Syllabus for Licensing Examination of Certificate in Medical Laboratory Technology 2021

Nepal Health Professional Council
Bansbari, Kathmandu

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Subject:Clinical Biochemistry

Unit 1

Colorimeters, Water bath, Incubator, Centrifuges, Balances, and pH meter, Paper chromatography, Electrophoresis, Spectrophotometer, Flame photometer, Semiauto and Auto analyser, Dispensers and Auto-pipettes, Polymerase Chain Reaction (PCR)

Unit 2

Laboratory hazards and precautions. Preparation of Solution and its types. Define acid, base, salt, neutralization, Titration of Acid and bases. Cleaning of glassware. Filters, Monochromometers, Triangle law of light and concept of complimentary colours, Optical density, Bear's & Lambert's law. Common anticoagulants, Preservation of Chemical Reagents and preservatives, Changes occurring in the blood after collection, Store blood and take precautions during blood storage,

Unit 3

Definition, classification and metabolism of biomolecules (carbohydrate, protein and lipid). Blood sugar regulation in the body including hormonal regulations, Diabetes mellitus & abnormalities of metabolism of carbohydrates

Unit 4:

Define, classify and enumerate the properties of enzymes, units of enzyme, (IU & common units), enzyme reaction and enzyme substrate reactions and effects of various factors Plasma proteins and identify the plasma protein abnormalities.

Unit 5:

Principle, procedure, precautions, calibration of graph & normal value in the estimation of samples: Sugar, Urea, Amylase, GPT, GOT, Acid phosphatase, Alkaline phosphatase, calcium, phosphorus, sodium Potassium, chloride, Creatinine, Cholesterol, Triglycerides, HDL, LDL, uric acid, protein, and bilirubin.

Unit 6:

Hormones and tumour markers, Quality Control in biochemistry laboratory.

Subject: Clinical Haematology

Unit 1 Haematopoiesis

The site of blood formation, process of erythropoiesis, leucopoiesis and thrombopoiesis. Physiology and metabolism of the blood cells and its disorders

Unit 2: Red Cell Disorders

Erythrocytic disorder, Haemoglobin, its structure and function, List normal and abnormal haemoglobins, Haemoglobinopathies and thalassemia, polycythaemia. Define and classify anaemia,

Unit 3: White Blood Cell Disorders

Morphological and functional disorders of white blood cells. Leucocytes disorders and leukaemia

Unite 4: Coagulation mechanisms

Process of Coagulation, Coagulation factor and arrest the bleeding. Bleeding time, coagulation time, prothrombin time, activated partial thrombin time , the thrombocytic disorders and bleeding disorder

Unit 5: Haematological Techniques

Haematological instruments, Flow cytometry, Fluorescent and Electron microscopy glassware and chemicals.
Anticoagulant; describe various anticoagulants and state their mechanism of action.
Blood sample collection, Defebrination technique.
Different stain, Blood smear.
Heamatological tests: Total blood cell count, Differential leukocyte count, Erythrocyte sedimentation rate, haemoglobin, packed cell volume (PCV), Blood indices (MCV, MCH, and MCHC), Reticulocyte count and their significance
Stain of Bone marrow smears, Errors and precaution on haematological work Quality control measures.

Subject: Microbiology and Immunology

Unit 1 Clinical Bacteriology

Cell structure, morphological classification of bacteria.
Explain bacterial growth requirements.
Describe the principles of various staining techniques and normal bacterial flora of human body.
Bacterial culture techniques, culture media, controlling microbial growth, sterilization, disinfection and antisepsis.
Various methods for the identification and antimicrobial susceptibility testing of bacteria
Various quality control methods, safety precautions and disposal of contaminated materials in bacteriology laboratory.
Classification, culture characteristic, morphology, identification and antibiotics/ sensitivity of the following common bacteria from clinical samples.

Unit 2 Clinical Mycology

Morphological Classification of medically important fungi.
Describe briefly superficial/cutaneous, systemic mycosis and aetiological agents.
Describe the collection techniques of various clinical samples for the diagnosis of fungal infection (skin/nail/hair sample, corneal scraping, sputum and biopsy materials).
Describe fungal culture media (SDA, RSA, DTM)

Unit 3 Clinical Virology

Multiplication process of viruses
Common and emerging viral diseases.
Basic laboratory procedure used in the diagnosis of viral diseases.
Clean and sterilize glassware used in virology laboratory.
Perform Giemsa staining for viral inclusion bodies.
Prepare samples for virus culture/investigation.
Demonstration of ELISA and Western blot for the diagnosis of HIV infection.
Prepare media for transporting virus culture and its storage.

Unit 4 Immunology (27 Hours)

Immunity, antigen/ hapten, antibody.
Innate and acquired defence mechanism.
Classification of antigen antibody reactions
Describe vaccine. List out the common vaccine against vaccine preventable diseases in Nepal.
Perform intradermal skin test (Mantoux Test), VDRL, ASO titre, RA factor, CRP, Widal and Brucella agglutination Test

Subject: Histopathology and Cytology Techniques

Unit 1 Histopathology

Fixatives and preservatives
Prepare simple and compound fixatives (10% formalin, 10% normal saline and Zenker's fluid).
Define principle of basic histological stain: Hematoxylin and Eosin, PAS, Alcian Blue, Ziehl-Neelsen and Congo Red stains.
Histokinette and its principle.
Principle of processing of histopathological tissues (fixation, dehydration, clearing, embedding, trimming and labelling).
Types of microtomes including cryostat, and cut the sections of desired thickness.
Types of microtome knives and sharpening procedures.
Decalcification of bone and different types of decalcifying agents.
Mounting media (DPX, glycerine).
Maintain record and prepare the charts of investigation.

Unit 2 Cytological Procedures

Collect various types of cytological specimens (sputum, urine, effusion fluids, and tissue fluids)
Principle and techniques of sample processing: Uniform smear, thick and thin smear, fishfail smear.
Smear preparation of cytological specimens (sputum, urine, effusion fluids, and various body fluids).
FNAC, Stain: Papanicolaou stain. Giemsa stain Aceto-orcein stain.
Sex chromatin detection and semen analysis.

Subject: Anatomy and physiology

Important anatomical terminologies
The composition and function of blood
The structure and functions of alimentary canal, digestive system, circulatory system, endocrine system, urinary system & respiratory system

Subject: Clinical Parasitology

Unit 1: Protozoa

Pathogenesis and laboratory diagnosis of:

Entamoeba histolytica and E. coli, E. hartmanni, Endolimax nana Iodamoeba buetschlii, Giardia lamblia, Trichcmonas vaginalis and T. hominis, Leishmania: (L. donovari, L. tropica, L. mexicana and L. braziliensis) Plasmodium: (P. vivax, P. ovale, P. falciparum, P. malariae), Toxoplasma gondii. Cryptosporidium parvum, Cyclospora cayetanensis, Isospora belli, Balantidium coli

Unit 2: Helminths

Nematodes

Pathogenesis and laboratory diagnosis of:

Hookworm: Necator americanus and Ancylostoma duodenale, Ascaris lumbricoidea, Enterobius vermicularis , Trichuris trichiura , Strongyloides stercoralis, Microfilaria: Wuchereria bancrofti, Brugia malayi, and Loa loa.

Cestodes (Tape worms)

Pathogenesis and laboratory diagnosis of:
Taenia solium and Taenia saginata, Echinococcus granulosus and Hymenolepis nana.

Trematodes (Flukes, intestinal, hepatic, pulmonary and blood)

Pathogenesis and laboratory diagnosis of:

Fasciola hepatica, Faciolopsis buski, Paragonimus westermani , Schistosoma haematobium, S. mansoni, and S. japanicum

Unit 4: Laboratory techniques

Procedure for clinical specimens collection for parasitic investigations (stool, urine, blood, sputum, exudates, swabs and aspirates).
Preparation of reagents required for routine diagnostic purposes (, iodine solution, brine solution, 33% zinc sulphate solution, normal saline solution, Stooll's reagent, Giemsa and Leishman's stain and benzidine solution).
Various laboratory technique:

a) Feacel (stool) examination: physical, chemical-reducing substances and occult blood, and microscopic.
b) Blood examination by wet and stained smears preparation for blood parasites.
c) Urine, sputum examination for urinary and respiratory tract parasites.
d) Various concentration methods (floatation and sedimentation) to detect the blood and intestinal parasites.

Unit 5: Explain the collection, preservation and transportation of urine.

Method of examination of urine samples: physical, chemical and microscopic.
Urine albumin, sugar, bile salt, urobilinogen, porphobilinogen, chyle and Benze-John's protein.
Cerebrospinal fluid (CSF); constituents, normal reference values, method of sample collection and examination (CSF protein, sugar cells and microorganisms.
Body fluids: transudets and exudets, normal reference value, method of sample collection and examination (body fluid protein, sugar and cells and microorganisms.

Subject: Instrumentation and Automation

Unit: 1

Describe types of automatic analyzers:

a) Continuous flow systems
b) Discrete analyzers
c) Centrifugal analyzers
d) Thin film analyzers
e) Automated electrolyte analyzers

Unit: 2

Describe: the use of blood cell analyzers, use ELISA reader and washer, blood gas and acid-base analytical systems.
Explain the main features of automated blood gas analysers. Laboratory computer aids, photometric system used in peripheral laboratory, essential features of centrifugal analysers , maintenance of laboratory instruments, laboratory management with reference to placing of instruments and bio-safety zones

Subject: Blood Bank

Describe the scope, importance and principle of blood banking.
Describe blood grouping system and various blood groups.
Explain blood donors and preparation of blood donors.
State the principle and procedures of the proper storage of blood.
Describe the various method for compatible blood for recipient and understand the risk of incompatible blood,
Identify antiserum, blood bags and transfusion sets of delivery of safe blood for transfusion
Describe principal, procedure and precaution on

a) ABO and Rh. blood grouping
b) Cross-matching
c) Direct and indirect Coomb's tests.
d) Anti-d antibody titration.
e) Screening of blood bags

Describe transfusion reaction and counter check blood transfusion reaction
Describe the erythroblastosis foetalis.

Subject: Basic Pathology

Unit 1: Introduction to General Pathology

Understanding of Pathology, Field of pathology, Importance of Pathology, Scope and method , Application of in Laboratory investigation in Pathology diagnosis

Unit 2: Basics of cell injury

Introduction , Types and its causes , Common terminology used in cell injury, Clinical diagnosis and laboratory interpretation

Unit 3: Infection and inflammation

Causative organisms and its types in infection and inflammation.
Terminology used in Benign clinical interpretation (Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Necrosis, Apoptosis, Hypoxia, Ischemia, Oedema, exudates and transudates etc.
Laboratory investigation and interpretation
Immunological investigation

Unit 4: Neoplasia

Introduction , Benign and malignant tumours , Terminology used in Malignant clinical interpretation (carcinoma, sarcoma, lymphoma, dysgerminoma, etc) Laboratory investigation and interpretation Application of Immunological investigations , Essential Histo and cytochemical investigations , Introduction of tumour marker.