

Semester - I

Paper DMLT: 01 Fundamentals of medical laboratory technology

Credit – 04

i) Introduction to Clinical laboratory

Basic laboratory principles – Code of Conduct of medical laboratory personnel. The use of the laboratory – Basic laboratory principles – code of conduct of medical laboratory personnel – Organization of clinical laboratory and role of medical laboratory technician – safety measures – Medical Laboratory professional and professionalism in laboratory workers

ii) Common Laboratory Equipment's

Incubator, Hot Air Oven, Water Bath, Centrifuge, Autoclave, Spectrophotometer, Balance Microscope – Fundamentals of Microscopy, Resolution & Magnification Light Microscopy, Glassware – Description of Glassware, its use, handling and care, Colorimeter, Blood cell counter.

iii) Basic Steps for Drawing A Blood Specimen

Requirement of Blood Collection – Blood collection – Phlebotomy – Sampling errors – Collection and preservation of biological fluids – Anticoagulants – Preservation of samples – chemical preservatives – process of analysing the specimens – the laboratory report.

iv) Manual & Automation in Clinical Laboratory

Types of analyzers – semi-auto analyser, Batch analyzer –Steps in the automated systems responsibilities of a technician in the maintenance of the analyzers, ELISA technique, ELISA plate reader and washer.

Fundamentals of Medical Laboratory Technology (Practical)

1. Handling common laboratory equipment's
2. Responsibilities of a technician in the maintenance of the analyzers.
3. Use and care of microscopes.
4. Using of autoclave hot air oven, other common laboratory equipment etc.
5. Practical use of automated pipettes.
6. Demonstration working with different auto analyzers.
7. Specimen collection, identification, transport, delivery and preservation.

Reference Books.

1. Fichbach, 2005 Manual of Lab and Diagnostic Tests, Lippincott Willams Wilkins, New York.
2. Gradwohls, 2000 Clinical Laboratory Methods and Diagnosis (Ed) Ales C. Sonn Enwirth and Leonard Jarret, M.D.B.O, New York.
3. J. Ochei and Kolhatka, 2002 Medical Laboratory Science Theory And Practice, Tata McGraw Hill, New Delhi.
4. Kanai L. Mukharjee, 2007 Medical Laboratory Technology Vol. 1 Tata McGraw Hill

- i) Introduction to anatomy**
Scope of Anatomy and Physiology – Definitions and Terms in Anatomy and Physiology structure and function of human cell – Elementary tissues of human body.
- ii) Cardio Vascular System**
Brief account on composition blood – function of blood elements – blood group and Rh typing, Coagulation of blood. Structure and functions of various parts of the heart & its function & Blood pressure.
- iii) Respiratory System**
Structure & function of lungs, Physiology of breathing, Lung volume & capacity.
- iv) Digestive System**
Name and various parts of digestive system Liver, Spleen, gall bladder, Pancreas, Buccal Cavity, tongue, tonsil, Pharynx, Oesophagus, Stomach, intestine etc. – Physiology of digestion and absorption.
- v) Urinary System**
Structure and function of kidneys, its role in urine formation, ureter, urinary bladder, Micturition.
- vi) Reproductive System**
Anatomy & Physiology of Male & Female reproductive system, menstrual cycle, Contraceptives.
- vii) Nervous System**
Elementary knowledge of structure – functions of nervous system – Brain, Spinal Cord & Nerves.
- viii) Endocrine System**
Endocrine glands their hormones and functions – Thyroid, Parathyroid, suprarenal, Pituitary and Thymus.

Practicals

- i) Study of Human Skeleton Parts with Skeletal Models.
- ii) Study with charts and models of all organ systems mentioned above.

Reference Books:

1. Solon on E.A. (2008) Introduction to Human Anatomy and Physiology 3rd Ed. Saunders: St Louis.
2. Chaurasia, B.D. & Garg, K., (2012) Human Anatomy Regional and Applied CBS Publications: New Delhi
3. T.S. Ranganathan – A text book of Human Anatomy
4. Fattana, Human anatomy (Description and applied) Saunder's & C. P. Prism Publishers, Bangalore – 1991
5. W. F. Ganong - Review of Medical Physiology

1. Definition, classification and biomedical importance of Carbohydrate (absorption of glucose, Diabetes mellitus), protein (Haemoglobinopathy) and lipids.
2. Enzyme – Definition, classification, Coenzymes, Clinical importance of enzyme Enzyme pattern in disease.
3. Vitamins & minerals- Fat soluble vitamins (A,D,E,K), Water soluble vitamins, Principle elements-(Ca, Na, K, Cl, Fe & S. Trace elements-Iodine, Caloric value of food, Basal metabolic rate, Protein Energy Malnutrition-Kwashiorkor, Marasmus.
4. Acid & Bases- Definition, PH, Buffers, Normality, Molarity, Molality, Renal control of acid base balance, Clinical causes of acid base imbalances, Respiratory acidosis, In brief - Respiratory alkalosis, Metabolic acidosis, Metabolic alkalosis.
5. Lipid Metabolism

Biochemistry (Practical)

1. Qualitative test of monosaccharides (Glucose & Fructose).
2. Qualitative tests of Proteins -Heat coagulation test.
3. Qualitative test for ketone bodies, bile salts & pigments.

REFERENCE BOOKS.

BIOCHEMISTRY.

1. Review of Physiological Chemistry, Harold Harper A,
2. Biochemistry- U satyanarayana
3. Text book of biochemistry- By Vasudevan.
4. Biochemistry – by Lippincott.

1. Introduction to Microbiology, Morphological classification of Bacteria.
2. Culture media, types of media, special media.
3. Sterilization and Disinfection (Physical and Chemical methods)
4. Morphology and Pathogenicity of-
 - a) Gram positive cocci-Staphylococci, Streptococci,
 - b) Gram negative cocci- Neisseria
 - c) Gram positive bacilli- Corynebacterium, Actinomy, Listeria, Bacillus, Clostridia, Mycobacterium tuberculosis and Mycobacterium leprae.
 - d) Gram negative bacilli- Pseudomonas, Vibrio, Aerononas, Plesiomonas, Brucella, Haemophilus, Rickettsia, Mycoplasm Salmonella, Shigella, Vibrio
5. Antimicrobial susceptibility test.

Practical

1. Staining

- a) Gram staining technique.
- b) Acid fast staining (Z-N)

2. Identification of bacterial culture

- a. Colony characteristic.
- b. Morphological characteristic.
- c. Interpretation of biochemical reaction.

3. Antibiotic sensitivity test

4. Serological tests

- a. Widal
- b. ASO
- c. CRP
- d. RPR/VDRL/TRUS
- e. RA.
- f. HbsAg & anti HIV detection.

5. ELISA & its modification

6. Diagnostic tests of urine for isolation & identification of pathogenic bacteria.

Reference books

Microbiology.

1. Medical Microbiology by Patric R. Murray, Ken S. Rosenthal, Michael A. Pfaller.
2. Text Book of Microbiology by Chakraborty.
3. Microbiology An introduction by Tortora Funk, Case 12ed.
4. Mackie & Mc Carthey - Medical Microbiology,
5. Ananthansarayana, R., Jayaram Pumkar - Test Book of Microbiology,

Semester-2 (6 months)

DMLT: 05 Elementary Clinical Biochemistry (Theory)/Pathology

Credit – 04

1. Photometry
Introduction & definition of photometry. Colorimetry- Lambert Beer's law, Parts of photo colorimeter.
2. Manual vs Automation in clinical laboratory
Types of analyzer- Semi autoanalyzer, Responsibilities of a technician in the maintenance of the semi autoanalyzer.
3. Organ function tests:
 - a) Tumor Markers
 - b) Cardiac Marker
 - c) Tests for liver function. Jaundice & its types.
 - d) Pancreatic function test.
 - e) Function of kidney, Urine formation & renal function tests.

Practical

Clinical Biochemistry

1. Urine analysis- collection, preservation, physical, chemical & microscopic.
2. Normal constituents Nitrogenous & Non Nitrogenous substance.
3. Abnormal constituents of urine.
 - (a) Qualitative test for sugar, Albumin, blood, bile salts and pigments
 - (b) Determination of sugar, albumin
4. Blood/serum/plasma.
 - a) Collection and preservation of blood, b) Blood glucose test, c) G.T.T. d) Glycosylated Hemoglobin. (HbA1C)
 - b) Determination of serum urea; uric acid; creatinine
 - c) Estimation of total protein (Biuret Method) and estimation of serum albumin & serum globulin.
 - d) Estimation of serum phosphorus, Sodium, Potassium & Calcium.
5. Determination of SGOT and SGPT,
6. Determination of Phosphatase (Acid & Alkaline)
7. Estimation of serum lipids: Cholesterol, Triglyceride, Phospholipid, HDL, VLDL & LDL.
8. Normal values of all parameters.

REFERENCE BOOKS.

Biochemistry

1. Lehninger Principles of biochemistry- by David L. Nelson.
2. Text book of biochemistry for medical students by M. D. Rafi.

Pathology

1. Text book of pathology by Mohan Harsh
2. Concepts in pathology by Devesh Mishra.
3. Rapid review pathology by Edward F. Goljan.
4. Pathophysiology by Lippincott.

Immunology.

1. Immunity - Introduction. Types of immunity, Antigen-antibody reaction.
2. Hypersensitivity & Histocompatibility
3. Humoral and cell mediated immunity.
4. Auto immunity and Auto-immune diseases
5. Immune deficiency diseases and its investigations (HIV).

Haematology/Blood bank technology.

1. Introduction to Haematology & Blood cells
2. Collection of blood - ways of collection.
3. Anticoagulants
4. ESR
5. Haematocrit - Packed cell volume (PCV)
6. Red cell Indices - MCV, MCH, MCHC.
7. Morphology of Normal and Abnormal cells.
8. Anticoagulants & Storage of blood.
9. Cell separation, and transfusion of various components of blood.
10. Complications of blood transfusion & remedial action.
11. Haemolytic disorder of Newborn & exchange transfusion.
12. Organization, operation and administration of blood bank.
13. Screening test of blood & screening of donors.

Practical

1. Haemoglobin estimation by Sahli's method.
2. R.B.C. count.
3. TLC
4. DLC & Leishman's staining
5. Platelet count
6. Bleeding time, clotting time.
7. Preparation & examination of blood smear (Peripheral smear)
8. E.S.R.
9. Determination of Blood group: ABO and Rh factor.
10. Widal test
11. ASO test.
12. Mantoux test for TB.
13. i) Donor's screening and selection.
 - a) Identification,
 - b) Recording Hemoglobin estimation,
 - c) Grouping and typing of donor's blood,
 - d) Ruling out transfusion transmitted diseases. Screening of HbS, Ag, HIV, HCV, HBV, Trepanoma, Palladium, Plasmodium, HTLV, Rapid kit method.

- e) Cross matching of blood samples. Compatibility test, Direct & indirect Coomb's test- Principle involved & method used.
- ii) Blood Storage & transport
 - a) Anticoagulant preparation,
 - b) Recording the details of storage of blood,
 - c) Maintenance, cleaning of various equipments used in blood bank
- 14. Laboratory investigation of immuno deficiency patient & HIV patient.

Field Work: - Visit to: - Reference blood group centre, Blood Bank.

Reference Books Immunology.

1. Roitt's Essential Immunology by Ivan Roitt & Peter J Delves, Oxford, Blackwell science publication London. 10e.
2. Elgert: Immunology understanding the immune system, John Willy & Sons, Inc. Publication, New York 1996.
3. Abbas et al. Cellular & Molecular Immunology (3rd Ed.) W.B. Saunders Company, 2000.
4. Kubly Immunology 4 Ed.
5. Immunology by Tizzard

Reference Books Hematology

1. Wintrobe's clinical hematology by John P. Greer.
2. Essential hematology by Victor Hoffbrand, Paul A. H. Moss(Willey Black well)
3. Rodak's hematology by Elaine Keohane, Larry Smith, Jeanine Walenga.
4. Hematology, Immunology & Infectious disease by Robin K. Ohls, Akhil, Maheshwari.
5. Hematology at a glance by Atul B. Mehta, Victor Hoffbrand.

Reference Books Blood Bank Technology

1. Modern Blood Banking & Transfusion Practices by Denise & M. Harmening
2. Text Book of Blood Banking & Transfusion Medicine by Sally V. Rudmann.
3. Mollison's Blood Transfusion in Clinical Medicine by Klein, Mollison's.
4. Essentials of Blood grouping & Clinical Application by K. P. Ranganathan.
5. Blood Bank Technology by Williams & Williams.
6. Blood Transfusion- A guide to formation & Operation of transfusion devices by C. L. Bowley.

1. Cells, Tissues & their function.
2. Methods of examination of tissue and cells
3. Fixation of tissue.
 - a) Simple fixatives
 - b) Cytological fixatives
 - c) Histochemical fixatives
4. Tissue processing.
 - a) Collection of specimen
 - b) Labeling and fixation
 - c) Dehydration
 - d) Clearing
 - e) Impregnation
 - f) Embedding.
5. Section Cutting.
 - a) Microtomes and microtomes knives
 - b) Techniques of section cutting
 - c) Mounting of sections
 - d) Frozen section.
6. Staining.
 - a) Dyes and their properties
 - b) Basic theory of staining,
 - c) Staining technique with haematoxyline and eosin
 - d) Common special stains.
7. Cytopathology
 - a) Pap staining.
 - b) Fine needle aspiration cytology (FNAC)

Laboratory Managements & Ethics.

1. Care of laboratory glassware, equipment and chemicals.
 - a. General principles.
 - b. Making simple glass wares in the laboratory.
 - c. Laboratory chemicals their proper use and care.
 - d. Proper storage.
 - e. Labeling.
2. Specimen handling.
 - a. General principles
 - b. Collection techniques and containers for specimen.
 - c. Types of specimens.
 - d. Specimen transport.
 - e. Specimen transfer and distribution & reassignment. (Processing)
 - f. Specimen Disposal.
 - g. Specimen preservation.

3. Laboratory Communication
 - a. General principles.
 - b. Inter-departmental communications.
 - c. Public Relations.
 - a) Patients, b) Physicians, c) Nursing staff, d) Sales representatives, e) Other personal.
 - d. Request and Report forms.
4. Laboratory Safety
 - a. General Principals
 - b. First aid.
 - c. Safety measures.
 - i) Mechanical ii) Electrical iii) Chemical iv) Biological v) Radioactive.
5. Material managements.
 - i) Procurement,
 - ii) Identification and correspondence of materials with sources,
 - iii) Inventory control and analysis,
 - iv) Inspection and storage,
 - v) Records & reports,
 - vi) Cast control
 - vii)Purchase and utilization of supplies.
6. Ethics & General Principles.

The project / field work involving visit to at least 10 different institutions / pathology labs. / Hospitals units related to the subjects and critical analysis of these Units should be submitted for diploma course.

Field Work: -Visit to different hospitals and laboratories. i.e. Medical College/Dental college/Sadar Hospital

Reference Books

HISTOTECHNOLOGY.

1. Hand Book of Histopathological and Histochemical Technique C.F.A. Culling
2. Introduction of Medical Labotaroy Technology F.J. Baker and R.E. Silverton.
3. Theory and Practice of Histological Technique. John D. Baneroft and Alan Steven,
4. An Introduction to Histotechnology. Geoffrey G. Brown.,
5. A Manual for Histologic Technician. Aun Preece, J
6. Hand book of MLT by V.H. Talib.
7. Hand book of MLT by R. Sood.
8. Hand book of MLT by Mukherjee.
9. WHO technical manual of Laboratory technology.
10. WHO technical manual of Blood banking transfusion medicine.
11. Todd's Clinical diagnosis of laboratory method.

COURSE OBJECTIVE: On completion of the course the students will be able to

1. Comprehend the parts of a computer and the different operating systems
2. Utilize the MS word for typing letters and text.
3. Effectively use features in MS Word to manipulate text and insert pictures and various fonts.
4. Perform basic mathematical operations in a spreadsheet
5. Prepare and use effectively a Power Point Presentation.
6. Utilize the internet for web searches and e-mail.
7. Appreciate the contribution of HIS to the healthcare industry
8. Describe the uses of the hospital information system

BASIC COMPUTER

- 1) **Introduction to the Computer:** Parts of a Computer I/O devices – memories – RAM and ROM. Networking – LAN, WAN, MAN (only basic ideas)
- 2) **Introduction to Microsoft Word:** Typing text in MS Word, manipulating text, formatting the text & using different font sizes. Bold italics. Using Bullets and numbering, insertion of pictures, & file insertion. Aligning of the text and justify.
- 3) **Introduction to Microsoft Excel:** It is used primarily to enter, edit, format, sort, perform mathematical computations, save, retrieve and print numeric data.
- 4) **Microsoft Power Point:** Preparing new slides using MS-Power – Point. Inserting Slides, Slide transition and animation. Using templates, different text and font sizes. Inserting slides with sounds, inserting clip arts, pictures, tables and graphs. Presentation using wizards.
- 5) **Introduction to the Internet:** Define about the World Wide Web & brief history. Using search engine and beginning Google search – Exploring the next using internet explorer and Navigator - uploading and Download of files and images - E-mail Id creation – sending message – Attaching files in E-mail.
- 6) **Introduction to the Hospital Information System:** Define of Hospital Information system, architecture of a HIS, aim and uses of HIS, Types of HIS Benefits of using a hospital information system.

BASIC OF COMPUTER (Practical's)

1. Introduction of Microsoft Word.

Type a text document, save the document. Align the text with different formats using Microsoft Word. Inserting a table ensuring proper alignment of the table using MS Word.

2. Microsoft Excel.

The generic term for the type of program that allows for entering, analyzing, and calculating data. Arrangement of selected data alphabetically or numerically. Perform basic mathematical operations in a spreadsheet

3. Microsoft Power Point

Preparing a slide show with transition, animation and sound effect using MS-Power Point. Customizing the slide show by inserting pictures and tables in the slides using MS-PowerPoint.

4. Introduction to the Internet.

Create and e-mail account. Use Internet to search for a subject of Internet.

REFERENCES:

1. Murray H., (2003) Teach yourself basic computer skills, Trans Atlantic Publishers.
2. Behnet A. (1996) Computers: Technology, Electronics and Internet, Holy Hall Publishers.
3. Prokosh H. U., Dudeck, J. (1995) Hospital Information System: Design and Development Characteristics, Impact and Future Architecture, Elsevier: St. Louis.



Post Graduate Diploma in Medical Lab Technology

(Duration One Year)

Proposed By

Post-Graduate Department of Zoology

Vinoba Bhave University

Hazaribag