

F.SC Medical Laboratory (Pathology) Technology Curriculum 2013



Schedule training for intermediate science (Medical Laboratory Technology)

S.No	Subject	Theoretical	Practical	Total Working Hours
Compulsory Subjects				
1	English	150 x 1 hours	--	150 hours
2	Urdu	150 x 1 hours	--	150 hours
3	Islamic Studies	150 x 1 hours	--	150 hours
4	Pakistan Studies	150 x 1 hours	--	150 hours
Technical Subjects				
1	Elementary Anatomy & Micro techniques	40 x 1 hours 40 x 1 hours	25 x 1 hours 60 x 1 hours	250 hours
2	Hematology and Blood Banking	50 x 1 hours 20 x 1 hours	70 x 1 hours 20 x 1 hours	250 hours
3	Microbiology – I (Bacteriology & Virology)	55 x 1 hours 15 x 1 hours	70 x 1 hours 20 x 1 hours	250 hours
4	Microbiology – II (Parasitology and Mycology)	50 x 1 hours 20 x 1 hours	50 x 1 hours 20 x 1 hours	210 hours
5	Clinical Pathology & Serology	50 x 1 hours 30 x 1 hours	70 x 1 hours 20 x 1 hours	260 hours
6	Elementary Chemistry & Chemical Pathology	40 x 1 hours 60 x 1 hours	25 x 1 hours 60 x 1 hours	270 hours
Grand Total		970	1020	1990 Hours



SCHEME OF STUDIES

Compulsory Subjects			
1	English	2 Papers	200 Marks
2	Urdu	2 Papers	200 Marks
3	Islamiat	1 Papers	50 Marks
4	Pakistan Study	1 Papers	50 Marks
Technical Subjects			
1	Elementary Anatomy & Micro techniques	1 Paper	100 Marks
2	Hematology and Blood Banking	1 Paper	100 Marks
3	Microbiology – I (Bacteriology & Virology)	1 Paper	100 Marks
4	Microbiology – II (Parasitology and Mycology)	1 Paper	100 Marks
5	Clinical Pathology & Serology	1 Paper	100 Marks
6	Elementary Chemistry & Chemical Pathology	1 Paper	100 Marks
Total Marks			1100 Marks



F.Sc MEDICAL LABORATORY TECHNOLOGY (Pathology) 1st YEAR

S.No	Subject/Papers	Course	Marks	
1.	English – I	According to BISE Peshawar	Theory 100	Practical Nil
2.	Urdu – I	According to BISE Peshawar	100	Nil
3.	Islamiyat	According to BISE Peshawar	50	Nil
4.	Elementary Anatomy & Micro techniques	Teacher Lecture Notes	75	25
5.	Microbiology -I	Teacher Lecture Notes	75	25
6.	Elementary Chemistry & Chemical Pathology	Teacher Lecture Notes	75	25

Grand Total= 475 + 75 = 550

ELEMENTARY ANATOMY AND MICRO TECHNIQUES

S.No	Topic
Anatomy	
1	Introduction to Anatomy General organization of human body – division into system – descriptive terms used in anatomy- cell and tissue cell growth – cell metabolism
2	Respiratory System Description of the system as a whole – larynx, trachea, while – short anatomical description of each organ- brief microscopic picture of organs
3	Digestive System Description of the system as whole – liver, spleen, pancreas – function of the system as a whole – short anatomical description of each organ brief microscopic pictures.
	Urinary System Description of the system as a whole – function of the system as the whole – short anatomical description of each organ – brief microscopic picture of organs
5	Circulatory System Description of the system as a whole, identification of gross component- functions of the system as a whole – short anatomical description of heart, major arteries and veins - brief microscopic picture
6	Nervous System Description of the system as a whole with the relationship with one another – function of the system as a whole-short anatomical description of each organ - brief microscopic picture
7	Reproductive System Description of the system as a whole – parts of male and female reproductive system - – function of the system as the whole – short anatomical description of each organ – brief microscopic picture of organs
8	Muscular and Skeletal System Name and anatomical position of bones – types of bones and joints function of skeleton – identification of important bones – types of muscles – description of important group of muscles – brief microscopic picture.
9	Endocrine System Location of various endocrine glands and their recognition
Micro techniques	
10	Introduction to Micro techniques Scope – relationship with other branches of pathology
11	Identification of Tissue

12	Routine Histopathological techniques Fixation – fixative – advantage and disadvantages of common fixative.
13	Section Cutting Microtome – types – principle of operation, operation and care of microtome
14	Routine Staining Object of staining – classification of stains – common stain used – properties – principle of H&E stain – the rationale of various steps in this procedure.
15	Mounting Stain slide Utility – substance used – techniques of permanent mounting
16	Decalcification and staining of bone

ELEMENTARY ANATOMY AND MICRO TECHNIQUES

S.No	Topic	Weightage %
1	Introduction to Anatomy	4 %
2	Respiratory System	6 %
3	Digestive System	6 %
4	Urinary System	6 %
5	Circulatory System	6 %
6	Nervous System	6 %
7	Reproductive System	6 %
8	Muscular and Skeletal System	6 %
9	Endocrine System	4 %
10	Introduction to Micro techniques	4 %
11	Identification of Tissue	10 %
12	Routine Histopathological techniques	8 %
13	Section Cutting	7 %
14	Routine Staining	8 %
15	Mounting Stain slide	6 %
16	Decalcification and staining of bone	6 %
Total %		100 %



ELEMENTARY ANATOMY AND MICRO TECHNIQUES**PRACTICAL ACTIVITIES**

Activities	Number of Laboratory Period
Elementary Anatomy	
1 Demonstration of general organization of human body by charts and models	
2 Demonstration of Respiratory System of human body – short anatomical description of larynx, trachea, main bronchi and on models/charts	
3 Demonstration of Digestive System of human body – short anatomical description of stomach, intestine, liver, spleen pancreases on chart and models	
4 Demonstration of Urinary System of human body – short anatomical description of kidney, urinary bladder and nephron on charts and models	
5 Demonstration of Circulatory System of human body – short anatomical description of heart and blood circulation on charts and models	
6 Demonstration of Nervous System of human body – short anatomical description of brain and spinal cord on charts and models	
7 Demonstration of Reproductive System of male and female – short anatomical description of testes, penis, ovary, uterus and vagina.	
8 Demonstration of Muscular and Skeletal System of human body – short anatomical description and identification of bones on skeleton, charts and models	
9 Demonstration and identification of Endocrine glands, thyroid, adrenals, pituitary, parathyroid etc.	
Micro techniques	
10 Dissection of frog and rabbit/guinea pig to identify various organs – distribution of tissue to students for processing	
11 Identification of Various Tissue – macroscopically and microscopically – selection of tissue.	
12 Microtome's- types – operation of microtomes	
13 Cleaning and care of microtomes	
14 Types of knives used in microtomes – demonstration and identification – mounting of knife on microtomes	
15 Sharpening of knives of microtomes	
16 Preparation of routine fixatives	

		4
17	Fixation of tissue	2
18	Routine Histopathological techniques: dehydration clearing – embedding – moulds – trimming block	5
19	Cutting of sections on microtomes – procedure- difficulties and how to overcome	4
20	Mouting and fixing of tissue ribbon on slides	2
21	Staining – preparation of common stain used in histopathology	4
22	H & E staining of various samples – rationale of various steps in this procedure	7
23	Procedure of permanent mounting of stained slide	4
24	Bone – decalcification – routine staining	4
	Total	85

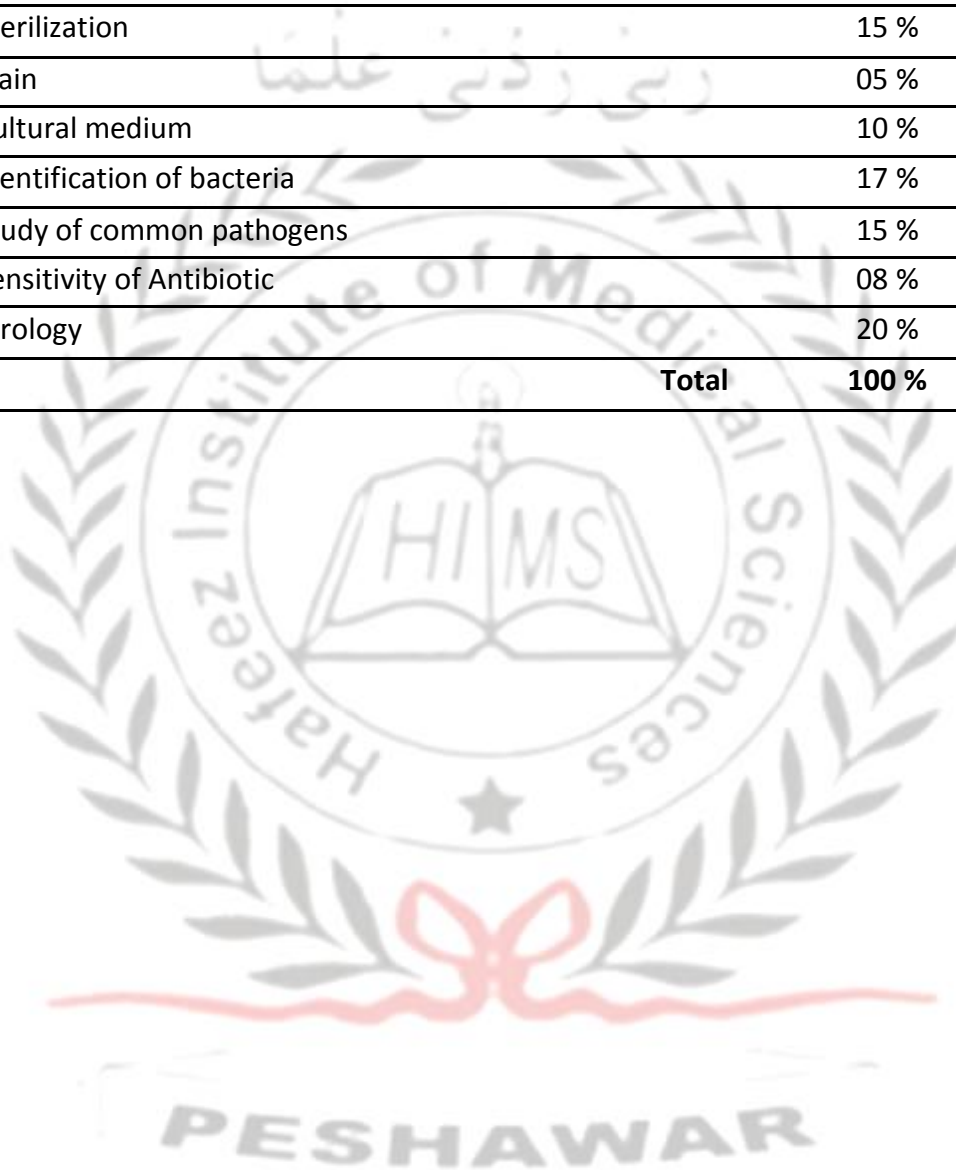


Microbiology – I
Bacteriology and Virology

S.No	Topic
1	Introduction Introduction to clinical microbiology – its scope – relationship with other branches of medical sciences
2	Microscope Brief history of microscope - theory of light microscope – nature of light- concept of amplitude – wave length and phase- perception of color and brightness – refraction – formation of images – simple and compound microscope – lenses of microscope – objectives – types of objectives – eye pieces - magnification of eye pieces magnification, resolution, numerical aperture etc.
3	Sterilization Definition – principle – different methods of sterilization i.e. autoclave hot air sterilizer, water bath, Seitz filter, inspissations etc- sterilization of different articles and materials – test for efficiency of sterilization – antisepsis , bacteriostatic, bactericidal methods of destruction of bacteria
4	stain What are stains? Principle, classification of stains – staining methods
5	Cultural medium Nutritional, temperature and atmosphere requirement of bacteria- cultural medium – classification of culture media – composition and use of important media for use in microbiology.
6	Identification of bacteria Morphological classification of bacteria – growth characteristics of clinically important bacteria – enzymic activity of bacteria – methods to measure this – antigens as tools for identification.
7	Study of common pathogens In blood, urine, throat, eye, stool, ear and C.S.F etc
8	Sensitivity of Antibiotic Principles of action of antibiotics on microorganisms' resistance – methods of determination of sensitivity of antibiotics.
9	Virology Broad classification and characteristics of viruses and diseases caused by them Limitation of light microscopy in virology – examination of viruses Routine procedure for isolation of virus : collection , transport and storage of viruses.

Microbiology – I
Bacteriology and Virology

S.No	Topic	Weightage %
1	Introduction	05 %
2	Microscope	05 %
3	Sterilization	15 %
4	stain	05 %
5	Cultural medium	10 %
6	Identification of bacteria	17 %
7	Study of common pathogens	15 %
8	Sensitivity of Antibiotic	08 %
9	Virology	20 %
Total		100 %



PRACTICAL ACTIVITIES

Activities	Number of Laboratory Period	
Bacteriology		
1	Introduction and general requirements for Microbiology laboratory	1
2	Cleaning and washing of new and infected glasswares used in Microbiology laboratory	2
3	Handling and disposal of infected materials	1
4	Sterilization and disinfection of different methods for sterilization	4
5	Microscope – introduction – different parts and their functions	2
6	Correct use of microscope	2
7	Care of microscope	1
8	Common stains used in microbiology – preparation of stain- preparation of film – fixing and staining – Gram's staining – Ziehl Nelson Staining – sensitivity to antibiotics	5
9	Culture media – classification – composition and uses of important media – preparation of common media	5
10	Adjustment of pH on media – methods	2
11	Culture techniques – preparation and uses of wire loop – inoculation on plates and slopes – stab streaking – pour plate – shake culture – incubation	3
12	Anaerobic and aerobic culture techniques	2
13	Examination of culture for growth – types of colonies with characteristics	4
14	Microscopic examination of bacterial smear – identification of bacteria under microscope	3
15	Morphological characters of important and common organisms	2
16	Study of common organism – important test – coagulase test catalase test – oxidase test – motility test	4
17	Blood culture – sampling – media – used – procedure – identification of organisms – bacteria commonly isolated	3
18	Urine culture - sampling – media – used – procedure –bacteria commonly isolated	3
19	Throat, swab culture - sampling – media – used – procedure –bacteria commonly isolated	3
20	Eye swab culture - sampling – media – used – procedure –bacteria commonly isolated	3
21	Nasal and ear swab culture - sampling – media – used – procedure – bacteria commonly isolated	3
22	Stool culture - sampling – media – used – procedure –bacteria commonly isolated	3

23	Vaginal swab culture - sampling – media – used – procedure –bacteria commonly isolated	3
24	C.S.F and other fluids culture	3
25	Methods of determination of sensitivity of antibiotics	3
Virology		
26	Precautions to be observed in virology lab	2
27	Collection, transportation and storage of specimen for virological examination	3
28	Examination of virus under microscope	3
29	Staining procedure for viruses	3
30	Procedure of isolation of viruses	5
31	Diagnostic tests for viral diseases	4
Total		90

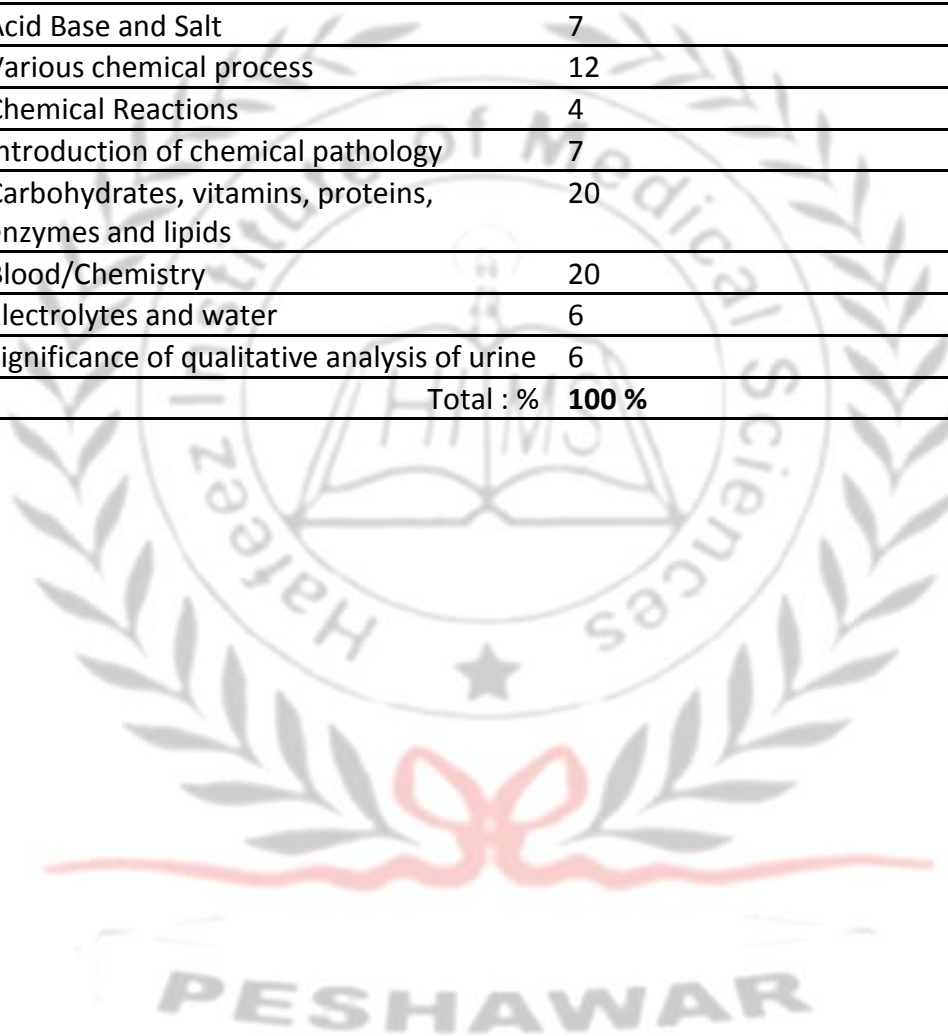


ELEMENTARY CHEMISTRY AND CLINICAL PATHOLOGY

S.No	Topic
1	Introduction to chemistry Definition – division of chemistry – utility of each branch
2	Element Definition – atomic structure – periodic tables – valency property classification – symbols – metal and nonmetals – brief description of important elements
3	Compound and Mixture Definition – properties – difference between mixture and compound – separation of mixture – formulae of common compounds
4	Units of measurements Metric System – imperial System – conversion from Fahrenheit to Centigrade - measurement of weight – volume – heat – energy and length etc.
5	Solution Definition – compound and solution – classification of solution – solubility – factors influencing solubility – concentration of solution – molar, molal, normal and saturated solution – preparation of solutions
6	Acid Base and Salt Definition of acid, base, salt and alkali – measurement of strength of acidity and alkaliaty – titration – hydrogen ion concentration – measurement of hydrogen ion concentration – indicators – pH – Henderson Hassel Bach equation.
7	Various chemical process Definition – procedure – utilization Decantation, hydrolysis, precipitation, centrifugation, evaporation, oxidation and reduction, titration, catalysis and sublimation.
8	Chemical Reactions Introduction brief description of chemical reactions and its types
9	Introduction of chemical pathology Definition and scope of chemical pathology – subject to be taught – relationship with other branches of pathology – apparatus and reagents to be used –description – principle of operation of calorimeter – flame photometer, blances, pH meter and centrifuge
10	Carbohydrates, vitamins, proteins, enzymes and lipids Brief accounts of source, classification, metabolism and importance.
11	Blood/Chemistry Normal values – short description of metabolism interpretation of findings of following in blood:- Sugar, cholesterol, urea, uric acid, bilirubin, alkaline and acide phosphate, ereatinine, total protein. S.G.P.T, S.G.O.T, thymol turbidity
12	Electrolytes and water Important electrolytes in human body. Brief account of function and metabolism of Na, K, Ca and Fe in blood – distribution of body fluid – dehydration and ocdema
13	Significance of qualitative analysis of urine for calcium, creatinine urea, sugar, albumin chloride.

ELEMENTARY CHEMISTRY AND CLINICAL PATHOLOGY

S.No	Topic	Weightage %
1	Introduction to chemistry	2
2	Element	3
3	Compound and Mixture	4
4	Units of measurements	4
5	Solution	5
6	Acid Base and Salt	7
7	Various chemical process	12
8	Chemical Reactions	4
9	Introduction of chemical pathology	7
10	Carbohydrates, vitamins, proteins, enzymes and lipids	20
11	Blood/Chemistry	20
12	Electrolytes and water	6
13	Significance of qualitative analysis of urine	6
Total : %		100 %



**ELEMENTARY CHEMISTRY AND CLINICAL PATHOLOGY
PRACTICAL ACTIVITIES**

Activities	Number of Laboratory Period	
Elementary Chemistry		
1	Measurement of weight in different units	1
2	Measurement of volume in different units	1
3	Measurement of length in different units	1
4	Measurement of heat in different units	1
5	Use and maintenance of electrical balances	1
6	Solubility – demonstration of factor affecting solubility	1
7	Preparation concentration solution	1
8	Preparation of Molar solution of different compounds	2
9	Preparation of Molal solution of different compounds	2
10	Preparation of Normal solution of different compounds	2
11	Preparation of Saturated solution of different compounds	1
12	Measurement of strength of acidity and alkalinity – titration of acid , base and other solutions	3
13	Measurement of pH of solutions by different methods	2
14	Demonstration of following procedures: filtration – crystallization – decantation – distillation – fractional distillation – centrifugation – hydrolysis – oxidation – reduction etc.	8
Chemical Pathology		
15	Introduction – apparatus and reagents used in chemical pathology laboratory	2
16	Description – principle and operation of colorimeters – different types.	2
17	Description and operation of flame photometer	2
18	Description and operation of pH meter	2
19	Description and operation of balances	2
20	Description and operation of centrifuge	2
21	Sampling of blood and urine for chemical examination – separation of plasma and serum	1
22	Preparation of anticoagulant and preservatives used in chemical pathology	2
23	Estimation of glucose in blood – interpretation of results	4
24	Estimation of cholesterol in blood	3
25	Estimation of urea in blood	3
26	Estimation of creatinine in blood	3
27	Estimation of uric acid in blood	3
28	Estimation of bilirubin in blood	3

29	Estimation of total protein in blood	3
30	Estimation of Acid phosphates in blood	2
31	Estimation of Alkaline phosphates in blood	2
32	Estimation of S.G.P.T in blood	2
33	Estimation of S.G.O.T in blood	2
34	Demonstration of thymol turbidity test	1
35	Estimation of sodium and potassium in serum by flame photometer	4
36	Estimation of calcium in blood	2
37	Quantitative analysis of urine for calcium, creatinine urea, sugar, albumin, and chloride.	8
Total		85



F.Sc MEDICAL LABORATORY TECHNOLOGY (MLT) 2nd Year

S.No	Subject/Papers	Course	Marks	
1.	English – II	According to BISE Peshawar	Theory 100	Practical Nil
2.	Urdu – II	According to BISE Peshawar	100	Nil
3.	Pak Study	According to BISE Peshawar	50	Nil
4.	Hematology & Blood Banking	Teacher Lecture Notes	75	25
5.	Microbiology -II	Teacher Lecture Notes	75	25
6.	Clinical Pathology & Serology	Teacher Lecture Notes	75	25

Grand Total= 475 + 75 = 550



HAEMTOLOGY AND BLOOD BANKING

S.No	Topic
1	<p>Introduction</p> <p>Definition and scope of hematology and blood banking – subject to be taught – relationship with other branches of pathology</p> <p>Circulation of blood in body – formation of blood – origin development and nomenclature of different blood cells</p> <p>Morphological characters of blood cells including those in different stages of development – composition of blood.</p>
2	<p>White blood cells</p> <p>Origin and development of leucocytes granuleocytes, lymphocytes, monocytes.</p> <p>Total leucocyte count - normal values</p> <p>Differential cell count: morphological characters of different white blood cells, leucocytosis, leucopenia, agranulocytosis, eosinophilia, lymphocytosis – their significance</p>
3	<p>Red blood cell</p> <p>Erythrocytes – definition – maturation – material required to form erythrocytes- total count – normal values</p> <p>Morphological study of red blood cells – macrocytes – microcytes – normocytes – spherocytes – hypochromia – normochromia - polychromasia – target cell – sickle cell etc.</p> <p>Reticulocyte count – normal values – abnormal values and interpretation</p> <p>R.B.C osmotic fragility test – significance.</p>
4	<p>Hemoglobin</p> <p>Mode of formation – definition of terms – normal value – composition – various types of hemoglobin</p> <p>Anemia : definition – classification – causes – investigation – prevention</p>
5	<p>Erythrocyte Sedimentation Rate</p> <p>What is ESR – Normal values – factor affecting ESR – abnormal values – significance</p>
6	<p>Blood Parasites</p> <p>Parasites in blood – procedure for detection – characteristics of malarial parasite</p>
7	<p>Coagulation</p> <p>Mechanism of coagulation – homeostasis tests– screening tests – bleeding diseases – short description</p>
8	<p>Bone Marrow Study</p> <p>General method to obtain bone marrow</p>
9	<p>Leukaemias</p> <p>Different types – brief introduction</p>

10	Blood Banking
	Introduction – importance of blood bank – organization – recording and documentation
	Introduction to ABO groups
	Introduction to Rh factor – significance
	Cross matching definition purpose – cross matching problems
	Coomb's test direct test – indirect test – utility – sources of error
	Donors – selection of donor – registration – collection of donor blood storage and transportation – processing of blood
	General idea about transfusion and its dangers

HAEMTOLOGY AND BLOOD BANKING

S.No	Topic	Weightage %
1	Introduction	08 %
2	White blood cells	10 %
3	Red blood cell	12 %
4	Hemoglobin	10 %
5	Erythrocyte Sedimentation Rate	06 %
6	Blood Parasites	07 %
7	Coagulation	11 %
8	Bone Marrow Study	06 %
9	Leukaemias	05 %
10	Blood Banking	25 %
	Total	100 %

PRACTICAL ACTIVITIES

Activities	Number of Laboratory Period
Hematology	
1	Introduction and general requirements for hematological laboratory
2	Methods of collection of sample for hematological tests
3	Anticoagulants used in hematology – preparation of anticoagulants
4	Study of hemocytometer – neubaur chamber – WBC and RBC pipette
5	Total leucocytes count – different procedures – reagents used preparation of reagents – estimation of total leucocytes count precautions
6	Differential leucocytes count – preparation of blood film – different stain used – advantages and disadvantages of different stains – preparation of stains – staining of blood film – morphological characters of different white blood cells DLC.
7	Total eosinophil count procedure
8	Total erythrocyte count – different procedures reagents used – preparation of reagents – estimation of total erythrocytes count
9	Hemoglobin – various method of estimation – sahli's method – cynmethaemoglobin – method – normal values – interpretation
10	Hematocrit - test – procedures – equipment used – macro method normal values
11	Erythrocyte sedimentation rate – various methods – eintrobe method – westergreen method- factor affecting ESR normal values – significance
12	Preparation of blood film for red cell morphology – student of morphology of red blood cells
13	Reticulocyte count – general consideration – preparation of
14	RBC osmotic fragility test – procedure
15	Blood parasite, malaria, leishmania, trepanosoma etc
16	LE cells – demonstration of LE cells – significance
17	Capillary resistance test (Hess test) – procedure – significance
18	Bleeding time – procedure – significance
19	Coagulation time– procedure – significance
20	prothrombin– procedure – significance
21	Platelet count– procedure – significance
22	Clot retraction test– procedure – significance
23	Bone marrow – general description of methods to obtain bone marrow – preparation of bone marrow smears routine staining
Blood Banking	
24	General introduction, equipment, diagnostic sera and chemicals used in blood banks

25	Collection of blood – anticoagulants used
26	BO blood grouping – slide method – tube method – reverse
27	Rh blood grouping – slide method – tube method – Du factor – significance
28	Method of cross match
29	Coombs test – direct and indirect test
30	Selection of donor – registration – collection of donor's blood storage and transportation
Total	
85	



Microbiology – II
Parasitology and Mycology

S.No	Topic
1	Introduction Definition and terms used – scope – relationship with other branches. Host parasite relationship.
2	Microscope Brief history of microscope - theory of light microscope – nature of light- concept of amplitude – wave length and phase- perception of color and brightness – refraction – formation of images – simple and compound microscope – lenses of microscope – objectives – types of objectives – eye pieces - magnification of eye pieces magnification, resolution, numerical aperture etc.
3	Classification and life cycle of parasites General classification of protozoa and helminthes Characteristics of common medical protozoa and helminthes and brief life cycle of following. Entamaeba histolytica – entamaeba coli – leishmania donovani – trypanosome – trichomonas vaginalis – Giardia lamblia – Malarial parasite – Taenia saginata and T sloim – Hymenolepis nana – echinococcus granulosus – schistosome – ascaris lumbricoides – trichuris trichura – enterobius vermicularis – ancylostoma duodenale and n.americans – strougloides stercoralis
4	Entomology Morphology and brief life cycle of house fly and mosquitoes
5	Mycology Should read Parasitology and mycology Definition – Scope- name and classification of fungus with diseases produced – routine mycological techniques – cultural characteristics of fungus.

Microbiology – II
Parasitology and Mycology

S.No	Topic	Weightage %
1	Introduction	5 %
2	Microscope	20 %
3	Classification and life cycle of parasites	45 %
4	Entomology	10 %
5	Mycology	20 %
Total : %		100 %

PRACTICAL ACTIVITIES

Activities	Number of Laboratory Period	
Parasitology		
1	Introduction and general requirements for Parasitology laboratory	2
2	Microscope – introduction – different parts and their functions	2
3	Microscope = correct use of condenser iris diaphragm objectives and eye pieces	2
4	Microscope illumination – dark field illumination	1
5	Care and cleaning of microscope	2
6	Study of common laboratory objects under microscope	2
7	Methods of collection of stool	1
8	Physical examination of stool	2
9	Saline and iodine preparation – preparation of stool film for examination under microscope	2
10	Particles to be studied under microscope – their identifying points	2
11	Examination of uncysted and cysted forms of E histolytics and E coli	2
12	Examination of uncysted and cysted forms of Giardia lamblia	2
13	Examination of Trichomonas vaginalis	2
14	Examination of ova of tacnia saginata, Taenia solium H. nana, E. granulosus – schistosoma – ascariis lumbricoides –ancylostoma duodenale- trichuris and trichura etc.	10
15	Concentration methods of stool – why required – different procedure	3
16	Examination of blood for parasites – sampling – blood smear – thick and thin film - staining	3
17	Examination of film for malarial parasites – leishmania – filarial – trypanosome etc.	4
18	Examination of occult blood in stool by different methods	3
19	Demonstration of life cycle of house fly and mosquitoes	3
Mycology		
20	Routine mycological techniques	2
21	Collection of sample for mycological examination	2
22	Preparation of film for direct microscope examination	2
23	Staining methods – stains used	4
24	Culture of fungus – general aspects	2
25	Media used for culture fungus	4
26	Culture and identification of fungus	4
Total		90



CLINICAL PATHOLOGY AND SEROLOGY

S.No	Topic
1	<p>Introduction to medical laboratory technology</p> <p>Sampling – collection and forwarding of different samples for laboratory investigations – storage of sample – preparation and instruction to patients – sample recording – processing of results – sources of error.</p> <p>Laboratory management:- role of laboratory technician – general rules of behavior and ethics for laboratory workers – sections of clinical pathology and their functions – organization and management of laboratory – reagents equipments and other basic items required for setting up a laboratory - basic service like gas water, electricity etc- record keeping of chemical reagents and equipments.</p> <p>Glass ware and water: - laboratory glassware – types – uses- cleaning of glassware for different purposes. Kind of water used in medical laboratory – preparation and quality control.</p> <p>Quality control:- quality control in different branches of pathology – aim and objectives – significance – different methods.</p>
2	<p>Urine Analysis</p> <p>Brief review of composition, formation and function of urine – methods of collection of urine for laboratory investigation</p> <p>Physical examination of urine – amount, odour , colour, appearance, reaction, pH specific gravity</p> <p>Qualitative examination of urine</p> <ol style="list-style-type: none"> Proteins in urine:- general consideration – bench Jones proteins – clinical significance of Proteinuria. Glucose in urine:- general consideration –significance. Ketone bodies in urine :- general consideration –significance. Bile salts and bile pigments in urine:- general consideration –significance. Hemoglobin in urine:- general consideration Urinary Sediments:- general consideration –significance – the Addis sediments count – calculation – normal values.
3	<p>C.S.F Examination</p> <p>Composition formation and function of C.S.F – collection of material – physical examination – chemical examination – cytological examination – bacteriological examination – significance of results</p>
4	<p>Gastric juice examination</p> <p>Composition formation and function of Gastric Juice – analysis of Gastric Juice – material used – preparation of patient – test meal and simulation – techniques of obtaining juice – composition of juice – factor which affecting the character and amount of gastric juice secretions – normal findings and significance of pathological findings.</p>
5	<p>Pregnancy Test</p> <p>General consideration – brief introduction of biological pregnancy immunological pregnancy tests</p>

6	Semen Analysis General consideration – collection – gross examination – microscopy – other test of semen – significance.
7	Glucose Tolerance Test Preparation of patient – preparation of glue curve – significance
8	Serology Definition, scope and limitation, relationship with other branches of pathology. Antigen – antibody- antigen/antibody reaction – types, principles Utilization of antigen – antibody reaction, principle and mechanism, agglutination, precipitation and complement fixation test, uses of these mechanisms, diagnosis of diseases. Brief account of Widel test, Kahn test, Wassermann test, ASOTRA test diagnosis of disease.

CLINICAL PATHOLOGY AND SEROLOGY

S.No	Topic	Weightage %
1	Introduction to medical laboratory technology	10%
2	Urine Analysis	10%
3	C.S.F Examination	20%
4	Gastric juice examination	20%
5	Pregnancy Test	10%
6	Semen Analysis	8%
7	Glucose Tolerance test	7%
8	Serology	15%
Total : %		100 %

**CLINICAL PATHOLOGY AND SEROLOGY
PRACTICAL ACTIVITIES**

Activities	Number of Laboratory Period
Clinical Pathology	
1	Collection and forwarding of different samples for laboratory investigation
2	Organization and management of laboratory
3	Storage of reagents and equipments
4	Cleaning of glassware for different purposes
5	Preparation of distilled water and deionised water for laboratory
6	Methods of collection of urine for laboratory investigation.
7	Physical examination of urine – amount, odour , colour, appearance, reaction, pH specific gravity
8	Test for proteins in urine – colour – amount heat denaturation test – sulfosalicylic acid test – commercial strips and tablets method.
9	24 hours urine estimation (Esback’s Method)
10	Bence Jones protein detection in urine
11	Test for reduction substance in urine – general consideration – benedicts test (qualitative and quantitative) fehling test – commercial strips and tablets.
12	Tests for ketone bodies in urine – general consideration – rothera’s test – Gerherdt’s test – Hart ‘s test – Acetest and Ketostix.
13	Tests for bile salts and bile pigments in urine – general consideration – loam test – sulphur test – Fouchet Test – leto test.
14	Test for hemoglobin in urine. General consideration – Benzidine Test – Guaic test – commercial tablets and strips method.
15	Test for urobilinogen in urine.
16	Examination for urinary sediments – general consideration – preparation of specimen for microscope examination.
17	Examination of crythocytes, leucocytes epithelial cells in urine and their significance.
18	Examination of different urinary casts in urine and their significance.
19	Examination of different urinary crystals in urine and their significance.
20	Miscellaneous findings in urinary sediments
21	C.S.F - sampling
22	C.S.F – physical examination, color, turbidity, appearance
23	C.S.F – total cell count
24	C.S.F – chemical examination for glucose, protein, globulin, chloride
25	C.S.F - Cytological examination
26	C.S.F – bacteriological examination

27	Gastric Juice examination - method of collection – qualitative and quantitative examination.	
28	Pregnancy test – general consideration – immunochemical test.	
29	Semen analysis – general consideration – significance	
30	Glucose tolerance test – general consideration – preparation of patient – fasting samples – glucose load – after load samples	
31	Preparation of glucose tolerance curve – significance	
	Serology	
32	Widal test – mechanism – reagent required – antigen preparation – serum preparation – test procedure – reading of result – interpretation	
33	Kahn test – mechanism – reagents required – apparatus required – test procedure – reading of test – interpretation.	
34	Wassermann test – procedure – reading of tests	
35	A.S.O.T – procedure – reading of tests	
36	R.A test – procedure – reading of tests	
37	V.D.R.L test – procedure – reading of tests	
38	Pregnancy test – procedure – reading of tests	
	Total	90

