**Dr. Indravadan P. Patel Institute of Medical Technology & Research**

Detailed Syllabus CMLT

COURSE CODE: CMLT- 101 CLINICAL BIOCHEMISTRY

MUST KNOW:

UNIT:1 Introduction & General aspects

* Introduction to Clinical Biochemistry
* Study of weights, volumes and Units, Inter-conversion of units, Measurements, Preparation of solution, Normal range
* Different anticoagulants used in Clinical Biochemistry, its application and Mechanism of action.
* Hazards in the Laboratory.

UNIT:2 Instrumentation

* Automation in Clinical Biochemistry laboratory
* Electrophoresis, Chromatography, Colorimeter, Spectrophotometer, ELISA, RIA, Flame photometer

UNIT:3 General Biochemistry of Carbohydrates

* Classification, Boimedical importance, properties (chemical & physical)
* Carbohydrate Metabolism (In brief) : Glycolysis, TCA, HMP shunt, Regulation of blood sugar, GTT, Diabetes, Glycated Hemoglobin

UNIT:4 General Biochemistry of Proteins

* Amino acids, Peptides, Classification & Properties of Plasma proteins, Immunoglobulins,
* Protein metabolism : Transamination, Deamination, Urea cycle, Phenyl ketonuria, Alkaptonuria.

UNIT:5 General Biochemistry of Lipids

* Lipids: Definition, Classification, Properties, Phospholipids.
* Lipid metabolism : Cholesterol, Lipoproteins, VLDL, LDL, HDL, Atherosclerosis, Ketosis, Lipid Profile

UNIT:6 Nucleic acids

* Nucleotides : Nucleic acids, Functions (In Brief), Purine catabolism, Uric acid: Formation, Estimation, Interpretation, Gout

UNIT:7 Hemoglobin

* Hemoglobin structure, Hbs, Thalassemia
* Hemoglobin : Synthesis (In brief) Porphyrias, Heme breakdown, Bilirubin, Jaundice, Lab. diagnosis

UNIT:8 Enzymes

* Enzymes : Definition, Classification, Factors affecting enzyme activity, Inhibition, Diagnostic use of Enzyme

UNIT:9 Minerals & Vitamins

* Minerals : Calcium, Iron, Phosphorus, Iodine, Sodium & Potasium.
* Vitamins (In brief) : A,D,E, K,B12,Folic acid & Vitamin C (In brief)

UNIT:10 Function Test

* Liver Function tests: Introduction, function of liver, type of investigations carried out, normal range and interpretation of results
* Renal function tests: Functions of kidneys, Various renal function tests including clearance tests and interpretation of results.
* Thyroid function tests: Estimation of T-3, T-4, TSH, Interpretation of results.

Unit 11: Quality Control

* Internal and External QC
* Westguard Rules, QC Charts

NICE TO KNOW:

UNIT:12 Nutrition

* Principles of nutrition, Balance diet, BMR.
* Kwashiorkor and marasmus UNIT:13 Molecular Biology
* Molecular biology (In brief) : Replication, transcription, DNA recombinant technology, Blot techniques, PCR
* pH, Blood buffers, Acid-base balance, Anionic gap

COURSE CODE: CMLT-102 MEDICAL MICROBIOLOGY

MUST KNOW:

UNIT 1: HISTORY & CLASSIFICATION

* History and Pioneers in Microbiology: Contributions of Antony Van Leeuwenhoek, Louis Pasteur, Joseph Lister, Robert Koch (Koch’s Postulates)
* Bacterial Taxonomy: Nomenclature and classification of microbes (in brief)

UNIT 2: MORPHOLOGY

* Microscopy, Stained preparation, Size & Shape
* Morphology of bacteria: Structures of a bacterial cell and their functions
* Physiology of Bacteria: Nutrition, Gaseous requirement, temperature requirement and other growth requirements

UNIT 3: GENERAL MICROBIOLOGY

* Sterilization and disinfection
* Culture media
* Culture methods
* Identification of Bacteria: biochemical tests
* Antibiotic sensitivity testing

UNIT 4: IMMUNOLOGY

* Infection, Immunity, Antigen, Antibody,
* Antigen-Antibody reactions (General features, Precipitation, Agglutination, Complement fixation test, Immunofluorescence, Radio Immunoassay, ELISA),
* Complement system,
* Hypersensitivity

UNIT 5: SYSTEMIC BACTERIOLOGY

Morphology, Cultural characteristics, Antigenic structure, Pathogenicity (in brief) and Laboratory diagnosis of -

* Staphylococcus, Streptococcus, Pneumococcus, Neisseria,
* Corynebacteria, Clostridia,
* Coliforms, Proteus, Salmonella, Shigella,
* Vibrio, Pseudomonas, Haemophillus,
* Mycobacteria, Spirochaetes

UNIT 6: MYCOLOGY

* Morphological Classification of fungi
* Laboratory diagnosis of Fungal Infections

UNIT 7: PARASITOLOGY

Morphology, life cycle, laboratory diagnosis of following parasites:

Protozoa:

* Entamoeba, Giardia, Trichomonas,
* Leishmania, Plasmodium

Helminthology

Cestodes:

* Taenia, Echinococcus

Nematodes:

* Trichuris, Ancylostoma,
* Ascaris, Enterobius, Wuchereria bancrofti(filaria)

UNIT 8: VIROLOGY

* General Properties of Virus: Morphology, Replication & cultivation of viruses
* Disease caused, Laboratory diagnosis & prevention of O Hepatitis viruses

O HIV

UNIT 9: CLINICAL / APPLIED MICROBIOLOGY

* Collection, Transportation & Culture of

O Sputum and other respiratory specimens O Urine O Faeces O Blood

O CSF and other body fluids

* Hospital-acquired infections & Laboratory Hazards
* Disposal of Biomedical waste
* Quality control in Diagnostic Microbiology
* Automation in Diagnostic Microbiology

Course Code: CMLT-103 Clinical Pathology & Blood Banking Unit 1: Clinical Pathology

MUST KNOW

* Urine Examination: Physical, Chemical and Microscopic
* Stool examination : Gross, chemical & microscopic
* CSF Examination
* Semen examination

NICE TO KNOW

* Sex chromatin determination.
* Other body fluids examination
* Quality control in Clinical Pathology

Unit 2: Blood Banking

MUST KNOW

* Immunohematology of red cell and blood group systems
* Apparatus used in blood banking, its care and cleaning
* Record keeping
* Methods of ABO and Rh blood grouping
* Screening of a blood donor, tapping of blood donor
* Cross matching tests
* Storage of blood
* Coomb’s test
* Blood component therapy

NICE TO KNOW

* Antibody titrations
* Blood transfusion reactions
* Quality control in Blood Banking

Course Code: CMLT-104 Hematology & Histopathology Unit 1: Hematology

MUST KNOW

* Venepuncture
* Instruments used in hematology
* Common anticoagulants and their use
* Composition of blood cellular elements, functions of blood
* Estimation of Hemoglobin
* Methods and counting of red blood cells, white blood cells, platelets and reticulocytes.
* Estimation of erythrocyte sedimentation rate, packed cell volume, blood indices
* Preparation of blood films, staining methods and preparation of different stains and diluting fluids
* Study of blood smear examination for red blood cells, different white blood cells, normal and abnormal cells, platelets, and parasites.
* Studies for blood coagulation and haemostasis
* Sickling tests, red cell fragility test and LE cell test. Foetal Hemoglobin Estimation and Hemoglobin electrophoresis.
* Basics of automated Blood Cell counters

NICE TO KNOW

* Quality control in Hematology
* Born Marrow Examination
* Laboratory diagnosis approach on Anemias, Leukemias, and Bleeding disorders.Unit

Unit: 2. Histopathology/Cytology

MUST KNOW

* Introduction to Histology
* Handling Biopsy Specimen
* Instruments in Histopathology
* Fixation & common fixatives
* Tissue processing: dehydration, clearing, embedding, methods of tissue processing: automated & manual, Preparation ob block.
* The manipulation and use of microtomes, Microtom knives and methods of sharpening.
* Paraffin block, section cutting, picking up sections, drying sections,
* Staining : principle of staining, preparation and use of Hematoxyline and eosin stain.
* Mounting,
* Frozen section apparatus: a theoretical knowledge of its application, construction and use.
* Diagnostic Cytology : preparation of smears and Papanicolaou stain.

NICE TO KNOW

* Quality control in Histopathology
* Methods in common use for decalcification
* recognition and correction of faults in section cutting
* .preservation of slides and blocks

List of Practials/skills

1.Pathology:

Students should be able to perform/use:

Haematology :

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| --- | --- |
| 1. | Microscope |
| 2. | Collection of Blood |
| 3. | Vacuettes blood collection tubes |
| 4. | Blood cell counter |
| 5. | Estimation of Hemoglobin |
| 6. | RBC count |
| 7. | PCV & RBC indices |
| 8. | Total WBC count |
| 9. | Differential count |
| 10. | Peripheral smear |
| 11. | Reticulocyte count |
| 12. | ESR |
| 13. | Sickling tests |
| 14. | Bleeding time & Clotting time |
| Clinical Pathology |
| 1. | Urine Exam. R & M |
| 2. | Stool R & M |
| 3. | Semen examination R & M |
| 4. | CSF Exam. R & M |
| Blood Banking |
| 1. | Blood Group |
| 2. | CM Tests |
| 3. | Du Tests |
| 4. | Comb's Tests, |
|  |  |

Histopathology & cytology

Must acquire

1. Preparation of fixatives
2. Haematoxylin and eosin

Nice to acquire:

1. Logging of tissue processing
2. Paraffin embedding
3. Section cutting
4. Staining
5. Mounting
6. Pap Stain.
7. Biochemistry:

Students should be able to perform/use Must acquire

1. Preparation of standard solution, molar solution and other reagents
2. analysis of normal and abnormal urine
3. Estimation of blood /serum glucose by various methods
4. GTT
5. Estimation of total protein and A/G ratio
6. Estimation of total cholesterol and its fractions
7. Estimation of Creatinine
8. Estimation of urea
9. Estimation of uric acid
10. Estimation of Bilirubin , direct , total

Nice to acquire:

1. Estimation of iron and TIBC
2. Chromatography
3. Electrophoresis of plasma proteins
4. Electrophoresis of lipoproteins
5. Estimation of calcium
6. Estimation of phosphorous
7. Estimation of AST
8. Estimation of ALT
9. Estimation of alkaline phosphatase
10. Auto analyzers
11. Electrolyte analyzer
12. Arterial blood gas analyzer
13. Chemiluminance equipment
14. Spectrophotometer
15. Microbiology:

Students should be able to perform:

Bacteriology

Must acquire

1. Aseptic practices in laboratory and safety precautions.
2. Preparation and pouring of media - Nutrient agar, Blood agar, Mac Conkey agar, Sugars, Serum sugars, TSI, Sabouraud dextrose.
3. Operation of autoclave, hot air oven, distillation plant, filters like Sietz and membrane and sterility tests.
4. Washing and sterilization of glassware (Plugging and packing)
5. Disposal of contaminated materials like cultures.
6. Quality control of media, reagents etc.
7. Care and maintenance of common laboratory equipments like water bath, centrifuge, refrigerators, incubators, etc.
8. Performance of antimicrobial suceptibility testing e.g. Kirby-Bauer,
9. Collection of specimens for Microbiological investigations such as Blood, Urine, Pus (Swabs),
10. Identification of Bacteria of Medical Importance upto species level
11. Preparation of stains viz. Gram, Ziehl Neelsen (ZN) etc. and performing of staining.
12. Care and operation of Microscopes viz. Light and Fluorescent microscopes.
13. Preparation, examination, and interpretation of direct smears from clinical specimens, viz. Sputum for AFB: ZN, Slit smears forM. leprae by modified ZN staining,
14. Quantitative analysis of urine by pour plate method and semi-quantitative analysis by standard loop test for finding significant bacteruria.
15. Plating of clinical specimens on media for isolation, purification, identification and quantitation purposes.
16. Methods for the preservation of bacteria, Maintenance of stock cultures.
17. Tests for motility: hanging drop preparation

Nice to acquire:

1. Techniques of anaerobiosis, anaerobic jars, evacuation and filling with CO2 and H2.
2. Preparation of stains viz., capsules, spores etc. and performing of staining.
3. Skin tests like Mantoux.
4. Special tests-Bile solubility, chick cell agglutination, sheep cell haemolysis, niacin and catalase tests for mycobacterium, satellitism, CAMP test, catalase, slide agglutination tests.
5. Culture and Antimicrobial susceptibility tests for mycobacteria.

Immunology

Must acquire :

1. Collection of blood by venipuncture, separation of serum and preservation of serum for short and long periods.
2. Performance of serological tests viz. Widal, VDRL/RPR
3. Enzyme linked immunosorbant assay: HIV, HBsAg, HCV
4. Latex agglutination tests: RA, CRP,
5. Rapid tests (Immunochromatography or Flow through type) HIV .

Nice to acquire:

1. Performance of serological tests viz. Brucella tube agglutination, Weil-Felix, cold agglutination, indirect haemagglutination, Paul-Bunnel, Rose-Waaler, IFA.

Mycology

Must acquire

1. Direct Examination of specimens by KOH, Gram, Kinyoun’s, Giemsa, Lactophenol Cotton Blue stains.

Parasitology:

Must acquire

1. Performance of stains - Leishman, Giemsa.
2. Examination of faeces for parasitic ova and cysts etc. by direct and concentration methods

(Salt flotation and Formol-Ether methods).

1. Examination of blood for protozoa and helminths by wet mount, thin and thick stained

smears.

Nice to acquire:

1. Identification of common arthropods and other vectors viz., Mosquito, sand-fly, Ticks, Mite, Cyclops.
2. Collection of specimens.
3. Preservation of parasites-mounting, fixing, staining, etc.
4. Serodiagnosis of parasitic infection.
* Virology:

Must acquire

* Serological tests - ELISA for HIV, HBsAg, HCV Nice to acquire:
* RPHA for HBsAg, Haemagglutination Inhibition for Influenza, and Haemadsorbtion for parainfluenza.
* Chick Embryo techniques - inoculation and harvesting.

SUGGESTED BOOKS :

1. Dr. Praful B. Godkar,Text Books of Medical Laboratory Technology
2. Anathanarayana & Panikar - A Text Book of Medical Microbiology
3. Monica Cheesbrough, District Laboratory Practice in Tropical countries - PartI & Part II
4. P. Chakraborthy- A Text Book of Microbiology
5. Chatterjee , KD - Parasitology
6. Vasudevan & Shreekumar : Biochemistry for Medical students
7. Dacie, Practical Haematology
8. K.Laxminarayan : Histological techniques
9. Dr. Mukherjee, Medical Laboratory Technology, Volume I , II & II
10. Silvertone : Introduction to Medical Lab. Technology
11. Manual for Clinical Pathology by Sabitry Sanyal

 Harper’s Biochemistry