination

**PAPER –III [**Hematology & Blood Transfusion – An introduction]

**A: Theory**

* Haemopoiesis: Origin & development of blood & blood forming tissues.
* Erythropoiesis, Biosynthesis of Hb, Nutritional factor inErythropoiesis, destruction of red cells.
* Granulopoiesis, different kinds of granulocytes & their function.
* Physiological function of blood.
* Techniques for: Hb measurement, cell count, differential leukocyte count & their normal values.
* Haemostasis - basic concept.
* Introduction of blood transfusion & immune - Hematology.
* Introduction to major ABO, blood group system.
* Computer Sciences (Microsoft word).

**B: Practical**

* Washing of glassware & other accessories used in blood bank.
* Brief knowledge of various equipment used in blood bank.
* Preparation of A, B & O cells.
* Preliminary ABO grouping.
* Importance of sample receipt, labeling & requisition forms in blood transfusion.

**PAPER –IV** [Basic concepts of Biochemistry]

**A: Theory**

* **Introduction:** Role of clinical Biochemistry in medical laboratory technology, laboratory ethics, general storage of chemicals, collection & recording of samples.
* **Analytical Biochemistry**: concept of solution, molar, normal moral & percent. Acids, bases, salts, buffers, Henderson Hassel-batch equation, general principals of colorimetry, Spectrophotometry, flame photometry, Flourometry& chromatography. Radio – isotopes & their utility in clinical biochemistry
* **Carbohydrates**: introduction, classification & functions of carbohydrates, monoxide & polysaccharides, mucopolysacharide.
* **Proteins:** Classification & functions of proteins simple & conjugated proteins properties of amino acids, essential &non-essential amino acid, levels of protein structure (brief concept)
* **Lipids:** Definition classification & functional role of lipids. Fatty acid, Triglycerides & Phospholipids, cholesterol, lipoproteins.
* **Nucleic acids:** Introduction, purine & pyrimidine. Types of nucleoside3 & nucleotides, structure of DNA, Watson crick model, structure & types of RNA.
* **Vitamins and their physiological role.**

**B: Practical**

* Collection & preservation of blood & urine sample.
* Sample processing (separation of serum plasma etc.)
* Preparation of common analytical reagents & buffers
* Calibration of colorimeter, standard curves absorption spectra.
* Qualitative & microscopy analysis of urine.

**Second year (BSc MLT part-2)**

**PAPER – I [**Biochemistry]

**A: Theory**

**Enzymology**: Definition & classification of enzymes, coenzymes & cofactors, factors effecting enzyme activity, tissue distribution of enzymes, brief concept of enzyme kinetics (Michaels Menten & line – weaver Burk treatments), enzyme inhibition, regulatory enzymes.

* **Carbohydrate metabolism:** Glycolysis, TCA cycle, HMP pathway, uronic acid pathway, glycogen synthesis & break down, gluconeogesis, disorder of carbohydrate metabolism.
* **Metabolism of proteins:** protein degradation , general reactions of amino acid metabolism,( deamination , decarboxylation & transamination , urea cycle & its regulation, disorders of proteins & amino acid metabolism
* **Metabolism of nucleic acids:** Degradation & synthesis of purine & pyrimidine bases, Disorders of purine&pyrimidine metabolism.
* **Automation in Biochemistry**
* **Mechanism of action of hormones and analysis.**

**B: Practical**

* Principal of glucose estimation by various methods. Quantitative estimation of glucose by enzymatic (end point) method.
* Glucose tolerance test, principal & methodology
* Principle of urea estimation by various methods. Quantitative estimation of urea by DAM method.
* Quantitative estimation of Creatinine in blood & urine.
* Quantitative estimation of Bilirubin & other liver enzymes.
* Quantitative estimation of uric acid in blood & urine.
* Quantitative estimation of calcium in blood & urine.
* Quantitative estimation of phosphorus in blood & urine.
* Quantitative estimation of total protein in blood & urine.
* Electrolyte estimations.
* Quantitative estimation of albumin.
* Laboratory software & interfacing

**PAPER –II** [Pathology]

**A: Theory**

* Cell structure & Introduction to various types of human cells & tissues
* Fixatives & reagents.
* Tissue processing – various steps & procedure.
* Bone & decalcification
* Microtomy. Types of microtomes, procedure & tissue sectioning
* Cryostat & its practical applications
* General outline of the theory & practice of staining.
* H & E staining.
* Special staining procedures include:

i) Nucleo – proteins ii) Connective tissues fibers iii) Cytoplasmic granules

iv) Extra – cellular substances v) Pigments vi) Carbohydrate

vii) Enzymes/ lipids viii) Bacteria etc

* Maintenance of equipment in the surgical pathology laboratory.
* Introduction to post – mortem techniques.

**B: Practical**

* Receipt of specimen, labeling & record maintenance.
* Handling of surgical biopsies & resected specimens for routine histopathological examination & for frozen section.
* Gross examination of surgical tissue.
* Processing of tissue ( soft tissues & bone)
* Preparation of fixatives and other chemicals for tissue processing.
* Tissue embedding
* Paraffin embedding & other embedding materials.
* Knife sharpening procedures, care of Knives.
* Microtomy – tissue sectioning (coarse & thin sections).
* H & E staining
* Special staining procedures.

**PAPER – III** [General microbiology, pharmacology & immunology/mol biology]

**A: Theory [**General Microbiology**]**

* Introduction ofMicrobiology**.**
* Application ofMicrobiology**.**
* Prokaryotic & eukaryotic cells

Microbial nutrition & growth

Microbial genetics

a) General principles

b) Recombination & plasmids

**Immune response**

1. Nonspecific & specific
2. Antigen – antibody reaction.

**Laboratory equipments& procedures:**

1. Microscope
2. Techniques of microscopic study:

i) Living organisms.

ii) Staining reaction & techniques.

c) Preparation of pure cultures.

i) Culture techniques

ii) Culture media

d) Sterilization methods:

i) Physical methods

ii) Chemical methods.

e) Laboratory tests for antibiotic susceptibility

**B: Practical**

* 1. Principles & practice of microscopy.
  2. Preparation of stains.
  3. Staining methods.
  4. Media room skills.
  5. Disposal of microbiological discard.
  6. Preparation of culture media.
  7. Identification of microbes.
  8. Antibiotic sensitivity testing.

**Theory** (Pharmacology)

* Sterilization methods.
* Waste disposal.
* Carcinogens.
* Safety precautions.
* Introduction to drug development, sources, nomenclature of drugs and drug information.
* Routes of administration and bio-transportation of drugs.
* Absorption of drugs and factors affecting absorption.
* Elimination of drugs.
* Quality control of drug assays.
* Chemical assay.

**Practical**

* Introduction of equipments.
* Cleaning and sterilization of glassware
* Solution making
* Sample collection.
* Demonstration of:

1. Colorimeter.
2. Spectrophotometer.
3. Flame photometer.
4. Distillation apparatus.

**Theory (**immunology/molecular biology)

* Basic concept of immunology.

1. Historical background.
2. Innate & adaptive immunity.
3. Self & non self.
4. Antigen, hapten, antibody.

* Basic of humeral & cellular immunity.
* Antigen & antibodies reaction.
* Organs & immune system.

1. Primary lymphoid organs
2. Secondary lymphoid organs

* Basic concept of antibody response (Primary/Secondary immune response )
* Introduction to Mol Biology- DNA/RNA composition & structure
* Immunization & types of vaccination, adjuvant.
* Monoclonal antibodies

**Practical:**

* Basic concept of laboratory working, handling of labile reagents & laboratory equipments.
* Disinfection, sterilization & disposal of infective & hazardous material, samples & laboratory ware.
* Agglutination & precipitin reaction based techniques.
* Gel diffusion techniques (double of immunoglobulin’)
* Electrophoresis &immuno – Electrophoresis
* Separation of cells from peripheral blood.
* DNA extraction

**PAPER –IV [**Hematology & blood transfusion]

**Theory [Hematology]**

* Lymphatic system, Lymphopoiesis, differentiation of lymphoid cells.
* Structure of red cells & its membrane, red cells morphology in health & disease.
* Anaemia – morphological & etiological classification.
* Investigations in a case of anaemia, Hypo-chromic microcytic anaemia
* Hemolytic anaemia: general concept.
* Hemoglobinopathies, Thalassemia & its related disorder.
* Physiology of primary hemostasis, Thrombocytopenia, pathogenesis & laboratory approach
* Laboratory control of oral & heparin anticoagulants.
* Automation in hematology

**Practical**

* Preparation of various anticoagulants
* Cleaning & sterilization of various glassware, syringes etc for use in laboratory.
* Collection of blood for various hematological tests.
* Preparation of blood & bone marrow slides & their routine staining.
* Hemoglobinometry by various methods.
* Measurement of red cells indices
* Hematocrit; manual & electronic.
* Total leukocyte count, platelet count & red cell count.
* Absolute Eosinophil count.
* ESR

**Theory (blood transfusion)**

* Criteria for selection of donors.
* Donor recruitment & registration.
* Preservation of blood & Anticoagulants used in blood.
* Blood group system(ABO)
* Blood group system(Rh)
* Antigen antibody reaction, factors modifying these reactions
* Total Quality Control
* Automation in Hematology

**Practical for Blood Banking**

* ABO – cell & sera grouping
* Rh. Blood grouping
* Compatibility techniques

1. Cross – matching in saline ( R. T. ) room temperature
2. Cross – matching with enzyme & albumin.
3. Combs Cross – match.

**Third year (BSc MLT-3)**

**PAPER –I** [Clinical Biochemistry and Molecular Biology]

**Theory**

* **Organ function assessment:** Biochemical assessment of hepatobiliary cardiovascular renal, gastrointestinal disorder & disorder of mineral metabolism.
* **Molecular biology:** Brief review of organization of DNA in eukaryotes. DNA replication, transcription, translation, genetic code, concept of gene cloning & PCR, Tumor Markers.
* **Quality assessment:** concept of quality control in clinical biochemistry, sensitivity, specificity, accuracy, precision, and significance SD & CV, QC graphs.
* **Automation in Biochemistry.**

**Practical**

* Quantitative estimation CSF protein
* Quantitative estimation urinary protein
* Quantitative estimation cholesterol
* Quantitative estimation triglycerides
* Quantitative estimation of ACP
* Quantitative estimation of ALP
* Quantitative estimation of SGOT
* Quantitative estimation of SGPT
* Quantitative estimation of CPK
* Quantitative estimation of LDH
* Quantitative estimation of amylase
* Quantitative estimation of VMA
* Quantitative estimation of 17 – ketosteroids
* Quantitative estimation of copper & cerulopasmin
* Automation in Biochemistry

**PAPER –II [**Pathology**]**

**Theory**

* Values of having museum & its maintenance
* Preparation of specimen & their fixation & preservation including mounting.
* Electron Microscopy

**Cytology**

**Theory**

* Introduction of cytology & laboratory safety procedures
* Equipments used in cytology & their practical
* Supply of material, fixatives used & staining procedures used in cytodiagnosis
* Sex chromatin from buckle smears & blood films
* Collection of nipple discharge & female genital tract specimens for routine staining
* Collection & processing of body cavity fluid specimen & CSF
* Fine needle aspiration cytology – technique, staining & interpretation of few common diseases e.g. Tubercular lymphadenitis, abscess, cysts, lipoma etc.
* Cytology of GIT cancer
* Respiratory tract & GIT specimens:

1. Sputum
2. Bronchoscopic
3. Brush cytology of upper & lower GI Tract

**Practical**

* Methods of fixation
* Methods of processing of biological material
* Liquid based cytology
* Immunohistochemistry

**PAPER –III [**Applied Microbiology, pharmacology & immunology/mol biology**]**

**Theory [**Applied microbiology**]**

* Broader aspects of microbial & associated diseases:

1. Bacteria
2. Parasites
3. Fungi
4. Viruses

* Collection, transport, processing & analysis of specific specimens types:

a)Respiratory tract

b) Gastrointestinal tract

c) Urinary tract

d) Genital tract

e) CNS

f) Wounds & abscesses

g) Eye, ear & sinus infection

h) Blood

i) Tissue samples for culture

* Microbiology of everyday life:

a) Air, water

b) Mild & food

c) Sewage

* Rapid & emerging techniques in diagnosis of infection diseases.

**Practical**

* Processing of various samples
* Bacteriological analysis of water & food – products.
* Putting up of various serological tests
* Parasitic identification procedures
* Microscopic & culture procedures in mycology.

**Theory** (Pharmacology)

1. Testing and screening of drugs of abuse.
2. Laboratory animals, animal house.
3. Experimental pharmacology.
4. Different physiological solutions and their significance.
5. Bioassays- Methods and principles.
6. Dose response curve.
7. Cholinergic and adrenergic system.
8. Statistics.

Distribution, mean, mode, median, variance, standard deviation, standard error, simple test of significance student’s “T” test and chi a square test..

**Practical**

* Demonstration of different physiological solutions

**Theory [**Immunology]

* Antibody structure & classes of immunology
* Cells involved in immune system, Monocytes, lymphocytes, null cells, polymorphs.
* Complement system
* Basic concept of HLA
* Types of hypersensitivity
* Principles & uses of laboratory assays ELISA/RIA
* PCR & Western Blotting Techniques

**Practical**

* Separation of T & B lymphocytes by resetting method
* Demonstration of ELISA/RIA techniques
* Types of hypersensitivity reaction
* DNA extraction.
* Demonstration - PCR

**PAPER –IV [**Hematology & blood transfusion**]**

**Theory** {Hematology}

* 1. General concept about various types of leukemia’s.
  2. FAB classification of acute leukemia’s.
  3. FAB classification of MDS.
  4. CML general concept and laboratory findings, Differentiation of CML from leukemoid reaction.
  5. Laboratory investigation in the case of bleeding disorders.
  6. Laboratory investigation in a case of DIC.
  7. Hypercoagulable states & laboratory approach
  8. Anti-nuclear antibodies.
  9. Laboratory & quality control of reagents &equipments.
  10. Monoclonal antibodies &Flowcytometry.

**Practical:**

1. Hemostasis**,** screening test, bleeding time, clotting time, Hess test, Prothrombin time, APTT & thrombin time
2. Fibrinogen estimation
3. Correction studies for screening the deficiencies of various coagulation factors
4. Screening for presence of FDP/D-dimer
5. Factor assay, VIII , IX, XIII
6. Estimation of Sr. iron, TIBC, & % saturation Examination of blood films for differential leukocyte count & malaria parasite
7. Prussian blue reaction – bone morrow staining for PAS – staining peroxides staining
8. Hb electrophoresis.

**Theory (**Blood transfusion**)**

1. Preliminary lecture on blood component
2. Selection of blood for various disorder
3. Transfusion reaction & their investigation
4. Principles & indication of combs investigations
5. transfusion transmissible diseases & importance of screening of blood for their diseases
6. Hazards of transfusion fresh whole blood

**Practical:**

1. Combs test direct & indirect (DCT, ICT)
2. HbsAg, HIV, HCV, VDRL screening
3. Investigation of transfusion reaction
4. Cross – matching for major surgeries & multi – transfusion patients.

**After successful result from University, students will have 16 weeks Internship (program below) & then university of Kashmir will award the degree.**

**Internship Program:**

**Chemistry/Hormone Lab—6 weeks; Hematology/Blood Banking 4 weeks, Microbiology – 3 weeks, Histopathology/Cytology-2 weeks & immunology/molecular biology-1 week.**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**