

**MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI**

1	Name of Course	<b>Diploma Course in Medical Lab Technician (W.E.F. 2015-16)</b>
2	Course Code	<b>201404</b>
3	Max.No.of Students Per Batch	25 Students
4	Duration	2 year
5	Type	Full Time
6	No.Of Days / Week	6 days
7	No.Of Hours /Days	7 Hrs
8	Space Required	Theory Class Room – 200 sqft , Lab Sub. – 400 sqft, Lab Elective - 400 Sq.ft. = <b>Total 1000 Sq.ft.</b> + <b>MOU with Pathology Lab is required.</b> Distance between Pathology Lab and Institute Should not be more than 10 Km.
9	Minimum Entry Qualification	S.S.C. Pass
10	Objective Of Course	To carry out medical laboratory technical work in various departments in medical and pharmacy colleges, peripheral laboratories, research and diagnostic centres, to setup and run own clinical laboratory.
11	Employment opportunities	He will assist the qualified person.
12	Teachers Qualification	For Vocational Subject - MBBS, OR MBS Hom/BHMS, OR B. Pharmacy, OR M.Sc. Microbiology/Biochemistry/MLT + 2year Experience or Equivalent and for Non Vocational Subject Master Degree in concern Subject.

**13] Teaching Scheme –**

Ppr	Subject Code	Clock Hours / Week		Total	
		Theory	Practical		
1	English (Communication Skill)	90000001	2 Hrs	1 Hrs	3 Hrs
2	Elective – I		2 Hrs	1 Hrs	3 Hrs
3	Elective – II		2 Hrs	1 Hrs	3 Hrs
4	Anatomy, Physiology and Pathology	20140004	3 Hrs	8 Hrs	11 Hrs
5	Biochemistry	20140005	3 Hrs	8 Hrs	11 Hrs
6	Microbiology and Medical care	20140006	3 Hrs	8 Hrs	11 Hrs
<b>Total</b>					<b>42 Hrs</b>

**14 Internship** Two Month Summer Internship from 1st May to 30th June is Compulsory.

**15] Examination Scheme – Final Examination will be based on syllabus of both years.**

Ppr	Subject	Subject Code	Theory			Practical			Total	
			Duration	Max	Min	Duration	Max	Min	Max	Min
1	English (Communication Skill)	90000001	3 Hrs	70	25	3 Hrs	30	15	100	40
2	Elective – I		3 Hrs	70	25	3 Hrs	30	15	100	40
3	Elective – II		3 Hrs	70	25	3 Hrs	30	15	100	40
4	Anatomy, Physiology and Pathology	20140004	3 Hrs	100	35	3 Hrs	100	50	200	85
5	Biochemistry	20140005	3 Hrs	100	35	3 Hrs	100	50	200	85
6	Microbiology and Medical care	20140006	3 Hrs	100	35	3 Hrs	100	50	200	85
<b>Total</b>									<b>900</b>	<b>375</b>

**16 Teachers** – Three Teachers per batch for vocational component. For English, Elective-I & II guest faculty on clock hour basis.

**17 Student have to choose any one subject for Elective-I and Elective-II from below given subjects**

18	<b>a) For Elective I – Student can choose any one subject</b>	<b>b) For Elective II – Student can choose any one subject</b>
	<b>Code</b> 90000011 Applied Mathematics 90000012 Business Economics 90000013 Physical Biology (Botany & Zoology) 90000014 Entrepreneurship 90000015 Psychology	<b>Code</b> 90000021 Applied Sciences(Physics & Chemistry) 90000022 Computer Application 90000023 Business Mathematics

# Theory - I - Anatomy, Physiology and Pathology – 1<sup>st</sup> year

(Subject Code – 20140004)

<b>Theory</b>	<b>Practical</b>
<b>ANATOMY PHYSIOLOGY</b> <b>Detailed Syllabus</b> <b>I. Basics in Anatomy</b> 1. Introduction to Human Anatomy 2. Cell structure, properties of cell, tissues - epithelial, connective muscular, nervous 3. Digestive System and Hepato Biliary System 4. Respiratory System 5. Cardio vascular System 6. Lymphatic System 7. Bones and Joints 8. Nervous System 9. Endocrine System 10. Sense Organs Eye, ear, skin, nose, tongue 11. Excretory System 12. Reproductive System <b>Basics</b> 1. Introduction to Human Physiology 2. Blood 3. Cardio vascular system 4. Lymphoid System 5. Digestive system 6. Respiratory system 7. Nervous system 8. Endocrine system 9. Excretory System 10. Reproductive system 11. Sense organs	<b>ANATOMY AND PHYSIOLOGY</b> <b>1. Human Skeleton</b> It includes - 1) Names of the Bones 2) Identification points 3) Surfaces (Skull, scapula, clavicle, humerus, radius, ulna, carpal bones, meta carpal bones, Phalanges. Innominate bone, Femur, patella tibia, fibula, tarsal bones, meta tarsal bones, Phalanges, Ribs-classification, vetebrae pieces, sternum.) <b>2. Human Organs</b> Brain, Stomach Lungs, Intestines Heart, Kidney Liver, Uterus Spleen, Fallopian tubes <b>3. Human slides</b> Epithelial Tissue Connective Tissue Muscular Tissue Nervous Tissue Liver Kidney Spleen Pancreas Lymphnodes Skin testes Ovary Uterus Tonsil Stomach layers Small Intestine Large Intestine <b>4. Blood Pressure</b> Estimation <b>5. T.P.R. (Temperature, pulse, respiration) Chart</b> <b>6. TC, DLC, (TC - Total count RBC Total count of WBC DLC differential count of Leucocyts)</b>

# Anatomy, Physiology and Pathology – 2<sup>nd</sup> year

Theory	Practical
<p><b>PATHOLOGY</b></p> <p>1. Urine - Analysis - Physical Examination - specific gravity PH, reaction, colour</p> <p>Chemical Examination - Sugar Albumin, bile salts, bile Pigments etc.</p> <p>Microscopic Sediment for RBC, WBC, Epitheleal cells, casts, crystals, parasites</p> <p>Preparation of Reagents, procedure and principle of tests</p> <p>2. Sputum Analysis - Physical Examination, Preparation and staining smear for Microscopic Examination</p> <p>3. Semen Analysis- Physical Examination Microscopy - counting, motility, staining, Morphology, abnormal and normal forms.</p> <p>4. Body Fluids - Differential count of Peritoneal, pericardial, pleural fluids and CSF, charging chamber, Identifying and counting the cells.</p> <p>3. Haematology -</p> <p>a. Collection of Blood -</p> <p>Methods of collection veinpuncture, finger puncture and vacutainer</p> <p>methods, materials required procedures, precautions, uses of the sample and advantages of each methods. POCT (sample collection at bed side)</p> <p>b. Preparation of anti coagulants -</p>	<p><b>PATHOLOGY</b></p> <p>Blood Collection</p> <p>Precaution and smearing techniques and labelling of the sample</p> <p>Preparation of anticoagulants</p> <p>RBC, WBC, &amp; platelet count</p> <p>ESR stands &amp; ESR estimation</p> <p>PCV &amp; calculation of RBC indices</p> <p>Hb estimation by different methods</p> <p>Urine - Physical Examination &amp; Chemical Examination</p> <p><b>PRACTICAL</b></p> <p>I. Automatic Tissue Processer</p> <p>Microtome &amp; Knives</p> <p>Centrifuge</p> <p>Hot air oven &amp; Incubator</p> <p>Busm beaker, stop watch</p> <p>Glass Makers</p> <p>Simple balance &amp; colorimeter</p> <p>Water bath - for tissue flotation</p> <p>Knowledge</p> <p>Maintenance &amp; cleaning</p> <p>Care about tissue equipment</p> <p><b>II. Maintenance &amp; preservation of</b></p> <p>Cytology slides</p> <p>M.P. blocks &amp; slides</p> <p>Histopathology specimens and process</p>

<p>Double oxalate, sodium citrate, EDTA, Heparin, action of each</p> <p>preparation, uses disadvantages, quantity required.</p> <p>c. RBC, WBC Count :</p> <p>Methods (Microdilution and bulk dilution) Materials required, diluting fluids, preparation, procedures, advantages of each methods,</p> <p>precautions, formula for calculation and clinical significance.</p> <p>d. Platelet count :</p> <p>Morphology and functions of platelets diluting fluids, procedure, formula for calculation and clinical significances</p> <p>e. Reticulocyte Count :</p> <p>Methods (dry &amp; wet) staining, diluting fluids, normal Morphology and values, clinical significance.</p> <p>f. Haemoglobin Estimation -</p> <p>Materials, procedure, of Tallquist, sahlis, Alkali haldanis, cyanmethaemoglobin and S.G. method, advantages and disadvantages and clinical significance</p> <p>g. Estimation of PCV -</p> <p>Macro &amp; Micro Method, procedure filling the tube, centrifuging and reading, advantages of each - normal values and clinical significance</p> <p>Estimation of Erythrocyte indices - calculation and importance</p> <p>MCV, MCH, MCHC, RDW, color index.</p>	<p>Preparation of form section material</p> <p><b>III. Glass ware</b></p> <p>Microslides &amp; coverstips</p> <p>Sample collection bottles</p> <p>Micropathology</p> <p>Cytology.</p> <p><b>IV. Immuno Haematology &amp; blood banking</b></p> <p>ABO blood grouping techniques</p> <p>RH Factor</p> <p>Coombs test - Direct &amp; indirect methods</p> <p>34</p> <p><b>V. Histopathology</b></p> <p>1. Fixation of biopsy tissue</p> <p>2. Processing of tissue</p> <p>Fixation</p> <p>Dehydration</p> <p>Clearing</p> <p>Impregnation</p> <p>Mounting</p> <p>Decalcification</p> <p>3. Mounting of museum specimens</p> <p><b>VI. Cytology</b></p> <p>Fixations used</p> <p>Fluid preparation for cytological exam</p> <p>Slide preparation and staining</p> <p>Pap staining</p> <p>Mounting and preservation</p> <p>VII. Sickle Cell Preparation</p> <p>VIII. Bone Marrow Smears Preparation</p>
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<p>h. ESR - Methods used, procedure, stages, factors affecting and clinical significance</p> <p>I. Preparation of Blood smear examination - Making ideal films - slide method, cover glass method and staining, Morphology of RBC, WBC, Platelets and Haemop araasites. Differential Leucocyte Count - counting and identification of cells - Normal values, Morphology, procedure for smears and staining clinical significance and limitation. Absolute Eosinophil count - Materials, diluting fluid, procedure, identifying and counting the cells.</p> <p>II. Special stains on peripheral blood smear and bonemarrow smears- Ramanoskys stains, Leishman, Gemsia, wrights, Mycloperoxidase stain, PAS (Periodic Acid Schiff) - Preparation, method and selection of stain, Buffer Solution. Bone Marrow Smear - Preparing smears, cuithont crush artefacts staining and clinical significane.</p> <p>III. Identification of Hemoparasites - Malarial Parasite, Microfilaria, Leishman making thick and thin films procedure and identification of parasite.</p> <p>IV. Sickle Cell Preparation - Principle, procedure and Methods, Materials, clinical significance</p>	<p>&amp; Staining</p> <p>IX. Cougulation Test, BT, CT.</p>
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V. Osmotic fragility test - Methods used, materials procedure, observation reporting, normal values, factors affecting, interpretation.

#### VI. Coagulation Tests

a) Bleeding time - methods, dukes, Ivy's procedure Normal value,

clinical significance

b) Cloting time - methods, Lee & White, procedure materials,

normal values, factors affecting coagulation clinical significance

c) Prothrombin time (PT)

d) APTT - in Detail

VII. L.E. cell Test - Principle, procedure, materials reprotng, clinical

significance and titration.

Buffy coat preparation - LE Cell Test, Microfilaria Abnormal cells.

#### VIII. Basics of coulter counter

IX. Autopsy - Aims & methods of performing Autopsy cleaning,

suturing and retaning the body. Cleaning autopsy instruments,

tables and rooms, preservation of organs.

Processing and preparation of Histopathology.

X. Histopathology -

1) Biopsy

2) Processing of tissue

a) Fixation

b) Dehydration

c) Clearing

<p>d) Impregnation</p> <p>e) Mounting</p> <p>f) Decalcification of Bone</p> <p>g) Routine Paraffin staining</p> <p>h) Immuno histochemists</p> <p>3. Microtomes and Knives</p> <p>XI. Museum Techniques</p> <p>Labelling &amp; storage of specimens</p> <p>Methods of color maintenance</p> <p>Presentation of specimen</p> <p>Mounting labelling and cataloging the specimen</p> <p>Maintenance and cleanliness of the Museum</p> <p>Disposal of waste, safety in the lab</p> <p>XII. Immuno Haematology and Blood Banking</p> <p>i) Introduction</p> <p>2) Human blood group antigens, their inheritance and antihodies</p> <p>3) ABO Blood group systems</p> <p>4) RH Blood group system</p> <p>5) Techniques of grouping and cross matching</p> <p>6) Blood collection, Preservation and maintaining of Records</p> <p>7) Coombs Test - a ) direct b) indirect</p>	
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# Biochemistry - 1<sup>st</sup> year

(Subject Code – 20140005 )

Theory	Practical
<p>1. Introduction to Bio-chemistry including code of ethics for Medical Lab technicians and Medical Lab Organisation.</p> <p>2. Reception, Registration and bio-chemical parameters investigated</p> <p>3. Glassware and plastic ware used in a bio-chemical laboratory</p> <p>I. Glass ware :</p> <p>a) Types of glass and composition</p> <p>b) Types of glassware used, their identification, application and uses</p> <p>c) Cleaning, drying, maintenance and storage of glassware</p> <p>II. Plastic ware : Brief outline</p> <p>4. Instrumental methods of Bio-chemical analysis :</p> <p>I. Colorimetry :</p> <p>Visual and photoelectric methods, instrumentation, principles and laws involved, construction, operation, care and maintenance, applications</p> <p>II. Spectrophotometry :</p> <p>Principle and theory, types, construction, and applications</p> <p>5. Basic lab operations like -</p> <p>I. Separation of Solids from liquids,</p> <p>a) Centrifugation : Principle, Different types of Centrifuges care and</p>	<p>1. Reception and registration</p> <p>2. Collection of Capillary blood</p> <p>3. Collection of Venous blood</p> <p>4. Collection of arterial blood</p> <p>5. Separation of Serum from clotted blood</p> <p>6. Separation of plasma from blood</p> <p>7. Preparation of protein free blood filtrate</p> <p>8. Lab glass ware</p> <p>a) Identification</p> <p>b) Handling</p> <p>c) Care and Maintenance</p> <p>d) Uses</p> <p>9. Lab instruments</p> <p>a) Centrifuges</p> <p>b) Balances</p> <p>c) Photo Electric colorimeter</p> <p>d) Spectrophotometer</p> <p>10. Preparation of</p> <p>a) Percentage solutions</p> <p>b) Normal solutions</p> <p>c) Molar solutions</p> <p>11. Qualitative identification tests of sugars</p> <p>12. Qualitative identification tests of proteins</p> <p>13. Qualitative identification tests for amino acids</p> <p>14. Quantitative determination of Blood</p>

<p>maintenance, applications</p> <p>b) Filtration using funnel</p> <p>II. Weighing : Different types of balances used, care and maintenance.</p> <p>III. Evaporation : IV) Distillation V) Refluxing VI) Drying different salts and dessication</p> <p>6. Water, Chemicals and related substances</p> <p>I. Purity of Chemicals</p> <p>II. Corrosives.</p> <p>8</p> <p>III. Hygroscopic Substances</p> <p>7. Prevention, Safety and first aid in lab accidents.</p> <p>8. Collection of specimens</p> <p>I. Blood :</p> <p>Types of Specimens, Collection, Precautions during collection, Processing and preservation.</p> <p>II. Urine :</p> <p>Types of Specimens, Collection of 24 hours urine and preservation</p> <p>9. Urine biochemical parameters.</p> <p>10. Units of measurements</p> <p>11. Solutions</p> <p>Types based on solute and solvent, Types based on method of expressing concentration, calculations</p> <p>12. Carbohydrates and lipids</p> <p>I. Carbohydrates :</p> <p>Definition, Biological importance, classification, qualitative tests</p>	<p>sugar</p> <p>15. Glucose Tolerance test</p> <p>16. Quantitative determination of Blood urea</p> <p>16. Quantitative determination of Serum creatinine</p> <p>17. Quantitative determination of Urine Sugar.</p>
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II. Lipids :

Definition, Biological importance,  
Classification, Acid value, Iodine

value, saponification value.

13. Amino acids and Proteins

Definition, Biological importance,  
Classification, Qualitative tests.

14. Diagnostic tests

Blood Sugar, Glucose tolerance test, Blood  
urea, Serum uric acid,

Serum creatinine.

15. Vitamins and Minerals

I. Vitamins :

Water Soluble vitamins, Fat Soluble  
Vitamins, Sources, Daily

requirements, Deficiency diseases

II. Minerals :

Sources, Daily requirements, Deficiency  
diseases

# Biochemistry- 2<sup>nd</sup> year

Theory	Practical
<p><b>I. Instrumental methods of Bio-chemical analysis</b></p> <p>1) Flame photometry : Principle, Theory, Construction of Flame</p> <p>Photometer, General and Clinical applications study of electrolytes</p> <p>using Flame photometer, Clinical importance of determination of electrolytes.</p> <p>2. Fluorimetry : Fluorescence, Principle and theory, construction of</p> <p>Fluorimeter, General and Clinical applications</p> <p>3. Nephelometry : Basic principle, instrumentation, general technique</p> <p>and clinical applications of Nephelometry.</p> <p>4. Basic principles and application of Potentiometry</p> <p><b>II. Separation Techniques</b></p> <p>1) Chromatography : Definition, Basic principles, different types and their techniques, General and clinical applications</p> <p>2. Electrophoresis : Definition and basic principle involved, different types, instrumentation, general and clinical applications,</p> <p>electrophoretic fractionation of serum proteins and lipo proteins.</p> <p><b>III. Immuno assays - Definition, Basic Principles of immuno chemical reactions and immuno assays</b></p> <p>1) Radio immuno assays</p> <p>Introduction to radio activity, Radio Pharmaceuticals, Safety and precautions, Hormone assays,</p>	<p>1) Electrophoretic fractionation of serum proteins and lipo proteins.</p> <p>2) Separation of amino acids and carbohydrates by paper chromatography.</p> <p>3) Determination of plasma prothrombin time</p> <p>4) Oral glucose tolerance test</p> <p>5) Estimation of serum calcium and inorganic phosphate</p> <p>6) Practice and use of automated pipettes</p> <p>7) Turbidimetric method of determination of plasma fibrinogen</p> <p>8) Estimation of HDL cholesterol</p> <p>9) Determination of Urinary 17 ketosteroids and VMA</p> <p>10) Determination of CPK, LDH, GGT and G6PD activities</p> <p>11) Determination of urine proteins by turbidimetric method</p> <p>12) CSF analysis - Pandy's test, Nonne - Apelt</p> <p>13) Demonstration of working of Auto analysers</p> <p>14) Training of Computer basics</p> <p>15) Estimation of serum sodium and potassium by Flame photometry</p> <p>16) Estimation of serum bicarbonate by titrimetric method.</p> <p>17) Demonstration of RIA</p>

<p>2) Enzyme linked immuno essays, Description of instruments used</p> <p>in these essays.</p> <p><b>IV. Metabolism :</b></p> <p>1) Carbohydratemetabolism - Glycolysis and TCA Cycle,</p> <p>2) Lipid metobolism - P - Oxidation of Fatty acids</p> <p>3) Protein metabolism - Urea cycle</p> <p>19</p> <p><b>V. Titrimetric methods of Quantitative determination, preparation of various solutions used in titrimetric analysis.</b></p> <p><b>VI. Liver function tests :</b></p> <p>1) Basic concepts including normal and abnormal bilirubin metabolism</p> <p>2) Classification</p> <p>3) Serum bilirubin determination</p> <p>4) Vandenberg test</p> <p>5) Total proteins and A/G ratio</p> <p>6) Enzyme estimations as LFT.</p> <p><b>VII. Renal function tests :</b></p> <p>1) Basic concepts and classification</p> <p>2) Clearance tests</p> <p>3) Concentration and dilution tests and</p> <p>4) Urine examination in assessing kidney function</p> <p><b>VIII. Gastric function tests :</b></p> <p>1) Basic concepts and introduction</p> <p>2) Techniques of different tests including tubeless gastric analysis</p> <p><b>IX. Thyroid function tests :</b></p> <p>1) Basic Concepts</p> <p>2) Estimations of various thyroid hormones, their</p>	<p>18) Demonstration of enzyme linked immuno assays</p> <p>19) Qualitative identification of urine sugars</p> <p>20) Qualitative identification of urine proteins</p> <p>21) Qualitative identification of urine BS &amp; BP</p> <p>22) Gastric juice analysis, demonstration of stimulation tests</p> <p>22</p> <p>23) Renal Calculi analysis</p> <p>24) Biliary Calculi analysis</p> <p>25) Demonstration of Ion selective electrodes</p> <p>26) Practice of Liver functions tests, and interpretation</p> <p>27) Practice of Renal functions tests, and interpretations</p> <p>28) Practice of Thyroid function tests and interpretations</p> <p>29) Practice and interpretation of cardiac profile and lipid profile</p> <p>30) Practice of quality control measures</p>
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interpretations

3) Recent methods of thyroid function tests

#### **X. Pancreatic function tests**

1) Basic concepts and introduction

2) Various tests done and methods including serum amylase

determination

#### **XI. Clinical Enzymology :**

1) Introduction and Basic Concepts of Enzymes, Coenzymes and

Isoenzymes

20

2) Importance of Enzymes

3) Transaminases

4) Cardiac Enzymes

5) Acid Phosphatase

6) Alkaline Phosphatase

#### **XII. Body Fluids :**

1) Outlines of formations of different body fluids

2) Composition & analysis of CSF including

a) CSF Sugar estimation

b) CSF Proteins estimation

c) CSF Chlorides estimation

including interpretation of results

#### **XIII. Automation and usage of computers in Biochemical Analysis**

#### **XiV. Quality assurance in Bio - Chemical laboratory.**

a) Introduction and importance of quality assurance,

General principle

b) Internal and external quality control

**XV. Diagnostic tests**

- a) Lipid profile - Serum cholesterol, HDL  
Cholesterol
- b) Glycosylated haemoglobin
- c) Serum Calcium
- d) Inorganic Phosphate
- e) Analysis of hormone metabolites
- f) Blood gas analysis

# Microbiology and Medical care – 1<sup>st</sup> year

(Subject Code – 20140006 )

Theory	Practical
<p><b>MICROBIOLOGY</b></p> <p>I. Historical introduction to Microbiology contribution of famous Scientist in the field of Microbiology in brief</p> <p>a) Anatomy Van Lee wen Hook</p> <p>b) Robert Koch</p> <p>c) Edward Jenner</p> <p>d) Louis Pasteur</p> <p>e) Joseph Lister</p> <p>II. Microscopy</p> <p>a) Principle working and maintainance of compound Microscope</p> <p>b) Principle of Flourescent Microscope, Electron Microscope, Dark Ground Microscope</p> <p>III. Sterlization and disinfection - classification and Methods of sterilization</p> <p>1) Principle and Methods of sterilization by heat</p> <p>a) By Dry Heat, Flamming, Red Heat, Hot air oven, incineration</p> <p>b) By Merit Heat-pasteurization, Inspissation, tyndalisation, autoclave</p> <p>2) Filtration Methods</p> <p>3) Ionising Radiation - Disinfection, Mode of action and uses of important chemical disinfections - Phenol and Phenolic compounds,</p>	<p><b>MICROBIOLOGY</b></p> <p>Lab Instructions for Personal Safety precaution</p> <p>Receipt and recording a specimen in the lab and dispatch of specimen</p> <p>Cleaning and care of glassware, syringes, apparatus, preparation of pasteur Pipettes.</p> <p>Handling and care of Microscope</p> <p>Operation of Autoclave, Incubator, waterbath, seitzfilter</p> <p>Preparation of various Media</p> <p>Preparation of stains and smears</p> <p>Methods of collection of microbidology specimen-and its importance and processing</p>

alcohols, halogens, dyes and acids and alkalies

4) Gaseous Methods of sterilization.

IV. Cleaning, drying & Sterilization of Glassware disposal of

contaminated material i.e. clinical infective material inoculated

culture media. Handling and Disposal of Biomedical waste.

V. Morphology and classification of Bacteria Sp. of cell, capsule,

flagella, spore, Anaerobic Methods of cultivation of Bacteria.

VI. Methods of Collection of clinical specimen for Micro-Biological

investigation (indetail) like sputum-petroff'smethod of

concentration, urine, swabs, stool, blood, CSF and aspirations

VII. Processing of clinical specimen collected for Isolation and

identification of organism

a) Preparation of direct smear and staining

b) Different Techniques of inoculation for isolation of bacteria

c) Hanging drop preparation and its use

d) Inoculation of various media for Bio-chemical reactions

VIII. Compostion and preparation of staining reagents and different

methods of staining

a) simple staining

b) Gram Staining

c) Spore staining

d) Capsular staining

e) Zeihl Neelson staining

f) Albert staining

g) Negative staining

h) Flagellar staining

i) Flourescent staining

IX. Culture Media - Classification of Media composition and preparation

and uses.

a) Basal Media - Peptone water, Nutrient broth, glucose broth.

b) Enriched Media - Blood agar, Loefflers serum slope, chocolateagar

c) Enrichment Media - Selenites broth, tetrathionatebroth Alkaline

peptone water

d) Differential Media - Maconkeys Media

e) Selective Media - Lowenstein Jenson Media, Potassium tellurite

Media, TCBS, Wilson and Blair Media Deoxycholate citrate agar

media

f) Blood culture media - Glucose broth, Hartleys broth, bile broth

Sugar Media for Bio-chemical Reaction.

Robertson cooked Meat Media, Thioglycolate media, Media and

Reagents for differents Biochemical reaction i.e. Indole test, V.P.

tests, M.R. test, citiate, urease, triple sugar Iron agar, Oxidase,

catalase test, Nitrate reduction test, Pheny alkaline deaminase

test, glucose phosphate broth, gelatin  
liquifaction.

Sabourauds dextrose Agar, PDA.

# Microbiology and Medical care – 2<sup>nd</sup> year

Theory	Practical
<p><b>I. Normal Flora of Micro-organisms in the Human Body.</b></p> <p><b>II. Introduction of Immunology -</b></p> <p>a) Brief outline of Immunity</p> <p>b) What are antigens</p> <p>c) What are antibodies</p> <p>d) Different-types of antigen and antibody reaction their application in the diagnostic, agglutination, precipitation, complement fixation, Neutralisation, RIA.</p> <p>e) Principle and Method of ELISA Tests.</p> <p><b>III. Collection and processing of faeces samples, concentration techniques of stool for Microscope Examination</b></p> <p>Parasitology - Morphology and Lab diagnosis of E-Histolytica, Gardia, Trichomonas, Plasmodium, Leshmania, Ankylostoma - deodenale, Ascaris Lumbricoidus, Taenia, E-Granulosus, Enterobius - Vermicularis, Dracunculus Medinensis, Wucharia Ban crofti</p> <p><b>IV. Antibiotic sensitivity test - Preparation of Antibiotic discs</b></p> <p><b>V. Preservation Methods of Stock cultures and their importance and principle procedure.</b></p> <p><b>VI. Brief outline of Morphology cultural characteristics and lab</b></p>	<p>1. Collection of clinical materials like blood, urine, stool, sputum, swabs etc.</p> <p>2. Parasitology - collection, preservation and transportation of faecal material for examination of parasites. Concentration techniques of stool for ova and cyst. Wet preparation of faecal sample for ova and cyst. Identification of ova and cyst in stool sample.</p> <p>3. Procedure of techniques of sputum for AFB.</p> <p>4. Procedure of skin clipping of Leprae Bacilli.</p> <p>5. Identification of organisms with Biochemical reactions of common organism like - staphylococcus, E.coli - Klebsiella, shigella, Salmonilla, Proteus, Psudomonas.</p> <p>6. Antibiotic Sensitivity tests</p> <p>7. Preservation of stock culture</p> <p>8. Bacteriology of water</p> <p>9. Bacteriology of Milk</p> <p>10. Bacteriology of food</p> <p><b>Mycology</b></p> <p>11. Collection of specimen for fungal examination like skin scrapings, swabs, CSF.</p> <p>12. Fungal examination by wet preparation</p>

<p><b>diagnosis of imp. pathogens</b></p> <p>a) Gram Positive - staphylococcus, Streptococcus, Pneumococcus</p> <p>b) Gram Negative - Gonococi, Meningococci</p> <p>c) Gram Positive Bacilli - Coryn-Diphtheria, Myco-tuberculosis, Mycro-leprae, B. anthracis</p> <p>d) Gram Negative Bacilli - Enterbacteriaceae - E.Coli, Klebsiella, salmonella, shigella, Enterobacter, proteous.</p> <p>e) Anarobic Bacterial, Bacteriodes, clostridium</p> <p>f) Vibriocholera - Pseudomonas</p> <p>g) H.influenza - B. Pertusis</p> <p>h) Spirochaetes - Treponema, leptospira, Borrelia</p> <p>i) Actinomyes &amp; Nocardia</p> <p><b>VII. Bacteriological examination and water, milk &amp; food.</b></p> <p><b>VIII. Mycology -</b></p> <p>Morphology cultural characteristics and lab diagnosis</p> <p>a) Candida b) Cryptococcus</p> <p>c) Dermatophyta d) Aspergillus</p> <p>e) Pencillium</p> <p><b>IX. Virology -</b></p> <p>Classification, General properties and cultivation and imp .</p> <p>pathogenic viruses such as Measles, Mumps, Influenza, polio,</p> <p>Hepatitis, Rabies, Herpes, Rubella, HIV, Dengue, and J.E.</p>	<p>13. Fungal culture</p> <p><b>Serology</b></p> <p>29</p> <p>14. VDRL Tests</p> <p>15. Preparation of widal Antegens &amp; widal tests</p> <p>16. Brucella Agglutination test</p> <p>17. Weil felix test</p> <p>18. Paul Bunnel test</p> <p>19. RA test</p> <p>20. CRP test</p> <p>21. TPHA</p> <p><b>Virology</b></p> <p>22. ELISA test</p> <p>23. Western blot test</p> <p>24. Incubation of fertile eggs and inoculation by various routes</p> <p>25. Model layout of Animal House.</p> <p>26. Feeding, breeding and handling of Animals</p> <p>27. Techniques of drawing of blood from animals</p> <p>28. Anesthesia for animals</p> <p>29. Common diseases of the lab animals - and preventive aspects.</p>
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<p><b>X. Vaccines -</b> classification and uses</p> <p><b>XI. Layout of Animal House</b></p> <p><b>XII. General principles of animal care - feeding, breeding and handling of animal and disposal of animal waste</b></p> <p><b>XIII. Anaesthesia for animals, Euthanasia, Rethins, and frog</b></p> <p>27</p> <p><b>XIV. Techniques of drawing a blood from animals</b></p> <p><b>XV. Common disease of the lab animals preventive, aspects and disposal of animals and related Material</b></p>	
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#### **REFERENCE BOOKS**

1. Praful-Godkar - Text Book of Medical Lab Technology
2. Ramnik Sood - Text Book of Medical Lab Technology
3. K.M. Samuel - Manual for Medical Lab Technology
4. Harold Varley - Practical Clinical Biochemistry
5. Lehninger - Textbook of Biochemistry
6. Rama Rao - Textbook of Biochemistry
7. C.C. Chatterjee - Human Physiology
8. Chowrasia - Human Anatomy
9. Anantha Narayan - Text Book of Microbiology
10. Toratora - Anatomy & Physiology
11. Indesten Singh - Histology
12. Chaurasia - Gross Anatomy
13. WHO Lab Manual

## List of Equipments Required to available in Institute

### **Biochemistry 1**

1. Hot Plate 1
2. Gas Cyllinder with Burner 1
3. Spirit lamps 15
4. Hand Centrifuges 5
5. Electrical Centrifuges 1
6. Refrigerator 165 lit. 1
7. Colorimeter 1
8. Hot air oven 1
9. Water bath 1
10. Analytical Balance 5
11. Physical Balance 2
12. Typewriter
13. Flame photometer 1
14. Spectro Photometer
15. Flourimeter 1
17. PH Meter
18. Incubator 1
19. Electrophoresis apparatus 1
20. Computer 1
21. Semi auto analyser 1

### **Glassware**

1. Test tubes  
18 x 150 mm - 100  
15 x 150 mm - 100  
15 x 125 mm - 100
2. Centrifuge tubes 36  
16 x 100 mm - 200
3. Fol in sugar tube 30
4. Beaker-glass and polypropylene 250 ml 5

5. Pipettes

a) Volumetric-capacity

2 ml - 6 Nos

5 ml - 5 Nos

10 ml - 6 Nos

20 ml - 5 Nos

25 ml - 5 Nos

b) Serological blow out type

1 ml 1/100 - 10 nos.

2 ml 1/100 - 10 nos.

5 ml 1/100 - 10 nos.

1.10 ml 1/10ml - 5 nos.

2 ml 1/10 ml - 5 nos.

0.1 ml 1/100 ml - 5 nos.

0.2 ml 1/100 - 5 nos.

c) Ostwald pipettes

0.1 ml - 4 Nos.

0.2 ml - 4 nos.

0.5 ml - 4

6. Burettes

25 ml - 4

50 ml - 4

7. Reagent Bottles

60 ml - 10 nos.

120 ml - 10 nos.

250 ml - 20 nos.

500 ml - 5 nos.

100 ml - 5

8. Dropper bottles 30 ml 5 nos.

9. Watch glass (Assorted sizes) - 6 Nos
10. Volumetric Flasks
  - 25 ml - 6 nos.
  - 50 ml - 6 nos.
  - 100 ml - 10 nos.
  - 250 ml - 10 nos.
  - 500 ml - 10 nos.
  - 1000 ml - 5 nos.
11. Stoppered graduated Test Tubes
  - 15 ml - 10 nos.
  - 40 ml - 10 nos.
  - 50 ml - 10 nos.
12. Distillation assembly (glass)
  - Complete set 1
13. Condensor 1
14. Round Bottom
  - flask 500 ml - 1 no.
  - 1000 ml - 1 no.
15. Filter Paper - Ordinary - 1 Ream
16. Whatman Filter Paper 46x57 cm No 1 - 20 sheet
  - No 2 - 10 sheets
17. Cotton (absorbant) 5 Rolls
18. Glass slides 5 boxes
19. Plastic Wash bottles 50 ml. 10 nos.
20. Mortar/Pestle - 2 nos.

## **Microbiology**

1. Student Microscope - 5
2. Centrifuge - 2
3. Refrigerator - 1
4. Autoclave - 1
5. Hot air oven - 1
6. Incubator - 1
7. Inspissator - 1
8. Deioniser - 1
9. Distil water plant - 1
10. Pipette washer - 1
11. Anaerobic Jar - 1
12. Vaccum Pump - 1
13. Analytical Balance - 1
14. Water Bath - 1
15. VDRL Rotator - 1
16. Electrophoresis apparatus - 1
17. Petri dishes - 100 x 17 - 100 nos
18. Test Tubers - 150 x 19 -100  
100 x 12 -100
19. Pipettes  
10 ml - 10 nos.  
5 ml - 10 nos.  
1 ml - 10 nos.
20. Wash bottles - 5
21. Spatulas - 12
22. Reagent bottles - 10
23. Measuring Cylinders 50 ml - 5

**Pathology**

1. Microscope 1
2. Hot air oven 1
3. Incubator 1
4. Centrifuge 1
5. Blood cell counter 2
6. Water Bath 1
7. Chemical Balance 1
8. Hot plate 1
9. Stopwatch 1
10. Haemometer 5
11. Haemocytometer 5
12. ESR stand 5
13. ESR Tubes 5
14. Mortor and Pestle 2
15. Urinometer 2
16. Spiritlamp 2
17. Syringe
  - 20 ml - 10
  - 10 ml - 10
  - 5 ml - 5
  - 2 ml - 2
18. Beaker
  - 100 ml - 5
  - 250 ml - 5

**A. Collaborating Institutions for Curriculum transaction**

1. All Hospitals
2. All Medical Colleges
3. All the national laboratories
4. Regional Research Laboratories
5. University Departments
6. Pharmaceutical Companies and Education Institutes

**B. On the Job Training Centres**

1. Government Head Quarters Hospital
2. PHCs
3. Dispensaries
4. Medical colleges
5. Private Hospitals
6. Private labs

## **IX. Qualification of Lecturers**

1. MBBS
2. MBS Hom/BHMS
3. B. Pharmacy
4. M.Sc. Microbiology/Biochemistry/MLT

## **X. Vertical Mobilities**

### **A) With Bridge Course**

- 1) B.SC (BZC)
- 2) Courses through EAMCET

### **B) Without Bridge Course**

- 1) B.Sc. MLT
- 2) B.Sc. Microbiology
- 3) B.Sc. Biochemistry
- 4) B.Sc. Biotechnology
- 5) M.Sc. MLT/Biochemistry/Microbiology/Biotechnology (at P.G. level)

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