LEARNING LAB

laboratory medicine

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Learning Lab for Laboratory Medicine is an adaptive e-learning product for preparation for certification, competency assessment, and continuing medical education. This program has been endorsed by the International Federation of Clinical Chemistry and Laboratory Medicine and honored by the prestigious Comenius EduMedia Award for excellence in Continuing Professional Education. The Learning Lab is now available in two versions: Advanced, and for Medical Laboratory Scientists (MLS). The program is sectioned into the following seven major pillars in Laboratory Medicine*.

1 GENERAL LAB MEDICINE

Covers principles in laboratory medicine, such as safety, management, leadership, statistics and machine learning.

2 CLINICAL CHEMISTRY

Covers principles in laboratory medicine, analytical techniques and instrumentation, pathophysiology of various organ systems and the corresponding analytes.

3 LABORATORY GENOMICS

Covers principles of molecular biology, nucleic acid techniques and applications, pharmacogenetics, forensic testing, molecular tumor markers, monogenic and polygenic basis for common and rare diseases.

4 TRANSFUSION MEDICINE

Covers testing in the blood bank, transfusion service techniques, indications for transfusion, blood products and modifications, adverse events associated with transfusion of blood products, and transfusion reactions.

5 HEMATOLOGY AND COAGULATION

Covers analytical techniques and instrumentation, hematopoiesis, iron metabolism (including hemoglobin and anemia), red and white blood cell disorders, platelet disorders, porphyrins and porphyrias, hematologic neoplastic disorders, hemostasis and coagulation.

6 MICROBIOLOGY

Covers microbes (bacteriology, mycobacteriology, virology, mycology, parasitology, prions) and associated infectious diseases, anti-infectives, antiparasites, infection control, and diagnostics as well as infection control and disease surveillance.

7 CLINICAL IMMUNOLOGY

Covers primary immunodeficiencies, allergic diseases, organ-specific and systemic auto-immune diseases, and monoclonal gammopathies.

*A listing of the curricula of the six sections is included in the Appendix.

WITH OVER 120 ADVANCED COURSES SPANNING ACROSS ALL DISCIPLINES OF LABORATORY MEDICINE THUS BECOMING THE *DE FACTO* BACKBONE OF ALL TRAINING PROGRAMS AND THE MAIN SOURCE FOR PROVIDING CONTINUING EDUCATION CREDITS IN THE FIELD.

UNIQUENESS OF LEARNING LAB

OUR HISTORY

Learning Lab was the result of a collaborative effort between NEJM Group, the most trusted and respected name in medical science, AACC, a recognized leader in laboratory medicine, and Area9, a global leader in education technology.

ADAPTIVE LEARNING

Learning Lab utilizes adaptive learning. Through a series of questions while timing the learner and asking about the level of confidence in the answer, sophisticated algorithms identify the areas in which the learner is not proficient and provides targeted learning materials.

MICRO LEARNING

Learning Lab enables learning in small blocks of time since most professionals are not always able to find the time needed to read long review articles.

MOBILE

Learning Lab enables learning wherever you are as the program can be accessed on mobile devices.

PEER COMPARISON

Learning Lab allows the learners to monitor their progress and provides comparison to peer groups.

LIFE-LONG LEARNING

Learning Lab is a life-long learning companion.

WHAT IS A COURSE?

Courses for all sections are based on curricula that are used by experienced and board-certified professionals from the various disciplines in laboratory medicine. Each course consists of three separate components: learning objectives, probes, and learning resources.

LEARNING OBJECTIVES

Learning objectives are granular and utilize Bloom's taxonomy. They range in complexity from *describe* or *define* to *deduce* and *analyze.* Each course contains 100-150 learning objectives to cover the topic of interest.

PROBES

There are nine different types of questions to choose from including multiple choice, fill in the blank, matching, and a clinical case. Morphologies, chromatograms, tables, electrophoretic patterns and other images can be used in these questions. There are at least two questions for each learning objective. Based on continuous analyses of how learners are responding, more depth will be developed.

LEARNING RESOURCES

Learning resources provide explanation for the answer in the form of a video, image, pathway, text (possibly read by a professional reader) and they also include a reference to support the explanation. There is at least one learning resource for each learning objective. Based on continuous analyses of how learners are responding, more depth will be developed where appropriate.

NADER RIFAI, PHD

PROFESSOR OF PATHOLOGY,
HARVARD MEDICAL SCHOOL
CO-EDITOR, LEARNING LAB

CHRISTINA ELLERVIK, MD, PHD

ADJUNCT PROFESSOR, UNIVERSITY OF
COPENHAGEN, DENMARK

FACULTY

THE PROGRAM IS CREATED UNDER THE EDITORSHIP
OF NADER RIFAI AND CHRISTINA ELLERVIK

Each section has one to three editors. Currently, over 130 practicing professionals, primarily from academia, from the US, UK, Canada, Iceland, Denmark, Norway, Australia, Croatia, Italy, South Africa, Singapore, Turkey and China are participating in this project.

CREATION OF A COURSE

After the identification of an author by one of the editors and a 45 minute phone call with Nader Rifai to explain the program and the vision, the following steps take place:

1 OUTLINE

Author develops a detailed outline of the course for review by editors.

2 TRAINING

Author is trained on the platform and the writing style.

3 MONITORING

Author's progress is monitored by the Area9 editorial specialist and editors. Approximately 15 one-hour conferences usually take place during the development of a course.

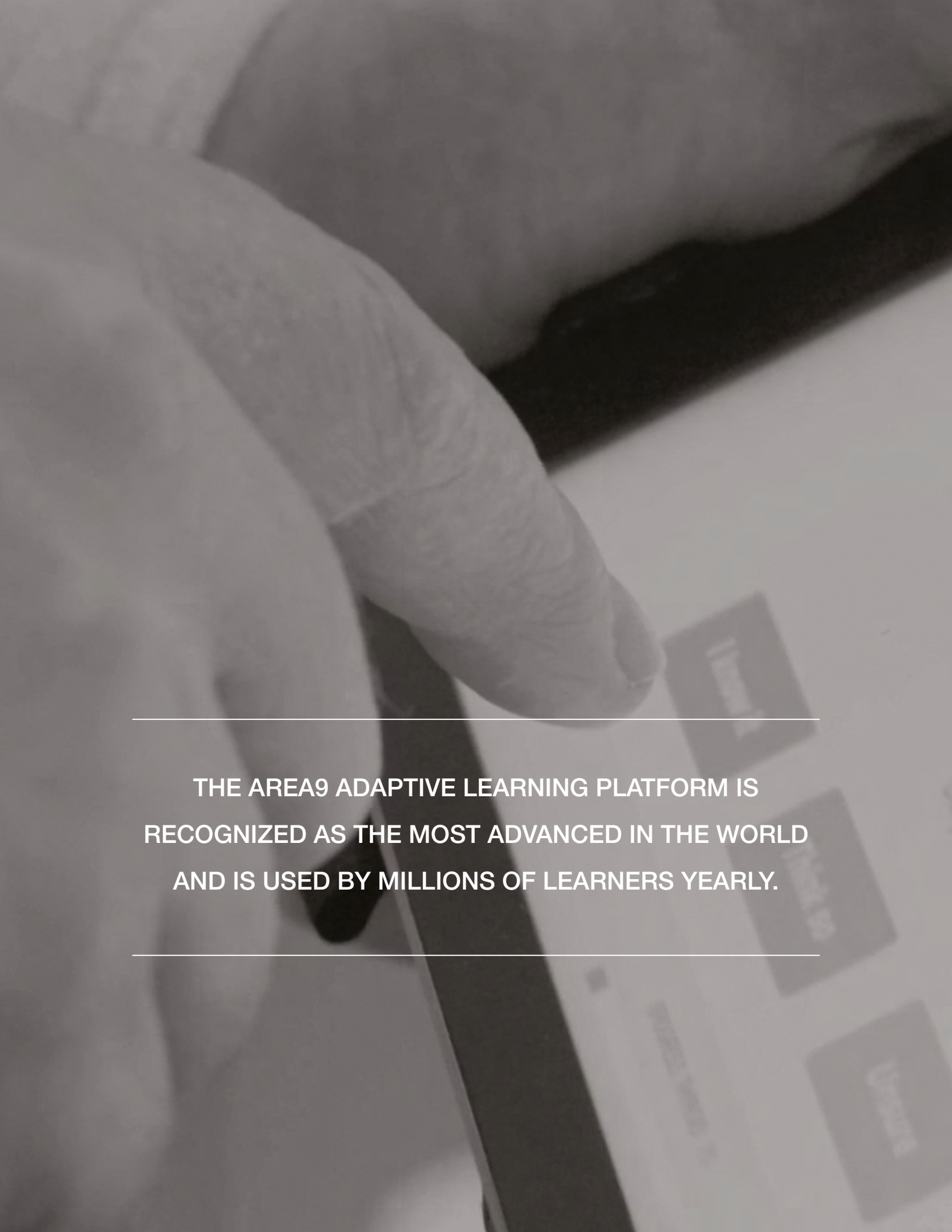
4 REVIEW

When the course is completed, it is reviewed by the Area9 editorial specialist, the editors involved, and an expert reviewer.

5 BETA TESTING

After the author responds to the reviewers' comments, the course undergoes beta testing by 3-5 individuals.

It takes about 300 hours to complete a course (4-6 months) by an author. The review process takes approximately 2 months.



THE AREA9 ADAPTIVE LEARNING PLATFORM IS RECOGNIZED AS THE MOST ADVANCED IN THE WORLD AND IS USED BY MILLIONS OF LEARNERS YEARLY.

UTILITY OF LEARNING LAB

THE LEARNING LAB WAS BUILT WITH TWO MAJOR GOALS:

- **To be used by all laboratory medicine professionals**

- **To be used by laboratory medicine professionals in the three entities:**
  - Hospital labs
  - Commercial labs
  - IVD industry

THIS PROGRAM IS USEFUL IN:

- **Preparing for certification exams**

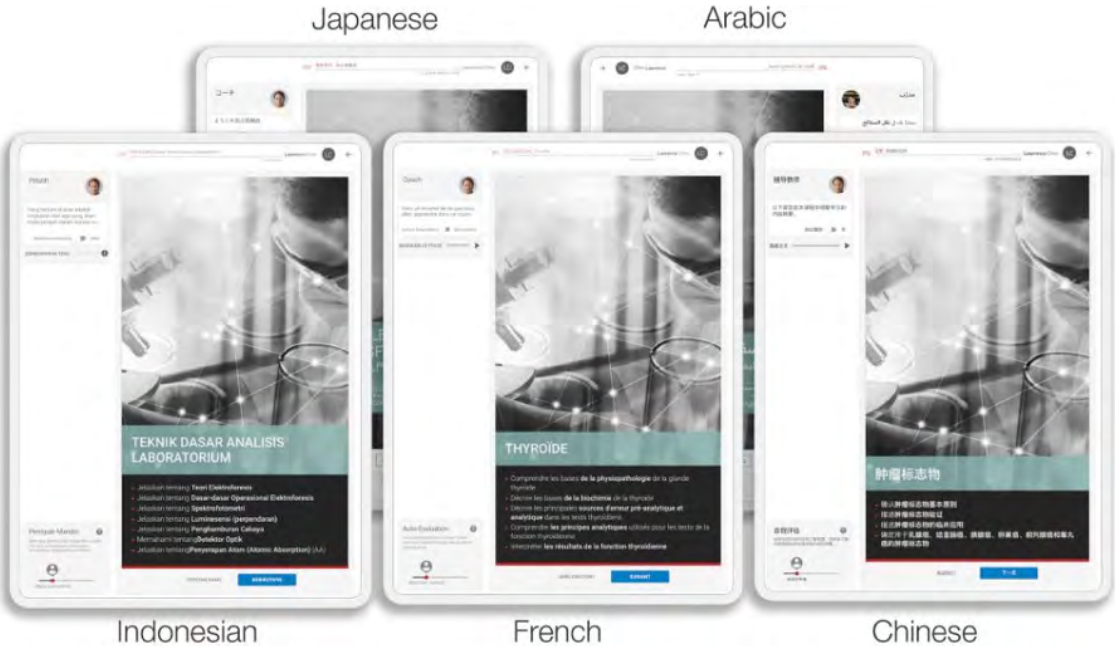
- **Assessing competency on a personal and institutional level**
  Employers will find the program not only useful in teaching their employees various aspects of laboratory medicine, but also in providing them with an assessment of their employees' knowledge level and competency.

- **Staying current in an ever expanding and fast moving field**

- **Providing a life-long learning companion**

LEARNING LAB COMMUNITY

Our community is growing continuously. More than 11,500 users (July 2023) from 145 countries already registered and benefit from an adaptive learning method that allows to retain knowledge over time and achieve faster and higher quality learning progression.



In addition to the English version the Learning Lab for Laboratory Medicine is also available, in part, in Chinese (simplified & traditional), Bahasa Indonesia, and French. Moreover, other translations like Arabic, Japanese, Spanish and Portuguese are in progress.

ADVANCED COURSES:
GENERAL LABORATORY MEDICINE COURSES
Biochemical Calculations
Biological and Pre-Analytical Variability
Laboratory Automation
Laboratory Safety
Point of Care Testing
Quality Control of the Examination Process
Statistics I: Method Evaluation
Statistics I: Applications
Machine Learning

CLINICAL CHEMISTRY COURSES
Adrenal Cortex
Basic Enzymology
Basic Laboratory Analytical Techniques
Body Fluids
Bone and Mineral Metabolism
Cardiac I: Anatomy/Physiology
Cardiac II: Biomarkers of Acute Coronary Syndrome
Cardiac III: Biomarkers of Heart Failure
Catecholamines and Serotonin I: Basics
Catecholamines and Serotonin II: Analytical and Clinical Aspects
Chromatography
Clinical Toxicology I: Drugs of Abuse
Clinical Toxicology I: Analgesics
Clinical Toxicology III: Alcohols
Diabetes Mellitus
Disorders of Water, Electrolyte and Acid-Base Metabolism
Exocrine Pancreas
Immunochemical Techniques
Inborn Errors of Metabolism I
Inborn Errors of Metabolism II
Kidney Function
Lipids and Lipoproteins I: Basic Biochemistry
Lipids and Lipoproteins II: Assays
Lipids and Lipoproteins III: Clinical applications
Liver Disease
Mass Spectrometry
Metals: Trace and Toxic

Nutrition
Pituitary Function and Pathophysiology
Pregnancy and its Disorders
Protein Electrophoresis
Proteins I: Basic Concepts
Proteins I: Clinical and Analytical Issues
Reproductive Endocrinology
Serum Enzvmes
Therapeutic Drugs Management I
Therapeutic Drugs Management II
Thyroid
Tumor Markers
Vitamin D
Vitamins

LABORATORY GENOMICS COURSES
Cell-Free DNA in Prenatal Screening
Concepts of Mendelian Inherited Disorder
Cytogenomics
Foundational Molecular Biology
Genomes and Variants
Hereditary Arrhythmias
Hereditary Cardiomyopathies
Hereditary Hearing Loss
Hereditary Neurodegenerative Disorders
Hereditary Neuronal and Muscular Disorders
Hereditary Renal Disorders
Inherited Cancers I: Mechanisms and Genetic Instability Syndromes
Inherited Cancers II: Dominant Inheritance Models of Cancer Syndormes
Lymphoid and Histiocytic Genetics
Mitochondrial Genetics
Myeloid Genetics
Non-Mendelian Disorders
Nucleic Acid Isolation
Nucleic Acid Techniques
Pharmacogenetics
Sequencing based Techniques
Solid Tumor Genomics

TRANSFUSION MEDICINE COURSES
Acute Transfusion Reactions
Blood Groups and Pre-Transfusion Testing
Delayed Transfusion Reactions
Hemolytic Disease of the Fetus and Newborn
Massive Transfusions
Plasma Products and Derivatives
Platelet Transfusion
Red Blood Cell Transfusion
Testing for Blood Donors
Therapeutic Apheresis

HEMATOLOGY AND COAGULATION COURSES
Automated Hematology
Bone Marrow Morphology
Flow Cytometry
Lymph Node Pathology
Mature T-Cell and NK-Cell Neoplasms
Myeloproliferative, Myelodysplastic, and Hybrid Syndromes
Peripheral Blood Morphology
Porphyrias
Thrombosis I: Routine Hemostasis Testing
Thrombosis II: Thrombophilia
Thrombosis IV: Normal Hemostasis

CLINICAL MICROBIOLOGY COURSES
Antifungals
Bacterial Diagnostics I
Bacterial Infections
Biosafety
Coronavirus Disease 2019 (COVID-19)
Fungal Diagnostics
Fungal Infections
Fungi
Infection Surveillance
Infectious Syndromes
Microbiology Specimens

Mycobacterial Diagnostics
Mycobacterial Infections and Antimycobacterials
Parasites
Parasitic Diagnostics
Parasitic Infections and Antiparasitics
Viral Diagnostics
Viral Infections and Antivirals
Viruses

CLINICAL IMMUNOLOGY COURSES
Central and Peripheral Nervous System Autoimmunity
Introduction to Autoimmunity
Autoimmune Endocrinopathies

MLS COURSES:

GENERAL LABORATORY MEDICINE COURSES
Biochemical Calculations
Biological and Pre-Analytical Variability
Laboratory Automation
Laboratory Safety
Point of Care Testing
Quality Control of the Examination Process
Statistics I: Method Evaluation
Statistics I: Applications
Machine Learning

CLINICAL CHEMISTRY COURSES
Adrenal Cortex
Basic Enzymology
Basic Laboratory Analytical Techniques
Body Fluids
Bone and Mineral Metabolism
Cardiac I: Anatomy/Physiology
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Cardiac III: Biomarkers of Heart Failure
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Catecholamines and Serotonin II: Analytical and Clinical Aspects

Chromatography
Clinical Toxicology I: Drugs of Abuse
Clinical Toxicology I: Analgesics
Clinical Toxicology III: Alcohols
Diabetes Mellitus
Disorders of Water, Electrolyte and Acid Base- Metabolism
Exocrine Pancreas
Immunochemical Techniques
Inborn Errors of Metabolism I
Inborn Errors of Metabolism II
Kidney Function
Lipids and Lipoproteins I: Basic Biochemistry
Lipids and Lipoproteins I: Assays
Lipids and Lipoproteins III: Clinical applications
Liver Disease
Mass Spectrometry
Metals: Trace and Toxic
Pituitary Function and Pathophysiology
Pregnancy and its Disorders
Protein Electrophoresis
Proteins I: Basic Concepts
Proteins I: Clinical and Analytical Issues
Reproductive Endocrinology
Serum Enzymes
Therapeutic Drugs Management I
Therapeutic Drugs Management II
Thyroid
Tumor Markers
Vitamins

LABORATORY GENOMICS COURSES
Cell-Free DNA in Prenatal Screening
Concepts of Mendelian Inherited Disorders
Cytogenomics
Foundational Molecular Biology
Genomes and Variants
Hereditary Hearing Loss
Non-Mendelian Disorders
Nucleic Acid Isolation
Nucleic Acid Techniques

Pharmacogenetics
Sequencing based Techniques
Solid Tumor Genomics

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Acute Transfusion Reactions
Blood Groups and Pre-Transfusion Testing
Delayed Transfusion Reactions
Hemolytic Disease of the Fetus and Newborn
Massive Transfusions
Plasma Products and Derivatives
Platelet Transfusion
Red Blood Cell Transfusion
Testing for Blood Donors
Therapeutic Apheresis

CLINICAL MICROBIOLOGY COURSES
Bacterial Diagnostics I
Bacterial Infections
Fungal Diagnostics
Fungi
Microbiology Specimens
Mycobacterial Diagnostics
Parasites
Parasitic Diagnostics
Viral Diagnostics
Viral Infections and Antivirals
Viruses

CLINICAL IMMUNOLOGY COURSES
Autoimmune Endocrinopathies
Central and Peripheral Nervous System Autoimmunity
Introduction to Autoimmunity

HEMATOLOGY AND COAGULATION COURSES
Automated Hematology
Bone Marrow Morphology
Flow Cytometry
Myeloproliferative, Myelodysplastic, and Hybrid Syndromes
Peripheral Blood Morphology
Porphyrias
Thrombosis I: Routine Hemostasis Testing
Thrombosis II: Thrombophilia
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