



## CERTIFICATE IN MEDICAL LAB TECHNICIAN

**DURATION : 1 YEARS**

**ELIGIBILITY : 10<sup>TH</sup> PASS**

1<sup>ST</sup> SEMESTER

CODE	SUBJECT	MAX MARKS	CREDIT
101	HUMAN ANATOMY	100	4
102	HUMAN PHYSIOLOGY	100	4
103	BASIC HAEMATOLOGY AND CLINICAL PATHOLOGY	100	4
104	ENGLISH COMMUNICATION & SOFT SKILLS	100	3
105	GENERAL MICROBIOLOGY	100	4
106	GENERAL BIOCHEMISTRY	100	4
107	COMPUTER FUNDAMENTALS	100	3
108	PRACTICAL-I	100	3
109	CLINICAL POSTING	100	2

### 101 HUMAN ANATOMY

#### Unit -1

Terminology and General Plan of the Body, Body Parts and Areas, Terms of Location and Position, Body Cavities and Their Membranes, Dorsal cavity, Ventral cavity, Planes and Sections

#### Unit -II

Cells: Structure, function and location, Prokaryotic and eukaryotic cells, Cell organelles, Cell division Tissue, Types, Structure, Location and Function of Epithelial Tissue, Connective Tissue, Muscle Tissue, Nerve Tissue, Membranes, Glandular tissue

The Integumentary System: structure and function of The Skin, Subcutaneous Tissue

#### Unit-III

Musculoskeletal System: Basic anatomy of important muscles and bones

#### Unit-IV

Respiratory system: Basic anatomy of nose, larynx, trachea, bronchi and lungs

#### Unit - V

Digestive system: basic anatomy of oesophagus, stomach, small intestine, large intestine, liver, gall bladder, pancreas

### 102 HUMAN PHYSIOLOGY

#### Unit-I

Cell physiology: Structure, membrane, transport across cell membrane, Active, Passive, Organization of the Body, Body Composition, Body Fluid Volumes and its measurement, Diffusion, Osmosis, Tonicity, Homeostasis

#### Unit-II

Blood-composition, function, cellular component & their function, haemoglobin&anaemia, blood groups and coagulation

Lymphatic system-Composition & function of lymph, lymphatic tissue, Immunity with the role of thymus

#### **Unit-III**

Cardiovascular system-general arrange, heart, arteries, veins and capillaries, heart structure and function, cardiac cycle, heart sounds, heart rate, blood pressure, mechanism of circulation, definition of hypertension & shock

#### **Unit-IV**

Respiratory system: parts of respiratory system, mechanism of respiration, pulmonary function, pulmonary circulation, lungs volume, Gas transport between lungs and tissues, Definition of hypoxia, dyspnoea, cyanosis, asphyxia and obstructive airways diseases

#### **Unit- V**

Gastrointestinal physiology: Organs of GIT and their structure & function, secretion, digestion, absorption and assimilation, gastrointestinal hormones, physiology of digestion of carbohydrates, proteins& lipids, Structure & function of liver, spleen, gall bladder & pancreas, Jaundice, Cirrhosis & Pancreatitis

### **103 BASIC HAEMATOLOGY AND CLINICAL PATHOLOGY**

#### **Unit- I**

Introduction to Haematology, Organization of laboratory and safety measures, Laboratory Safety guidelines, Biomedical waste management, BMW – Segregation, collection, transportation, treatment and disposal (including colour coding), Personal Protective Equipment, The Microscope and its parts, care and maintenance, monocular and binocular microscope, Corrective Actions in Light Microscopy, Important equipment used in haematology lab

#### **Unit-II**

Haematopoiesis, Erythropoiesis, Leucopoiesis, Thrombopoiesis, Mechanism of hemopoiesis, stages of cell development, sites of hemopoiesis, Blood and its composition, plasma and its composition, RBC, WBC, Platelets, Anticoagulants, mechanism of action, types and uses, merits and demerits, effect of storage on blood cells

#### **Unit-III**

Collection, Transport, Preservation, and Processing of various clinical Specimens, Blood collection for hematological investigations, Venipuncture, Capillary blood, Arterial blood, Vacutainer, its type and uses, sample acceptance and rejection criteria.

#### **Unit-IV**

Hemoglobin, structure ,function and types , Hemoglobinometry , Haemoglobin estimation by various methods, advantages and disadvantages, physiological and pathological variations on blood parameters

Hemocytometry, visual and electronic method, Neubauer counting chamber, RBC count, WBC count, Platelets count, absolute eosinophil count, principle, procedure, calculation , significance, precautions involved during counting, absolute count of various WBCs. Physiological and pathological changes in values

#### **Unit-V**

Preparation of thin and thick smears, staining of smears, Romanowsky dyes, preparation and staining procedures of blood smears, Morphology of normal blood cells and their identifications, differential leucocytes count by manual and automated method, physiological and pathological variations in value

### **104 ENGLISH COMMUNICATION & SOFT SKILLS**

#### **UNIT-I: Introduction to English language**

- a) Role and significance of English language in the present scenario
- b) English Language: Its relevance for the Indian industry
- c) Introduction to Listening, Speaking, Reading, Writing (LSRW) and benchmarking of the class

#### **UNIT-II: Phonetics& Functional Grammar**

- a) Pronunciation and daily usage correction (speak with differences between p/b, s/sh, f/ph, t/d, v/w sounds)
- b) Parts of speech, articles, tenses, verbs and modals

- c) Practice of daily use words, numerals and tongue twisters
- d) Vocabulary building, Construction of simple sentences: Basic sentence pattern, subject and Predicate

*[Note: As part of classroom activity, language games, tongue & jaw exercises, simple passages from the newspapers for oral drills in the classroom and practice tests (written and oral)]*

**UNIT-III: English Communication- About Myself**

- a) Let's talk, making conversation, meeting and greeting
- b) Introducing myself, my family and my friends
- c) My opinions, my likes and dislikes
- d) Life at college, hostel and workplace

*[Note: As part of classroom activity, use the Workbook for reference for classroom and home assignments, carry out practice tests (written and oral)]*

**UNIT-IV: Personality Development**

- a) First impression: Dressing sense, good manners, speaking well and respectably
- b) Positive Attitude: Being happy and alert, a good listener and a good friend
- c) Consultation among peers: Soliciting advice and giving advice
- d) Goal setting, confidence building & handling rejection

*[Note: As part of classroom activity, refer Workbook for classroom and home assignments, carry out practice tests (written and oral)]*

**105 GENERAL MICROBIOLOGY**

**Unit-I**

Development of microbiology as a discipline, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Edward Jenner

Introduction to bacterial taxonomy, Classification of Bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, cell wall, plasma membrane, pili, ribosomes.

**Unit-II**

Microscopy: Study of compound microscope – magnification, numerical aperture, resolution and components of microscope. Dark ground illumination, care of microscope and common difficulties in microscopy. Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Transmission Electron Microscope, Scanning Electron Microscope

**Unit-III**

Cell size, shape and arrangement, cell-wall, composition and detailed structure of Gram-positive and Gram-negative cell walls, Cell Membrane: Structure, function and chemical composition of bacterial cell membranes. Cytoplasm: Ribosome, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids, Endospore: Structure, formation

**Unit-IV**

General safety measures used in Microbiology laboratory, Sterilization and disinfection: Various physical methods of sterilization – heat, UV radiation, ionizing radiation, filtration, characters affecting sterilization, autoclave control and sterilization indicators.

Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated, Segregation, Treatment, Disposal

**Unit-V**

Antiseptics & Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants

Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound. use and abuse of disinfectants. precautions while using the disinfectants.

**106 GENERAL BIOCHEMISTRY**

**Unit-I**

Introduction to Clinical Biochemistry and role of Medical Lab Technologist, ethics, responsibility, safety measure and hazards in clinical biochemistry lab and first aid in laboratory accidents.

Glassware's & plastic ware's used in lab, calibration of volumetric apparatus, cleaning & care and

maintenance

#### **Unit II**

Principle, working, care & maintenance and calibration of Weighing balance, Hotplate, Magnetic stirrer, Centrifuges, Incubator, Hot air oven, Colorimeter, Spectrophotometer, Water distillation plant, Deionizers Henderson Hassel balch equation, pH paper, pH meter, method of pH measurement,

#### **Unit-III**

Preparation of solution and reagents, normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, standard solution, aqueous solutions, concepts of acid and base  
Units of measurement: SI unit, reference range, conversion factor, units for measurement of bio metabolite, enzymes, protein, drugs, hormones, vitamins

#### **Unit-IV**

Specimen collection and processing of blood, urine & CSF, separation of serum and plasma, deproteinization of sample, Handling of specimens for testing, preservation of specimen, transport of specimen, factors affecting the clinical results, effect of storage on sample

#### **Unit- V**

Physical, chemical and microscopic examination of urine, Bence Jones Proteinuria and its clinical significance, qualitative test of urine for reducing sugars, protein, ketone bodies, bile Salt, bile pigments, urobilinogen, occult blood, uric acid, urea and Creatinine, quantitative estimation of 24 hrs urine for protein and their clinical significance.

### **107COMPUTER FUNDAMENTALS**

#### **Unit-I**

Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages. Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

#### **Unit-II**

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

#### **Unit-III**

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

#### **Unit-IV**

Introduction of Operating System: introduction, operating system concepts, types of operating system, Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Electronic Payment Systems: Introduction, Types of Electronic Payment Systems, Digital Token-Based, Electronic Payment Systems, Smart Card and Electronic Payment Systems, Credit Card- Based Electronic Payment Systems, Risk and Electronic Payment Systems.

#### **Unit-V**

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

### **108PRACTICAL-I**

### **Practical Human Anatomy**

1. Demonstration of Major organs through models and permanent slides.
2. Demonstration of parts of circulatory system from models.
3. Demonstration of parts of respiratory system from models.
4. Demonstration of digestive system from models.
5. Demonstration of excretory system from models.
6. Demonstration of nervous system from models.
7. Structure of eye and ear
8. Demonstration of structural differences between skeletal, smooth and cardiac muscles.
9. Demonstration of various bones
10. Demonstration of various joints
11. Demonstration of various parts of male & female reproductive system from models

### **Practical Human Physiology**

1. To measure pulse rate
2. To measure blood pressure
3. Demonstration of ECG
4. To perform Hemoglobin by Sahli's Method
5. To perform Hemoglobin by CMG method.
6. Haemoglobin by CMG method.
7. To perform Total RBC count.
8. To perform total leucocyte count.
9. To perform differential leucocyte count.
10. To perform PCV
11. To calculate Red cell indices.

### **Practical Basic Haematology & Clinical Pathology**

1. To learn general laboratory safety rules.
2. To demonstrate glasswares, apparatus and plasticwares used in laboratory.
3. To prepare EDTA, Sod. Citrate & Sod. Fluoride anticoagulants and bulbs/vials used in laboratory.
4. Demonstration of Vacutainer.
5. To demonstrate method of blood collection.
6. To separate serum and plasma.
7. Demonstration of microscope
8. Determination of Hemoglobin by various methods.
9. Determination of TLC
10. Preparation of thick and thin smear
11. Determination of DLC
12. Determination of Total RBC
13. Determination of total platelet count
14. Determination of absolute leucocyte count

### **Fundamentals of Microbiology**

1. Demonstration of Microscope and its parts
2. Demonstration of glassware used in microbiology.
3. Demonstration of autoclave and sterilization of glass wares.
4. Demonstration of Hot air oven and sterilization of glass wares.
5. To perform Gram staining
6. To perform Acid fast staining (Ziehl-Neelsen staining)
7. To perform Indian ink staining
8. To perform Hanging drop method
9. Demonstration of capsule
10. Staining of bacterial spores
11. To demonstrate agglutination reaction.
12. To perform RA test
13. To perform WIDAL test
14. To perform RPR test.
15. To perform CRP test.

### **Practical Fundamentals of Biochemistry**

1. To study general laboratory safety rules.
2. To demonstrate glasswares, apparatus and plasticwares used in laboratory.
3. Collection of blood sample
4. To separate serum and plasma.
5. Preparation of different percentage solutions
6. Preparation of normal and molar solutions.(0.1 N NaOH, 0.2N HCl, 0.1 M H<sub>2</sub>SO<sub>4</sub>)
7. Demonstration of photocolormeter
8. Demonstration of spectrophotometer
9. Demonstration of pH meter
10. Deproteinization of blood sample

### **Practical: Basics of Computer**

Computer fundamental and internet lab

1. Using basic DOS commands.
2. Using external DOS commands
3. Creating a email account
4. Using web browser for searching and surfing.
5. Creating and formatting a document in MS office
6. Using autocorrect, auto text and spell check operation in MS office .
7. Create tables in MS Word.
8. Inserting different kinds of object in MS word.
9. Use main merge options in MS office.
10. Create a Excel work sheet with following options rows and columns alignment..
11. Using excel formulas.
12. Create a graph with available data in MS excel.
13. Create a PPT presentation using auto content wizard.
14. Use Clip art animation effects and word art galleries in presentations.
15. Using transition and setting timings for slide show.
16. Use MS access to create data base and tables.

### **109Hospital Posting:**

Students shall be deputed to various labs of Pathology department wherein they shall undergo practical training of handling patients, collection and processing of blood, urine, sputum stool and body fluids samples. Identification of patient's particulars based on CR number, Lab Number and transfer of samples from collection centres to different labs. Process of performing various tests in different labs. Each student is required to maintain a logbook of the various posting. Student's performance shall be evaluated on continuous basis by the faculty posted in various sections. The faculty shall submit the assessment records of each student posted in his/her section on monthly basis to the HOD. Marks will be awarded out of 100.