SCHOOL OF MEDICAL LABORATORY SCIENCE

STUDENT CATALOG

Comanche County Memorial Hospital

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LAWTON, OKLAHOMA

www.ccmhmlsschool.org

STUDENT CATALOG

Revised September 2025

Approved by:

Stacey Paryag-Stevens, MPA, AHI(AMT), MLS(ASCP)^{CM}

Program Director

ACCREDITED BY:

National Accrediting Agency for Clinical Laboratory Sciences
5600 N. River Rd., Suite 720
Rosemont, IL 60018-5119
847.939.3597 / 773.714.8880 (PHONE)
773.714.8886 (FAX)
www.naacls.org

Stacey Paryag-Stevens, MPA, AHI(AMT), MLS(ASCP)^{CM}

Program Director

CCMH School of Medical Technology

Laboratory Department

P.O. Box 129

3401 West Gore Blvd

Lawton, OK 73502

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www.ccmhmlsschool.org

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ABOUT US

Comanche County Memorial Hospital School of Medical Laboratory Science is one of the only three hospital-based MLS programs in the state of Oklahoma. It is a hospital-based program located in the laboratory of Comanche County Memorial Hospital (CCMH) in Lawton, Oklahoma accepting 3+1 and 4+1 students.

The school has been in existence since the hospital was built in 1951. The program director and most of the laboratory supervisors and staff are graduates of this program. Graduates from this program also staff the other hospitals in Lawton/Fort Sill. Although there are a number of students completing a portion of their education in this institution, the MLS School is the only educational program based in the hospital with staff and faculty employed by the hospital. All the other educational programs are university or vocational school based.

CCMH MLS School is committed to providing an effective and comprehensive educational program for Medical Laboratory Science students to produce well-educated Medical Laboratory personnel for Comanche County Memorial Hospital and Southwest Oklahoma as well.

The goals of CCMH MLS School are to:

1. Educate competent Medical Laboratory Scientists with the knowledge and skills necessary to demonstrate entry-level proficiency in all areas of the laboratory and to possess basic management skills, knowledge of educational methodology, hospital and laboratory information systems, and research methods.

2. Educate competent Medical Laboratory Scientists with the knowledge and skills necessary to perform all pre-analytical, analytical, and post analytical procedures in accordance with standard operating procedures, quality assurance protocols, regulatory and accreditation standards.

3. Attain the program outcomes on a 3-year average of:

    a) At least 75% certification pass rate within first year of graduation

    b) At least 70% graduation rate

    c) At least 70% job placement rate.

The objective of the Comanche County Memorial Hospital School of Medical Laboratory Science is to provide our students with the following career entry competencies:

1. To collect, process and determine the acceptability of biological specimens for analysis.
2. To perform analysis on body fluids, cells and chemical elements.
3. To maintain and operate laboratory instruments and equipment.
4. To use good judgment regarding the reporting of laboratory determinations.
5. To establish and perform quality control procedure to assure the reliability of all test results.
6. To practice laboratory safety, so as not to endanger one's self, coworkers or patients.
7. To keep accurate records.
8. To communicate with physicians, patients, and other members of the health care team.
9. To be familiar with management responsibilities.
10. To teach medical laboratory procedures and be knowledgeable of educational methodology.
11. To actively participate in continuing education programs.
12. To maintain a professional and caring attitude toward patients, families, and other members of the health care team.
13. To peruse published articles and make informed decisions relevant to their scope of study.

The Comanche County Memorial Hospital School of Medical Laboratory Science is the only accredited program in Southwest Oklahoma by the National Accrediting Agency of Clinical Laboratory Sciences (NAACLS). NAACLS granted re-accreditation to CCMH MLS School March 2017 for 10 years, which will be valid until 2027 for fulfilling all requirements after review of paper and site inspection in 2016.

National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)
5600 N. River Rd. Suite 720, Rosemont, IL 60018-5119
773.714.8880 (PHONE) 773.714.8886 (FAX)
www.naacls.org

Discrimination in the School of Medical Laboratory Science based on race, creed, color, national origin, sex, age or handicap is not tolerated.

Pursue a Career in Medical Laboratory Science

WWW.MLSGO.ORG

Clinical Educational Training in:

- Chemistry
- Hematology
- Immunology
- Blood Bank
- Microbiology
- Genetics
- Lab Operations

Medical Laboratory Science Group of Oklahoma

The MLSGO is a group of representatives from accredited hospitals and affiliated universities that are involved in medical laboratory science education. The MLSGO promotes the advancement of knowledge in the field and prepares capable individuals for a career in clinical laboratories as a medical laboratory scientist.

Medical laboratory scientists are vital health care detectives that perform laboratory testing on patient samples. They uncover and provide laboratory information from analyses that assist physicians in patient diagnosis, treatment, and disease monitoring/prevention. Sophisticated biomedical instrumentation and technology, computers, microscopes, and methods requiring manual dexterity are used to perform laboratory testing on blood and body fluids. A few duties include operating computerized instruments, identifying abnormal cells, assuring safe transfusion of blood products, culturing and identifying bacteria and viruses, and correlating test results with patient's condition. A variety of disciplines within the profession keeps the field exciting and interesting.

Earn 30 Hours of College Credit!

Job Prospects/Earning Potential for a Medical Laboratory Scientist:

Currently, there is a shortage in many parts of the U.S. meaning greater job security and employment at higher salaries for graduates. According to results of the 2023 American Society for Clinical Pathology (ASCP) Wage Survey of Medical Laboratories in the United States, the base salary for staff level medical laboratory scientists averages $30.96/hour in Oklahoma and $35.75/hour nationally (Am J Clin Pathol https://doi.org/10.1093/AJCP/AQAE130). Salaries are subject to change based on years of experience and geographic location. Salaries are higher for those who become supervisors, managers or lab directors.

Contact an MLSGO member for more information:

NAACLS ACCREDITED HOSPITAL PROGRAMS

- Comanche County Memorial Hospital
  3401 West Gore Boulevard
  Lawton, OK 73505
  Phone: 580-704-7650
  Program Director:
  Stacey Paryag-Stevens MPA, AHI(AMT), MLS(ASCP)CM
  Email: Stacey.Paryag@ccmhhealth.com

- Mercy Hospital Ada
  430 North Monte Vista
  Ada, OK 74820
  Phone: 580-272-1625 or 580-421-1596
  Program Director: Leah Babcock, MS, MT(ASCP)
  Email: leah.babcock@mercy.net

- Mercy Clinical Affiliate: Mercy Hospital Ardmore
  1011 14th Avenue N.W.
  Ardmore, OK 73401
  Phone: 580-220-6063
  Clinical Liaison: Kari Butler, MLS(AMT)
  Email: kari.butler@mercy.net

- Mercy Clinical Affiliate: Mercy Hospital Oklahoma City
  4300 W. Memorial Rd.
  Oklahoma City, 73120
  Phone: 405-936-5769
  Clinical Liaison: Jolee Bence, MT(ASCP), MBA
  Email: Jolee.bence@mercy.net

- Saint Francis Health System
  6161 South Yale Avenue
  Tulsa, OK 74136
  Phone: 918-494-6342
  Program Director: Nate Harden, MS, MLS(ASCP)^{CM}
  Email: ndharden@saintfrancis.com

- NAACLS INFORMATION
  5600 North River Road Suite 720
  Rosemont, IL 60018-5119
  (847)939-3597 (773)714-8880
  (773)714-8886(fax)
  Website: www.naacls.org
  Email: info@naacls.org

UNIVERSITIES

- Cameron University: Lawton, OK
  Advisor: Michael Husak, Ph.D.
  Email: michaelh@cameron.edu

- East Central University: Ada, OK
  Advisor: April Nesbit, Ph.D.
  Email: anesbit@ecok.edu

- Midwestern State University: Wichita Falls, TX
  Advisor: James Masuoka, Ph. D.
  Email: james.masuoka@msutexas.edu

- Northeastern State University: Broken Arrow, OK
  Advisor: Dianne Kirk, Ph.D., MLS(ASCP)H., MB
  Email: kirk01@nsuok.edu

- Oklahoma State University: Stillwater, OK
  Advisor: Brooke Equinox, Ph.D.
  Email: brooke.equinox@okstate.edu
  Regents Professor: Tyrrell Conway, PhD
  Email: tconway@okstate.edu

- Southwestern Oklahoma State University: Weatherford, OK
  Advisor: Eric Paul, Ph.D.
  Email: eric.paul@swosu.edu

- University of Central Oklahoma: Edmond, OK
  Advisor: Caroline Bentley, Ph.D.
  Email: cbentley3@uco.edu

- University of North Texas: Denton, TX
  Advisor: Lisa Welch, Ph.D.
  Email: Lisa.Welch@unt.edu

Educational Requirements of a Medical Laboratory Scientist:

1. Completion of a National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) accredited program.
2. B.S. degree in medical laboratory science/medical technology or related science.
3. Certification by the Board of Certification (BOC) of the American Society for Clinical Pathology (ASCP) or equivalent.

DESCRIPTION OF THE MEDICAL LABORATORY SCIENTIST PROFESSION

The medical laboratory scientist is qualified by academic and applied science education to provide service and research in clinical laboratory science and related areas in rapidly changing and dynamic healthcare delivery systems. Medical laboratory scientists perform, develop, evaluate, correlate and assure accuracy and validity of laboratory information; direct and supervise clinical laboratory resources and operations; and collaborate in the diagnosis and treatment of patients. The medical laboratory scientist has diverse and multi-level functions in the principles, methodologies and performance of assays; problem-solving; troubleshooting techniques; interpretation and evaluation of clinical procedures and results; statistical approaches to data evaluation; principles and practices of quality assurance/quality improvement; and continuous assessment of laboratory services for all major areas practiced in the contemporary clinical laboratory.

Medical laboratory scientists possess the skills necessary for financial, operations, marketing, and human resource management of the clinical laboratory.

Medical laboratory scientists practice independently and collaboratively, being responsible for their own actions, as defined by the profession. They have the requisite knowledge and skills to educate laboratory professionals, other health care professionals, and others in laboratory practice as well as the public.

The ability to relate to people, a capacity for calm and reasoned judgment and a demonstration of commitment to the patient are essential qualities. Communication skills extend to consultative interactions with members of the healthcare team, external relations, customer service and patient education.

Medical laboratory scientists demonstrate ethical and moral attitudes and principles that are necessary for gaining and maintaining the confidence of patients, professional associates, and the community.

(Adopted from *NAACLS Standards for Accredited and Approved Programs*, a*dopted 2012, revised 9/2013*)

DESCRIPTION OF ENTRY LEVEL COMPETENCIES OF THE MEDICAL LABORATORY SCIENTIST

At entry level, the medical laboratory scientist will possess the entry level competencies necessary to perform the full range of clinical laboratory tests in areas of Clinical Chemistry, Hematology/Hemostasis, Immunology, Immunohematology/Transfusion medicine, Microbiology, Urine and Body Fluid Analysis and Laboratory Operations, and other emerging diagnostics, and will play a role in the development and evaluation of test systems and interpretive algorithms.

The medical laboratory scientist will have diverse responsibilities in areas of analysis and clinical decision-making, regulatory compliance with applicable regulations, education, and quality assurance/performance improvement wherever laboratory testing is researched, developed or performed.

At entry level, the medical laboratory scientist will have the following basic knowledge and skills in:

1. Application of safety and governmental regulations and standards as applied to clinical laboratory science;
2. Principles and practices of professional conduct and the significance of continuing professional development;
3. Communications sufficient to serve the needs of patients, the public and members of the health care team;
4. Principles and practices of administration and supervision as applied to clinical laboratory science;
5. Educational methodologies and terminology sufficient to train/educate users and providers of laboratory services;
6. Principles and practices of clinical study design, implementation and dissemination of results.

(Adopted from *NAACLS Standards for Accredited and Approved Programs*, a*dopted 2012, revised 9/2013*)

Medical Laboratory Science Group of Oklahoma (MLSGO)

PROCEDURE: **APPLICATION AND ADMISSION PROCESS**
EFFECTIVE DATE: **11/10**
REVISION DATE: **9/13, 6/15, 10/15, 10/16, 7/17, 7/19, 10/19, 11/22, 7/25**
REVIEW DATE: **10/14**

PURPOSE

To provide a standardized, systematic process in applying for admission to a NAACLS-accredited, hospital-based, medical laboratory science program in Oklahoma.

The Medical Laboratory Science Group of Oklahoma (MLSGO) supports the student application procedure for admission to an affiliated medical laboratory science program.

POLICY

Oklahoma Hospital-Based Medical Laboratory Science Programs
MLS Programs include:

- Comanche County Memorial Hospital in Lawton, Oklahoma
- Mercy Hospital in Ada, Oklahoma (clinical affiliates in Ardmore and Oklahoma City, Oklahoma)
- Saint Francis Health System in Tulsa, Oklahoma

Applicant Types
Applicant must meet one of the following two requirements:

- 3+1 Option: applicant must be a baccalaureate candidate at an affiliated university. Applicant must have completed all prerequisite courses required by the university/college and the MLS program.

- 4+1 Option (post baccalaureate candidate): applicant must have a bachelor degree prior to program entry and have completed all of the prerequisite courses required by the MLS program.

Note: 3+1 = 3 years of college + 1 year Medical Laboratory Science (MLS) program.
Note: 4+1 = Baccalaureate Degree + 1 year Medical Laboratory Science (MLS) program.

Prerequisite Courses
Prerequisite courses include:

- Biological Sciences (minimum of 16 credit hours)
  - Microbiology (Bacteriology)*
  - Immunology*
  - Physiology or Anatomy
  - Biological Sciences Elective

- Chemistry (minimum of 16 credit hours)
  - General Chemistry (2 courses)
  - Organic Chemistry
  - Biochemistry*

- Mathematics (minimum of 3 hours)
  - College Level Math or Statistics or Higher

Applicant must complete all program prerequisite courses at the university with a C or better prior to entrance into the program. Any grade below a C in the prerequisite courses will need to be retaken prior to entry. If another class is used as a substitute in one or more prerequisite courses, applicant must receive a C or better in that course.

*Microbiology, Immunology, and Biochemistry must be completed within seven years of the application deadline. If more than seven years have passed, applicant must retake those individual classes and pass with a C or better.

Grades
Student transcripts are evaluated using the 4.00 grading scale.

<u>Cumulative GPA</u>
Applicant must have a minimum 2.50 cumulative GPA*. Cumulative GPA will be obtained from the transcript of the university granting the degree.

> *Comanche County Memorial Hospital will only grant interviews to students with a minimum cumulative GPA of 2.80 on a 4.00 scale.

<u>Science GPA</u>
Applicant must have a minimum 2.50 GPA in biology and chemistry courses. Science GPA will be calculated by the program director and will include all attempts of biology and chemistry courses by the applicant, excluding withdraws. If applicant repeats a course, both the original grade and repeated grade will be included in the GPA calculation.

Foreign Transcripts
Applicants who possess a foreign baccalaureate degree are highly encouraged to apply using the 3+1 option; those that apply using the 4+1 option are to have their transcript evaluated by an ASCP-approved agency.

Application Process

- Applicant will consult with university advisor to discuss coursework, program options, and interviewing strategies.
- Applicant will submit the application by the established deadline.
- Applicant will submit all accompanying documents to complete the application file; applicant should contact MLS program director for required program-specific documents.
- Program director will contact applicant to schedule an interview once application file is complete.
- Applicant placement will follow the MLSGO matching process.
- Applicant will consult with university advisor regarding course enrollment.
- Applicant will consult with program director regarding expenses (books, uniforms, professional liability insurance, and national certification exam).

Application Deadline

- Applications shall be submitted by the October 15th deadline.
- **Late applications will not be considered for that year's class unless there are positions available after the matching process has occurred.**
- Program director will grant an interview only to those applicants who have met or will meet the academic requirements as well as those that complete the application by October 15th.

Application Instructions

- Visit www.mlsgo.org
- Click Student; Apply Now; Application Form; Begin.
- Complete and submit the online application form.
- Pay the application fee through PayPal **before closing the browser.**
- Follow the instructions to complete the background check at www.castlebranch.com

Academic References

- Two academic references are required. Applicants should use an individual that knows the applicant very well and can speak to their abilities in the classroom and/or laboratory. Applicants should use an instructor or professor that has firsthand knowledge of academic and/or laboratory performance.
- Applicants will complete the online waiver by going to https://students.mlsgo.org/evaluation
- Applicants will need to complete the waiver section twice, one for each professor.
- Applicants will provide the name and email address of the professor being asked to complete the online *Student Academic Evaluation Form.*
- Professors will automatically receive an email with a link to complete the online recommendation form once the waiver has been submitted. Nothing needs to be printed.
- Professors will submit the online recommendation form.
- Program directors receive an email notification once each waiver has been submitted and another email notification once the professor has completed the online recommendation form.

Application File

A completed application file includes:

- Submitted application with fee
- Official transcript(s) from all universities/colleges attended
- Two completed *Academic Reference* forms
- Employer reference (if applicable)
- Online background check report performed by www.castlebranch.com
- Program-specific documents (contact program director for more information)

Matching Process

MLSGO utilizes a matching program for placing applicants, which is similar to the system used by the National Intern and Resident Matching Program for medical students. After the applicant completes all interviews, the applicant will rank each hospital they wish to attend in order of preference using an online matching form. Matching form submissions will only be viewed on the day of the matching meeting. Hospital programs will provide an acceptance list on the day of the matching meeting, which lists candidates in order of preference for their medical laboratory science class. Applicants will be placed at their highest-ranked hospital program that has the applicant on its acceptance list. When multiple hospital programs have the same applicant on their acceptance lists, the applicant's preference is used to decide the match. No program is required to accept any applicant, nor is any applicant required to accept a position within any program. Applicants not matched in the process will receive notification of their status from the matching chairman no later than February 7th. If notification is not received, the applicant may obtain their acceptance status by writing to: MLSGO; P.O. Box 115; Ada, OK 74820

Matching Instructions

- Applicant will visit the website: www.students.mlsgo.org
- Enter the same email address used on the application.
- Rank in order of preference the hospital program of choice.
- If applicants wish to change original decisions, the matching form may be resubmitted. The most recent submission will be used.
- Applicants will be notified of their acceptance by the matched hospital program director.
- In order to confirm acceptance into a program, the applicant must submit documented acceptance to that particular program by March 1st.
- Matched applicants will submit a $50 refundable deposit through *PayPal* to MLSGO in order to secure a position in that program. Deposits will be refunded two weeks after the program start date to those that fulfill the acceptance commitment. Applicants who do not fulfill the acceptance commitment will not receive this refund, per discretion of the program director.
- Applicant will submit notification of acceptance or declination to the program director by March 1st. All 3+1 and 4+1 applicants who have been matched to a program will submit a $50 refundable deposit through PayPal to MLSGO to secure a position in that program. Deposits will be refunded two weeks after the program start date. Applicants who do not fulfill the acceptance commitment will not receive this refund, per discretion of the program director.

Final Acceptance

Final acceptance is contingent upon successful completion of:

- All university coursework for classes prior to entrance into the program
- Passing the background check performed by www.castlebranch.com
- Safety requirements of the individual program if applicable (i.e., physical examination, program-specific background check, urine drug screen, TB skin test, and proof of immunizations)

REVIEWED BY:

Medical Laboratory Science Group of Oklahoma (MLSGO), formerly:
Oklahoma Consortium of Clinical Laboratory Science Affiliates

Comanche County Memorial Hospital
SCHOOL OF
Medical Laboratory Science

ADMISSION REQUIREMENTS

- *Official Transcripts*
- *Science GPA Computation*
- *Student Online Application with photo*
- *2 Professor Online Evaluations*
- *1 Work/Personal Reference*
- *Online Matching Procedure*

Mail or digitally submit your Official Transcripts to:

Stacey Paryag-Stevens, MPA, AHI(AMT), MLS(ASCP)^{CM} , Program Director
Comanche County Memorial Hospital
School of Medical Laboratory Science,
Laboratory Department
P.O. Box 129
3401 West Gore Blvd
Lawton, OK 73502

stacey.paryag@ccmhhealth.com

Join our Team!

……

We Do It Well

Comanche County Memorial Hospital
SCHOOL OF
Medical Laboratory Science

COURSE LIST & SCIENCE GPA COMPUTATION

I HAVE ALREADY TAKEN THESE **REQUIRED SCIENCE & MATH COURSES** FOR MY MEDICAL LABORATORY SCIENCE (MLS) DEGREE:

MAJOR COURSES	CR	GRADE	QP	MAJOR COURSES	CR	GRADE	QP

TOTAL CREDITS: _____ TOTAL QUALITY POINTS: _____

SCIENCE GPA: _____ (record on page 1 of application form)

I HAVE ALREADY TAKEN THESE REQUIRED GENERAL COURSES FOR MY MLS DEGREE:

GENERAL COURSES & CREDITS	GRADE	GENERAL COURSES & CREDITS	GRADE

I AM CURRENTLY ENROLLED IN THESE COURSES IN **FALL** _____:

	COURSE NAME & CREDITS		COURSE NAME & CREDITS		COURSE NAME & CREDITS
1		4		7	
2		5		8	
3		6		9	

I INTEND TO ENROLL IN THESE COURSES IN **SPRING** _____:

	COURSE NAME & CREDITS		COURSE NAME & CREDITS		COURSE NAME & CREDITS
1		4		7	
2		5		8	
3		6		9	

I INTEND TO ENROLL IN THESE COURSES IN **SUMMER** _____:

	COURSE NAME & CREDITS		COURSE NAME & CREDITS		COURSE NAME & CREDITS
1		4		7	
2		5		8	
3		6		9	

_____

NAME OF STUDENT

_____

SIGNATURE

_____

DATE

PLEASE SUBMIT YOUR OFFICIAL TRANSCRIPT OF GRADES. PHOTOCOPIES ARE UNACCEPTABLE.

MEDICAL LABORATORY SCIENCE PROGRAM

October 15th Deadline

- **Go to www.mlsgo.org.**
- **Click students; Apply; Application Portal.**
- **Complete and submit the Application Form.**
  - Follow the instructions to complete the background check.
    Pay the application fee through PayPal before closing the browser.
  - Complete the reference form twice to have two instructors complete an Online academic evaluation.
- **Send official transcript(s) from all universities/colleges attended to each program.**
- **Mail an employer reference letter (optional) to each program.**

MLSGO hospital programs are accredited by:
National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)
NAACLS 5600 North River Road Suite 720 | Rosemont | IL 60018-5119
Phone: (847)939-3597 | (773)714-8880 | Fax: 773.714.8886
Website: www.naacls.org | Email: info@naacls.org

Mercy

SaintFrancis Health System

Comanche County Memorial Hospital

CastleBranch

Oklahoma Consortium of Clinical Laboratory Science Affiliates

How to Place Order

Welcome to myCB

To place your order go to:

https://portal.castlebranch.com/OK02

Package Name (if applicable):

PLACE ORDER → SELECT PROGRAM → SELECT PACKAGE

To place your initial order, you will be prompted to create your secure myCB account. From within myCB, you will be able to:

- View order results
- Upload documents
- Manage requirements
- Place additional orders
- Complete tasks

Please have ready personal identifying information needed for security purposes.

The email address you provide will become your username.

Contact Us: **888.914.7279** or **servicedesk.cu@castlebranch.com**

Comanche County Memorial Hospital
SCHOOL OF
Medical Laboratory Science

STUDENT WORK RECOMMENDATION FORM

NAME OF STUDENT (Please print name in full): _____

I. **PERSONAL APPRAISAL**

A. How long have you known this applicant? ( ) less than 1 year ( ) 2-3 years ( ) 3 or more years

In what capacity? ( ) Manager ( ) Supervisor

B. **Write a letter of recommendation** on applicant with content of **at least five (5)** characteristic guidelines listed below in comparison to other workers in your department/firm.

Letter of Recommendation Guidelines

- **Punctuality:** Ability to meet scheduled times
- **Organization:** Extent to which applicant effectively plans and manages work and time
- **Quality of Work:** Level of completeness, accuracy
- **Complies with rules/regulations:** Ability to follow rules
- **Ability to work under pressure:** Multitasking and adaptability to stress
- **Responsibility:** Willingness to take on/assume responsibility
- **Reaction to constructive criticism:** Acceptance and action
- **Team Skills:** Ability to work collaboratively with others
- **Empathy:** Sensitive to the needs of others
- **Initiative:** Self-starter
- **Motivation:** Depth of commitment to performing well at work
- **Need for Supervision:** Level of ability to work alone

C. Overall recommendation of applicant to the MT program:

_____ Highly Recommended _____ Recommended with Reservations

_____ Recommended _____ Not Recommended

NAME: _____ TITLE: _____

SIGNATURE: _____ DATE: _____

COMPANY: _____

PERMISSION TO RELEASE PERSONALLY IDENTIFIABLE AND/OR
WAIVER OF RIGHT TO INSPECT OR REVIEW CONFIDENTIAL LETTER OF RECOMMENDATION
(FAMILY EDUCATION RIGHTS AND PRIVACY ACT OF 1974, AS AMENDED)

I, _____, ( ) do ( ) do not hereby waive and renounce all right of access, including those established by the Family Education Rights and Privacy Act of 1974, to any letter or letters of reference or confidential letters of recommendation to be hereafter written in my behalf by:

_____ (Name of person asked to write recommendation)

Furthermore, I grant the above named person permission to release specific and personally identifiable information about me from my educational record in order that he/she may fulfill my request to write a letter of recommendation. He/she may release to the party or parties named below:

( ) any such information he/she may release, or
( ) only the information listed on the reverse side.

The above named person may also release the information verbally to the party or parties listed below.

This waiver is not operative and becomes null and void if at any time said letter or letters of reference or confidential recommendations are used for any purpose other than these which are specifically intended. My specific intention is:

( ) respecting admission to an educational agency or institution
( ) other (specify): _____

_____

Such a letter of reference of confidential recommendations with this form is to be sent to: Program Director, School of Medical Laboratory Science indicated below:

_____ Comanche County Memorial Hospital Lab; Stacey Paryag-Stevens, MPA, AHI(AMT), MLS(ASCP)^{CM}; Program Director; 3401 West Gore Boulevard, Lawton, OK 73505; Phone: (580) 704-7650 Fax: (580) 585-5462 Email: stacey.paryag@ccmhhealth.com

_____
Signature of Waiving Party (Applicant)

_____
Date

Comanche County Memorial Hospital
SCHOOL OF
Medical Laboratory Science

ESSENTIAL FUNCTIONS FOR MEDICAL LABORATORY SCIENCE STUDENTS

Revised: 01/2024

Essential Observational Functions

- Observe laboratory demonstrations in which biological materials are tested for their biochemical, hematological, immunological, microbiological components.
- Characterize the color, odor, clarity, and viscosity of biologicals, reagents, or chemical reaction products.
- Employ a clinical grade binocular microscope to discriminate among fine structural and color differences of microscopic specimens.
- Read and comprehend text, numbers and graphs displayed in print and on a video monitor.

Essential Movement Functions

- Move freely and safely about the laboratory.
- Reach laboratory bench tops and shelves, and patients seated in specimen collection furniture.
- Perform moderately taxing continuous physical work, often requiring prolonged sitting over several hours.
- Maneuver phlebotomy and culture acquisition equipment to safely collect valid laboratory specimens from patients.
- Control laboratory equipment (i.e. pipettes, inoculating loops, test tubes) and adjust instruments to perform laboratory procedure.
- Employ an electronic keyboard to operate laboratory instruments and to calculate, record, evaluate and transmit laboratory information.

Essential Communication Functions

- Read and comprehend technical and professional materials (i.e. textbooks, journals, handbooks and instruction manuals).
- Follow verbal and written instructions in order to correctly and independently perform laboratory test procedures.
- Clearly instruct patients prior to specimen collection.
- Effectively, confidentially, and sensitively converse with patients regarding laboratory tests.
- Communicate with faculty members, fellow students, staff and other health care professionals verbally and in a recorded format.
- Independently prepares laboratory reports, and takes paper, computer and laboratory examinations.

Essential Behavioral Functions

- Manage the use of time and be able to systematize actions in order to complete professional and technical tasks within realistic constraints.
- Possess the emotional health necessary to effectively employ intellect and exercise appropriate judgment.
- Provide professional and technical services while experiencing the stresses of task-related uncertainty (i.e. ambiguous test ordering, ambivalent test interpretation), emergent demands (i.e. "stat" test orders) and distracting environment (i.e. high noise levels, crowding, complex visual stimuli).
- Be flexible and creative and adapt to professional and technical change.
- Recognize potentially hazardous materials, equipment and situations and practice safety in order to minimize risk of injury to patients, self and nearby individuals.
- Adapt to working with unpleasant biologicals.
- Support and promote the activities of fellow students and of health care professionals. Promotion of peers helps furnish a team approach to learning, task completion, problem solving and patient care.
- Be honest, compassionate, ethical and responsible. The student must be forthright about errors or uncertainty. The student must be able to look for ways to improve. The student must be able to evaluate the performance of fellow students and tactfully offer constructive comments.

ATTENTION ALL APPLICANTS

Please read the essential functions carefully, complete the statement below, and return this form to Comanche County Memorial Hospital School of Medical Laboratory Science, 3401 W. Gore Boulevard, Lawton, OK 73505.

I, _____, attest that I have read and understand the essential functions of the CCMH Medical Laboratory Science Program, and I believe that I can perform these essential functions with or without accommodations.

_____

Student's Signature & Date

MLSGO
Matching Procedure

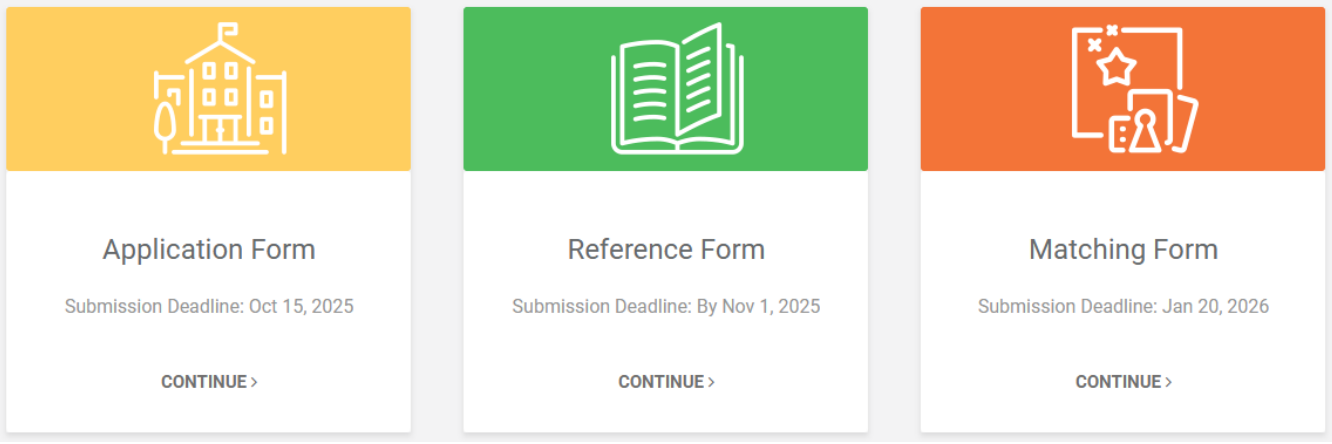
Website: www.students.mlsgo.org

Matching Form Submission Deadline: January 20

Matching Meeting Date: Last Friday in January

Process Overview
The Medical Laboratory Science Group of Oklahoma (MLSGO) utilizes a matching program for placing applicants, which is similar to the system used by the National Intern and Resident Matching Program for medical students. After the applicant completes all interviews, the applicant will rank each hospital they wish to attend in order of preference using an online matching form. Matching form submissions will only be viewed on the day of the matching meeting. Hospital programs will provide an acceptance list on the day of the matching meeting, which lists candidates in order of preference for their medical laboratory science class. Applicants will be placed at their highest-ranked hospital program that has the applicant on its acceptance list. When multiple hospital programs have the same applicant on their acceptance lists, the applicant's preference is used to decide the match. No program is required to accept any applicant, nor is any applicant required to accept a position within any program. Applicants not matched in the process will receive notification of their status from the matching chairman no later than February 7th. If notification is not received, the applicant may obtain their acceptance status by writing to: MLSGO; P.O. Box 115; Ada, OK 74820

Applicant Instructions
1. Visit website: www.students.mlsgo.org
2. Enter the same email address used on the application.
3. Rank in order of preference the hospital program of choice.
4. If applicants wish to change original decisions, resubmit the matching form. The most recent submission will be used.
5. Applicants will be notified of their acceptance by the matched hospital program director.
6. In order to confirm acceptance into a program, the applicant must submit documented acceptance to that particular program by March 1st.
7. Matched applicants will submit a $50 refundable deposit through *PayPal* to MLSGO in order to secure a position in that program. Deposits will be refunded two weeks after the program start date to those that fulfill the acceptance commitment. Applicants who do not fulfill the acceptance commitment will not receive this refund, per discretion of the program director.



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3+1 STUDENT VERSUS 4+1 STUDENT

3+1 Option

- Baccalaureate Candidate (3 years of college + 1 year medical technology program internship)
- Tuition is paid to university
- Student will be enrolled in university
- Grades from MLS School will be applied to College transcript (30 semester hours)
- Student will have to file for graduation to university
- Bachelor's degree in Medical Technology will be awarded after successful completion of internship year from respective university

4+1 Option

- Post Baccalaureate Candidate (Baccalaureate degree + 1 year medical technology program internship)
- Tuition is paid to hospital. Please contact program director for more information.
- Student will not be enrolled in university
- Grades from MLS School will not be applied to College transcript
- Student already has a Science bachelor's degree

ALL Applicants must complete all prerequisite classes before the start of the MLS program.

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Medical Laboratory Science Group of Oklahoma
MLSGO

Rev 2015

CURRICULUM

4117 CLINICAL MICROBIOLOGY

4117 CLINICAL MICROBIOLOGY **7 Semester Hours**

Lecture and supervised laboratory instruction in pathogenic bacteria, fungi, parasites, viruses, and antimicrobial testing, with emphasis on clinical decisions and medical significance. Includes quality control, computer applications, instrumentation, quality assurance/improvement, safety and governmental regulations.

COARSE GOALS

This course is designed to provide knowledge and skills in order to:

- Identify pathogenic microorganisms, parasites, fungi
- Assess the quality of patient clinical specimens
- Process patient and plate clinical specimens
- Perform and interpret a gram stain from a patient clinical specimen or culture medium
- Differentiate clinically significant microorganisms from normal flora of various body sites/specimen types using a variety of media and methodology
- Identify clinically significant microorganisms using rapid, commercial and conventional methods
- Perform and interpret antibiotic susceptibility testing on clinically significant microorganisms using appropriate methods and antibiotics
- Correlate microbiology results with disease states and conditions in order to assist in the diagnosis and treatment of patients
- Successfully perform antibiotic susceptibility testing on microorganisms

DIDACTIC COURSE

MICROBIOLOGY

Outline

I. Sterilization/Disinfection/Staining/Media
II. collection and Handling of Specimens
III. Identification of Aerobic Microorganisms
IV. Gram Negative Cocci
V. Gram Negative Rods
VI. Oxidase Positive, Non-fermented Gram Negative Rods
VII. Gram Negative Coccobacillary Facultative Bacteria and Gram Positive Rods
VIII. Identification of Anaerobic Microorganisms
IX. Mycobacteria
X. Miscellaneous and Unclassified Pathogens, Viruses, and Antimicrobial Susceptibility Testing
XI. Infection and Quality Control
XII. Microbiology Math Computation

Learning Objectives

Upon completion, the student should be able to:

1. Explain the common staining methods used in microbiology, principles of the different stains, and characteristic stain properties of microorganisms.
2. Discuss the major types of media, examples of each media, and organisms expected to grow on specific types of media.
3. List the types of specimens collected for microbial, fungal or viral cultures, media used for each specimen, and pathogens and non-pathogens that could be isolated.
4. Compare and contrast gram-positive cocci, gram-negative cocci, gram-negative rods, and gram-positive rods by media used for growth, identification (morphology/biochemical reactions), pathogenicity, and antibiotic susceptibility testing.
5. Distinguish anaerobic organisms based on culture media, identification techniques (morphology/biochemical), pathogenicity, and treatment.
6. Differentiate mycobacterium based on culture media, identification techniques (morphology/biochemical), pathogenicity, and treatment.
7. List the common viruses isolated at Saint Francis Hospital, culture media (i.e., different cell lines), identification methods (morphology/biochemical), pathogenicity, and treatment.
8. Discuss the different susceptibility test methods.
9. Evaluate microbial, fungal, and viral cultures data, and associate findings with the appropriate disease or condition.
10. Define the importance of quality control, infection control, and causes of nosocomial infections.

MYCOLOGY

Outline

I. Aerobic Actinomycetes
II. Pathogenic Yeasts
III. Systemic fungi
IV. Hyaline mould
V. Dematiaceous mould
VI. Subcutaneous and Cutaneous fungi

Learning Objectives

Upon completion, the student should be able to:

1. Define mycology terminology.
2. List characteristics of fungi and types of diseases caused by fungi.
3. Compare and contrast three types of mycoses or fungal infections.
4. Evaluate septate and aseptate hyphae and different forms of vegetative hyphae.
5. Differentiate sporangium, cleistothecium, perithecium, pycnidium, and spherule.
6. Discuss specimen collection, processing, and types of media used for fungal cultures.
7. Compare and contrast characteristics of the following (etiology, manifestation, specimen collection, isolation, mode of transmission, and microscopic or macroscopic morphology):

    a. Nocardia
    b. Streptomyces
    c. Actinomyces
    d. Candida
    e. Cryptococcus
    f. Saccharomyces
    g. Pichia
    h. Malassezia
    i. Geotrichosis
    j. Trichosporon

8. Define dimorphic yeast and systemic mycosis.
9. Distinguish the features of both the mould and yeast forms of the following, including clinical significance:

    a. Blastomyces dermatitidis
    b. Histoplasma capsulatum
    c. Coccidioides immitis
    d. Sporothrix schenckii
    e. Paracoccidioides braziliensis

f. Beauveria species
g. Chrysosporium species
h. Malbranchea species
i. Sepedonium species
j. Chlamydospore former

10. Discuss safety precautions when working with fungi.
11. Compare and contrast the hyaline and dematiaceous moulds.
12. Outline dermatophyte genera.
13. Interpret dermatophytes from slides.
14. Differentiate Microsporum, Trichophyton, and Epidermophyton by appropriate laboratory test(s).

PARASITOLOGY

Outline

I. Basic Biology and Epidemiology of Human Parasites
II. Specimen Collection and Processing
III. Diagnostic Procedures
IV. Visual Recognition of Parasites Found in Various Body Fluids
V. Protozoa
VI. Nematodes
VII. Cestodes
VIII. Trematodes
IX. Arthropods

Learning Objectives

At the end of this course, students should be able to:

1. Describe the proper specimen collection and processing scheme
2. Compare the properties and uses of preservatives used in Parasitology
3. Discuss diagnostic procedures and explain proper use and limitations of each:
4. Calibrate an ocular micrometer and determine the sizes of objects in a microscopic field.
5. Evaluate laboratory data and justify findings with the following:

a. disease characteristics
b. human host location
c. infective and diagnostic stage
d. organism morphology
e. transmission vector
f. geographic distribution
g. results of special diagnostic tests (if any)

CLINICAL ROTATION – MICROBIOLOGY

Psychomotor Objectives

At the completion of the clinical rotation, the student will:

1. Identify Preexamination, examination, and post-examination components that may affect laboratory testing.
2. Identify specimens for bacteriological testing according to Microbiology Operating Procedure Manuals.
    a. Type (source)
    b. Transport media
    c. Storage temperature
    d. Labels and requisitions
    e. Sample quantity
3. Perform specimen accessioning according to laboratory policy.
4. Adhere to safety procedures according to OSHA and laboratory policy.
5. Comply with HIPAA (confidentiality) established guidelines.
6. Organize workload in an efficient manner (i.e., STATs, ASAPs, routines) according to laboratory policy.
7. List the media used to culture the following specimens for aerobes, anaerobes, and fungi according to laboratory policy.
    a. Abscess
    b. Blood and Bone Marrow
    c. Body Fluid
    d. Bone
    e. Cerebrospinal Fluid
    f. Ear (inner/outer)
    g. Eye
    h. Foreign Object (i.e., IUD, IV catheter, prosthetic valves)
    i. Genital Tract (i.e., cervical, vagina, prostate, urethra)
    j. GI Tract (i.e., gastric aspirate or biopsy, stool, rectal swab, ova and parasite)
    k. Hair, Nail, or Skin Scraping (fungal cultures)
    l. Respiratory Tract (i.e., sputum, bronchial washing, nasal and throat swab)
    m. Tissue
    n. Urine
8. Select the type of media and discuss temperature requirements for culturing
9. Differentiate the type of media according to manufacturer's guidelines.
10. Name the pathogenic and non-pathogenic organisms isolated from specimens according to laboratory policy.

11. With the aid of reference materials, describe the typical colony morphology of the following pathogens and non-pathogens isolated, including size, shape, pigment, hemolysis, and ability to grow:
    a. Staphylococcus
    b. Streptococcus
    c. Klebsiella
    d. Proteus
    e. Candida
    f. E. coli
    g. Haemophilus
    h. Pseudomonas
12. Explain the principle of enzyme based and metabolic based lab tests according to manufacturer's guidelines and laboratory policy.
13. With the aid of reference materials, discuss the phenotypic criteria used to identify organisms:
    a. Macroscopic (colony) morphology
    b. Microscopic morphology and staining characteristics (Gram stain)
    c. Nutritional requirements and metabolic capabilities
    d. Environmental growth requirements
    e. Antibiotic susceptibility testing
14. According to manufacturer's guidelines, describe biochemical reactions using the Rb system for listed organisms:
    a. Escherichia coli
    b. Enterobacter aerogenes
    c. Enterobacter cloacae
    d. Klebsiella pneumoniae
    e. Klebsiella oxytoca
    f. Citrobacter freundii
    g. Citrobacter koseri (diversus)
    h. Proteus mirabilis
    i. Proteus vulgaris
    j. Morganella morganii
    k. Serratia marcescens
    l. Salmonella species
    m. Shigella species
    n. Hafnia alvei
15. Perform and interpret the biochemical tests and immunological studies used to identify aerobic and anaerobic organisms with 100% accuracy.
16. Isolate anaerobes from specimens and identify by Gram stain, morphology, and biochemical test with acceptable accuracy.
17. With the use of reference materials, identify yeast and fungi by morphology, environmental requirements, and biochemical tests.

18. Perform and interpret antibiotic sensitivity studies, matching the interpretation of the technologist.
19. Prepare and read specimens for parasite and fungi examinations, matching the interpretation of the technologist.
20. Demonstrate ability to read bacteriological cultures and identify organisms with 100% accuracy.
21. Verify and report results with 100% accuracy.
22. Make stool for polys smears and evaluate and report findings with 100% accuracy.
23. Process, culture, and identify acid-fast bacteria organisms according to laboratory policy under the supervision of a technologist.
24. Troubleshoot problems with supervision or with the use of reference material (i.e., interference substances, instrument malfunctions, and patient critical values).
25. Evaluate an unknown specimen and report findings, matching the interpretation of the technologist.

Affective Behavior Objectives

Upon completion of the rotation in this department, the student shall demonstrate a professional attitude by the following behaviors:

1. Exhibits confidence in abilities, consistent with present level of experience.
2. Recognizes limitations and asks for guidance and/or assistance when necessary.
3. Admits mistakes readily, takes steps to correct them, does not rationalize or blame others for the mistakes, and learns from them.
4. Presents neat, clean appearance and complies with hospital and departmental dress code, including ID badges.
5. Exhibits a working knowledge and acceptance of hospital and laboratory policies (patient right to privacy).
6. Maintains considerate, caring, and friendly attitude toward patients, co-workers, health professionals, and visitors.
7. Expresses oneself effectively in written, verbal, and/or non-verbal communication.
8. Listens to and follows directions in a positive manner.
9. Demonstrates willingness and the ability to work effectively with others.
10. Accepts suggestions to improve performance and modifies behavior accordingly.
11. Demonstrates consistently the ability to produce quality work with acceptable accuracy.
12. Organizes work for maximum efficiency and priority (ex: STAT, ASAP).
13. Confirms identity of patient and/or specimen and is able to determine if specimen is acceptable for analysis.
14. Verifies abnormal results before reporting and is aware of normal results.
15. Reports test results on patients accurately and legibly onto workcards and/or worklists.
16. Utilizes computer properly to order tests, enter results, and obtain information.
17. Demonstrates the ability to read and understand written procedures by following printed instructions.
18. Transfers information and/or work experience from one situation to another (ex: lecture to lab, dept to dept, procedure to procedure).

19. Retains information and/or knows where to look for the information if forgotten (ex. results, procedures, supplies).
20. Arrives on time to the department at the beginning of the shift, and returns promptly from lunch, breaks, and class.
21. Notifies technologist when leaving for lunch, break, class, or other activity.
22. Follows standard of attendance, notifies the department in case of absence or tardiness.
23. Utilizes time effectively when work is complete, and looks for other tasks to do without being reminded.
24. Leaves equipment and/or work area clean, neat, and well-stocked without being reminded.
25. Offers assistance throughout the department as the situation dictates.
26. Locates test results and/or specimens as needed and without assistance.
27. Accepts responsibility for his/her duties and work area.
28. Adheres to safety rules as outlined in the Laboratory Safety Manual.
29. Demonstrates the ability to locate and select Safety Data Sheets for handling and disposing of chemicals, if necessary.
30. Uses personal protective equipment (lab coat, gloves, face shield) when appropriate.

4125 CLINICAL CHEMISTRY I

4125 CLINICAL CHEMISTRY I **5 Semester Hours**

Lecture and supervised laboratory instruction in biochemistry methodology and clinical microscopy, with emphasis on clinical decisions and medical significance. Includes quality control, computer applications, instrumentation, quality assurance/improvement, safety and governmental regulations.

COARSE GOALS

- To provide theory and lab methodology in analytical biochemistry with emphasis on clinical decisions and medical significance

- To provide the student with basic theory necessary to understand the methodology and operations of laboratory instrumentation.

DIDACTIC COURSE

CHEMISTRY I

Outline

I. Carbohydrates
II. Proteins and Amino Acids
III. Lipids, Apolipoproteins, and Lipoproteins
IV. Electrolytes, Osmolality, Sweat Testing, Blood Gases, and Acid-Base Balance
V. Instrumentation

Learning Objectives

Upon completion, the student should be able to:

<u>Carbohydrates</u>

1. Define the following terms: carbohydrates, monosaccharide, disaccharide, polysaccharide, ketone, insulin, glycogen, glycogenesis, glycogenolysis, gluconeogenesis, glucose tolerance, hyperglycemia, hypoglycemia, and glycation.
2. Explain carbohydrate metabolism.
3. Discuss the regulation of glucose concentration in the body.
4. List glucose reference values and criteria for diagnosis of diabetes mellitus, including the American Diabetes Association guidelines.
5. Discuss the abnormal metabolic relationships among glucose, ketones, fatty acids, and metabolic acids in an insulin-deficient individual.
6. State the principle and clinical application of lab procedures used to diagnose diabetes.

7. Compare and contrast etiology, pathophysiology, clinical features, laboratory findings, and treatment of the following:
    a. type I diabetes
    b. type II diabetes
    c. metabolic syndrome
    d. gestational diabetes
    e. impaired fasting glucose

8. Explain four types of glucose methodologies, including specimen requirements, principle, and known interference substances.
9. State the clinical importance of hemoglobin A1C or glycated hemoglobin in association with diabetes.

Amino Acids and Proteins

10. Define the following terms: amino acids, proteins, globulin, immunoglobulin, acute-phase reactants, paraprotein, and complement.
11. Discuss the biochemistry, function, and clinical significance of amino acids and protein.
12. List the principal plasma proteins and immunoglobulins, including the electrophoresis pattern (designating specific region).
13. Differentiate the acute phase reactants according to graph for review.
14. Discuss test principle and methodology used to assess amino acids and proteins in the body.
15. State the principle of electrophoresis.
16. Evaluate electrophoretic protein patterns and associate with appropriate disease or condition.

Lipids and Lipoproteins

17. Define the following terms: lipid, fatty acid, prostaglandin, apolipoprotein, lipoprotein, chylomicron, and atherosclerosis.
18. Discuss the metabolism of cholesterol and triglycerides.
19. State reference values for total cholesterol, triglycerides, HDL, and LDL in a healthy individual.
20. Explain the significance of apolipoproteins in health and disease.
21. Compare and contrast the five lipoprotein classes based on chemical makeup and clinical significance.
22. Outline laboratory tests that may aid in the diagnosis of lipoprotein disorders, and National Cholesterol Education Program (NCEP) guidelines for managing a lipoprotein disorder (adult and child).
23. List the test methodologies for serum cholesterol and triglycerides, including principle, specimen type, and interference substances.

Electrolytes, Osmolality, Sweat Testing, Blood Gases, and Acid-Base Balance

24. List the major physiological electrolytes.
25. Discuss the physiological function and regulation of sodium, potassium, and chloride, and reference values seen in healthy individuals.
26. State the principle of the ion-selective electrode quantitative sweat test for cystic fibrosis.
27. Explain the Henderson-Hasselbalch equation.
28. Compare and contrast metabolic and respiratory acidosis and alkalosis, including the cause, clinical features, and laboratory findings, and associate with disease or condition.
29. Interpret blood gas results (metabolic or respiratory/acidosis or alkalosis).
30. Evaluate case studies of carbohydrate, amino acids, lipoprotein, and blood gas analysis for assessment of a specific disease and/or condition.

Instrumentation

31. Relate Beer's Law to absorption spectrophotometry.
32. State how the proper wavelength is determined from a measurement.
33. List components of a spectrophotometer.
34. Describe the principle of the following: spectrophotometer, fluorometer, photometry, atomic absorption spectrophotometry
35. Compare and contrast turbidimetry and nephelometry.
36. Explain the principle of electrophoresis, stains, and quantitative procedures.
37. Identify the five zones or fractions produced by protein electrophoresis.
38. Define the following terms: endosmosis, amperometry and coulometry, chromatography, mass spectrophotometry, high performance chromatography, and isotope.
39. Compare and contrast the various labels used for immunoassay.
40. Discuss the needs and advantages of automation in the clinical laboratory.
41. Explain the process of instrument selection and purchase.

4325 CLINICAL CHEMISTRY II

4325 CLINICAL CHEMISTRY II **5 Semester Hours**

Lecture and supervised laboratory instruction in biochemistry methodology and clinical microscopy, with emphasis on clinical decisions and medical significance. Includes quality control, computer applications, instrumentation, quality assurance/improvement, safety and governmental regulations.

COARSE GOALS

- To provide theory and lab methodology in analytical biochemistry with emphasis on clinical decisions and medical significance

- To provide a comprehensive study of laboratory procedures useful in routine urinalysis and body fluid analysis with emphasis on clinical significance.

DIDACTIC COURSE

CHEMISTRY II

Outline

I. Enzymes
II. Liver Function
III. Gastric, Pancreatic, and Intestinal Function
IV. Nitrogen Metabolites and Renal Function
V. Calcium, Phosphate, and Magnesium Metabolism
VI. Toxicology and Therapeutic Drug Monitoring
VII. Endocrine Function

Learning Objectives

Upon completion, the student should be able to:

<u>Enzymes</u>

1. List factors that affect enzyme activities in blood.
2. Compare and contrast the physiological action, tissue distribution, clinical significance, test methods, and reference ranges of healthy individuals for the following:
    a. transaminases
    b. creatine kinase (CK)
    c. lactate dehydrogenase (LDH)
    d. phosphatase
    e. cholinesterase

f. amylase
g. lipase
h. gamma glutamyltransferase
i. 5'nucleotidase

3. Discuss test methodologies for isoenzyme analysis.
4. Interpret the electrophoresis migration pattern of CK and LDH isoenzymes.
5. Evaluate case studies and associate clinical features and laboratory findings with appropriate disease or condition.

Liver, Gastric Juices, Pancreas

6. Describe the anatomy (macroscopic and microscopic) and function of the hepatic system.
7. Illustrate the scheme of bilirubin metabolism from the breakdown of hemoglobin to the formation of urobilin.
8. Compare and contrast the enzymes synthesized in the liver, release action, and clinical significance.
9. Differentiate etiology, pathophysiology, clinical features, and laboratory test findings of the following:

a. acute viral hepatitis
b. acute alcoholic hepatitis
c. acute toxic or ischemic hepatitis
d. cholestasis
e. chronic hepatitis
f. cirrhosis
g. Reye's syndrome
h. Wilson's disease

10. State the clinical significance of gastrointestinal tract enzymes.
11. Analyze laboratory tests used to assess the exocrine function of the pancreas and intestinal absorption.
12. Differentiate the clinical significance of the D-xylose absorption test and galactose tolerance test.
13. Discuss cystic fibrosis and lab procedures used as an aid in diagnosis.

Kidney

14. Describe the anatomy (macroscopic and microscopic) and function of the renal system.

15. Define the following terms: nephron, glomerulus, renal replacement therapy, dialysis, and diabetic nephropathy.
16. State the clinical laboratory tests used to assess kidney function and the reference values.

17. Calculate creatinine clearance and glomerular filtration rate.
18. Compare and contrast the cause, symptoms, and laboratory test results of the following conditions:

    a. glomerulonephritis (acute and chronic)
    b. uremic syndrome
    c. acute renal failure
    d. nephrotic syndrome
    e. pyelonephritis
    f. urinary tract obstruction

Toxicology

19. Explain the reasons for monitoring therapeutic drugs.
20. Define the following terms: peak, trough, steady state, drug half-life.
21. Differentiate the commonly monitored drugs by generic and trade names, including classification in specific drug groups.
22. Discuss methodologies/instrumentation and specimen requirements for drug analysis.
23. Identify common drugs of abuse and their street names.
24. Evaluate case study scenarios for emergency toxicology and treatment.

Endocrinology

25. Describe the structure and function of the pituitary gland (anterior and posterior), including hormone synthesis and effect of increased or decreased levels.
26. List the laboratory test used to assess pituitary function.
27. Discuss the structure and function of the adrenal cortex and biosynthesis of adrenocortical hormones from cholesterol.
28. Compare and contrast the etiology, clinical features, laboratory findings, and treatment of endocrine disorders.
29. List the laboratory tests used to assess adrenocortical function.
30. Describe the physiology and synthesis of thyroid hormones.
31. Discuss the laboratory methods used to assess thyroid function and reference ranges.
32. Differentiate the function and disorders associated with androgen, estrogen, and progesterone hormone levels.
33. Discuss tumor marker associated with specific disease or condition.

URINALYSIS AND BODY FLUIDS

Outline

I. Safety and Quality Assessment; Preanalytical Variables, Analytical Variables, Postanalytical Variables
II. Introduction to Urinalysis
III. Renal Function
IV. Physical Examination of Urine
V. Chemical Examination of Urine
VI. Microscopic Examination of the Urine
VII. Renal Diseases
VIII. Metabolic Disorders
IX. Cerebrospinal Fluid (CSF)
X. Semen
XI. Synovial Fluid
XII. Serous Fluid
XIII. Amniotic Fluid
XIV. Fecal Fluid

Learning Objectives

Upon completion, the student should be able to:

1. Discuss safety hazards and precautions in the clinical laboratory (i.e., biological, chemical, fire).
2. Identify preanalytical, analytical, and postanalytical variables in the urinalysis laboratory.
3. Identify the components of the nephron, kidney, and excretory system.
4. Describe the process of glomerular ultrafiltration, renal tubular excretion, renal reabsorption, and renal blood flow leading to the formation of urine.
5. Compare and contrast principle and clinical relevance of clearance tests.
6. Discuss the algorithm of the renin-angiotensin-aldosterone system.
7. Discuss urine formation, composition, collection, and handling.
8. Explain steps in performing a routine urinalysis study (microscopic and macroscopic analysis).
9. State the principle of bright-field, dark-field, phase-contrast, and polarizing microscopy.
10. Distinguish normal from abnormal laboratory findings:

    a) color
    b) clarity
    c) specific gravity
    d) odor
    e) biochemical tests
    f) urinary sediment (WBCs, RBCs, squamous, renal, or transitional epithelial cells)
    g) other (crystals, casts, yeast, bacteria, parasites, fat bodies)

11. Compare and contrast the etiology, pathophysiology, and laboratory findings of the following diseases or conditions:

    a) glomerular disorders
    b) tubular disorders
    c) interstitial disorders
    d) renal failure
    e) renal lithiasis

12. Differentiate characteristics of the following inherited metabolic disorders, including screening and/or diagnostic testing:

    a) phenylketonuria
    b) tyrosinemia
    c) alkaptonuria
    d) maple syrup disease
    e) organic acidemias
    f) cystinosis
    g) mucopolysaccharidosis
    h) Lesch-Nyhan disease
    i) porphyrias

13. Discuss the clinical significance of body fluid analysis (CSF, pleural, peritoneal, pericardial, synovial fluids, seminal fluid, amniotic fluid, and feces).
14. Compare and contrast the formation, appearance (color/clarity), cell count, cellular composition (WBC, RBC, tissue-lining cells) and biochemical tests (glucose, protein) of body fluids from a healthy individual.
15. Identify normal and abnormal cells found in body fluids.
16. Evaluate urine or body fluid lab results and associate findings with a disease or condition.

CLINICAL ROTATION – CHEMISTRY

Psychomotor Behavior Objectives

Upon completion of this rotation, the student will:

1. Identify specimen for chemical analysis according to lab policy:
    a. Type (i.e. serum, plasma, whole blood
    b. Anticoagulant vs non-additive tube
    c. Storage temperature
    d. Label or requisition
    e. Sample quantity
2. Explain the importance of each special point according to the manufacturer's guidelines:
    a. Test sequencing
    b. Tube labeling
    c. Effect of light on reagents/samples
    d. Effect of temperature on reagents/samples
    e. Reagent stability
    f. Time specific procedures
    g. Effect of hemolysis/lipemia
3. Organize workload in an efficient manner according to lab policy (i.e., STATs, ASAPs, routines, special tests, holdovers, send-outs)
4. Calculate analytical values matching the interpretation of the technologist
5. Perform concentration of body fluid (i.e., urine and CSF) following Chemistry operating procedure
6. Define and explain the principle of operation of different instruments/ procedures
7. Operate, calibrate, and perform instrument maintenance according to the manufacturer's guidelines and lab policy
8. Select correct standards and controls for each procedure; perform, interpret, and record QC values within established acceptable ranges.
9. Troubleshoot problems with supervision or with the use of reference material(i.e., interference substances, instrument malfunctions, patient critical values)
10. Order, perform, interpret, and report test results with 100% accuracy:
    Routine Tests
    a. Chemistry profiles
    b. Arterial blood gases
    c. Troponins
    d. Serum electrophoresis
    Non-Routine Tests
    e. Surgery STATs
    f. Pharmacy and hemodialysis fluids
    g. Sweat tests

11. Replenish reagents and diluents; stock necessary supplies; keep clean work area in accordance o lab policy
12. Comply to HIPAA (confidentiality) established guidelines.
13. Perform electrophoresis on controls and patients utilizing proper gel plate, buffer, etc; scan and interpret results, understanding possible diagnosis
14. Recognize and adhere to safety procedures according to regulatory agencies and laboratory safety policy:
    a. Proper handling of specimens
    b. Disposal of glass and biohazard waste
    c. Handling of needles
    d. Proper pipetting
    e. Handling of spills and chemicals (acids, bases, etc)
    f. Knowledge of fire procedure
    g. Use of fire blanket, shower, eye wash

Affective Behavior Objectives

Upon completion of the rotation in this department, the student shall demonstrate a professional attitude by the following behaviors:

1. Exhibits confidence in abilities, consistent with present level of experience.
2. Recognizes limitations and asks for guidance and/or assistance when necessary.
3. Admits mistakes readily, takes steps to correct them, does not rationalize or blame others for the mistakes, and learns from them.
4. Presents neat, clean appearance and complies with hospital and departmental dress code, including ID badges.
5. Exhibits a working knowledge and acceptance of hospital and laboratory policies (patient right to privacy).
6. Maintains considerate, caring, and friendly attitude toward patients, co-workers, health professionals, and visitors.
7. Expresses oneself effectively in written, verbal, and/or non-verbal communication.
8. Listens to and follows directions in a positive manner.
9. Demonstrates willingness and the ability to work effectively with others.
10. Accepts suggestions to improve performance and modifies behavior accordingly.
11. Demonstrates consistently the ability to produce quality work with acceptable accuracy.
12. Organizes work for maximum efficiency and priority (ex: STAT, ASAP).
13. Confirms identity of patient and/or specimen and is able to determine if specimen is acceptable for analysis.
14. Verifies abnormal results before reporting and is aware of normal results.
15. Reports test results on patients accurately and legibly onto workcards and/or worklists.
16. Utilizes computer properly to order tests, enter results, and obtain information.
17. Demonstrates the ability to read and understand written procedures by following printed instructions.

18. Transfers information and/or work experience from one situation to another (ex: lecture to lab, dept to dept, procedure to procedure).
19. Retains information and/or knows where to look for the information if forgotten (ex. results, procedures, supplies).
20. Arrives on time to the department at the beginning of the shift, and returns promptly from lunch, breaks, and class.
21. Notifies technologist when leaving for lunch, break, class, or other activity.
22. Follows standard of attendance, notifies the department in case of absence or tardiness.
23. Utilizes time effectively when work is complete, and looks for other tasks to do without being reminded.
24. Leaves equipment and/or work area clean, neat, and well-stocked without being reminded.
25. Offers assistance throughout the department as the situation dictates.
26. Locates test results and/or specimens as needed and without assistance.
27. Accepts responsibility for his/her duties and work area.
28. Adheres to safety rules as outlined in the Laboratory Safety Manual.
29. Demonstrates the ability to locate and select Safety Data Sheets for handling and disposing of chemicals, if necessary.
30. Uses personal protective equipment (lab coat, gloves, face shield) when appropriate.

4236 CLINICAL HEMATOLOGY

4236 CLINICAL HEMATOLOGY **6 Semester Hours**

Lecture and supervised laboratory instruction in routine and special hematology studies, correlating hematological findings with medical significance. Systematized study of disease, cell maturation and function, principles of hemostasis; methodology used in routine and special hematology studies; and correlation of hematological findings with physiological conditions. Includes quality control, computer applications, instrumentation, quality assurance/improvement, safety and governmental regulations.

COARSE GOALS

- To provide a comprehensive study of normal and abnormal hematology and relate this to lab tests with emphasis on their clinical significance.
- To provide an overview of hemostasis, allowing the student to comprehend and apply their knowledge in the Coagulation area.
- To provide knowledge of hematology, coagulation, and flow cytometry and an understanding of the test principles and equipment used in the area.

DIDACTIC COURSE

HEMATOLOGY/CELL IDENTIFICATION

Outline

I. Complete Blood Count and Routine Hematology Methods
II. Hematopoiesis/Bone Marrow
III. Red Cell Structure and Function
IV. Anemia Overview
V. Cell Morphology
VI. Iron Metabolism and Hypochromic Anemias
VII. Megaloblastic Anemia
VIII. Aplastic Anemia and Related Disorders
IX. Intracorpuscular Defects
X. RBC Enzyme Deficiencies
XI. Hemoglobinopathies
XII. Thalassemia
XIII. Extracorpuscular Defects
XIV. Anemia Associated with Systemic Diseases
XV. WBC Disorders
XVI. Leukemia
XVII. Chronic Myeloproliferative Disorders
XVIII. Myelodysplastic Syndromes (MDS)
XIX. Lymphomas
XX. Multiple Myeloma and Related Plasma Cell Disorders
XXI. Lipid (Lysosomal) Storage Disease and Histiocytosis
XXII. Instrumentation

Learning Objectives

Upon completion, the student should be able to:

<u>Complete Blood Count and Routine Hematology Methods</u>

1. Define the following terms: hematology, blood, plasma, serum, and anticoagulants.
2. Compare and contrast the various types of anticoagulants (name, anticoagulant property and anticoagulant of choice for lab testing) and
3. Discuss possible pre-examination, examination, and post-examination variables that will affect hematology test results.
4. Explain the importance and discuss the tests included in a complete blood count.

5. Interpret and explain patient data generated by advanced hematology analyzers, including the hemogram parameters, red cell histograms, platelet histograms, and leukocyte histograms/scattergrams.
6. Describe the importance of quality control and quality assurance measures for automated differential analysis.
7. Name diseases that are associated with an elevated and decreased WBC, RBC, and platelet count.
8. Calculate a manual white blood cell count, red blood count, and platelet count and discuss the principle of the diluting fluids.
9. Calculate platelet estimates from given data.
10. Calculate and interpret the red blood cell indices: mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC).
11. Discuss and interpret the red cell distribution (RDW) and platelet distribution width (PDW).
12. Recall reference values for white blood cells, red blood cells, platelets, hemoglobin, hematocrit, red blood cell indices (MCV, MCHC and MCH), RDW, and reticulocytes.
13. Evaluate patient results for a CBC compared to reference values.
14. Identify the "rule of three" when assessing RBCs, Hgb, and Hct.
15. Calculate a corrected WBC, corrected reticulocyte, and reticulocyte production index (RPI).
16. Differentiate absolute and relative counts of white blood cells based on laboratory data.
17. Discuss the white blood cell differential count of a peripheral smear obtained from a healthy adult and infant.
18. Discuss the importance and assess the quality of a properly made peripheral blood smear.
19. Explain the principle, significance, and composition of the Wright's (Romanowsky) Stain.
20. Differentiate causes of an acidic or an alkaline stained peripheral smear.
21. Examine a blood smear and select the appropriate area to perform a WBC differential and RBC morphology.
22. Estimate a WBC and platelet count by viewing a stained blood smear.
23. Identify components of cellular anatomy.
24. Name the white blood cells and list the reference ranges of white blood cells found in the peripheral blood of a healthy adult, child, and neonate.
25. Recognize normal and abnormal cells on a peripheral blood smear.
26. Compare and contrast the RBC, WBC, and platelet morphology.

<u>Hematopoiesis/Bone Marrow</u>

27. Outline and discuss the characteristics of hematopoiesis involving the erythrocytic, granulocytic, monocytic, lymphocytic, and megakaryocytic maturation sequences.
28. Explain the role of cytokines in regards to hematopoiesis.
29. Compare the morphology of immature and mature red blood cells, white cells, and platelets.
30. Discuss morphology of tissue cells (i.e. tissue neutrophils, tissue eosinophils, tissue basophils).
31. Differentiate reactive lymphocytes from monocytes.

32. State the function of megakaryocytes.
33. Explain the process of platelet release from the bone marrow.
34. Name the non-hematopoietic bone-derived cells.
35. Distinguish between osteoblast and osteoclast.
36. Differentiate osteoblast from plasma cell and osteoclast from megakaryocyte.
37. Describe the bone marrow structure, its hematopoietic functional ability, and effect of erythropoietin on the bone marrow.
38. List indications for and proper sites of bone marrow studies.
39. Describe the preparation of bone marrow collection, aspirate, and biopsy examination.
40. Explain how to estimate bone marrow cellularity.
41. Discuss the significance of the myeloid to erythroid (M:E) cell ratio.
42. List the components of a bone marrow report.

Red Cell Structure and Function

43. Describe RBC membrane structure and function.
44. List the areas of red cell metabolism that are crucial to normal RBC survival and function.
45. Correlate RBC lipid abnormality with red cell morphology.
46. Explain hemoglobin structure, function, composition found in normal human development (i.e., Hgb A, Hgb F) and Hgb methodology.
47. Illustrate hemoglobin production (i.e., alpha, beta, epsilon, gamma, and delta) during fetal development, infancy, and birth.
48. Evaluate hemoglobins as normal or abnormal for infants and adults.
49. Explain the clinical importance of abnormal hemoglobin.
50. Interpret the hemoglobin-dissociation curve.
51. Compare and contrast the red blood cell metabolic pathways.
52. Describe extravascular and intravascular hemolysis.
53. List the proteins that carry the following components in circulation: iron, hemoglobin dimers, metheme, and bilirubin.

Anemia Overview

54. Define anemia.
55. List causes of anemias and describe clinical signs.
56. Interpret laboratory tests for the diagnosis of anemia using an algorithm.
57. State the laboratory tests used for the diagnosis of anemia and diagnostic value.
58. Evaluate clinical and laboratory data for anemia classification.

Cell Morphology

59. Describe the characteristics of normal and abnormal RBC and WBC morphology, and associate with clinical conditions.
60. Define the following terms:
    - Anisocytosis

- Poikilocytosis
- Normochromic
- Hypochromic
- Macrocytic
- Microcytic
- Polychromasia

61. List the characteristics and clinical conditions associated with the following:
    - Agglutination
    - Rouleaux
    - Macrocytes
    - Microcytes
    - Hypochromia
    - Polychromasia
    - RBCs of various shapes (i.e., poikilocytosis)
    - RBC inclusions
62. State conditions with the following abnormal WBC morphology:
    - Toxic granulation
    - Vacuolization
    - Döhle bodies
    - Hyper and hypo segmentation
    - Shift to the left
63. Discuss the etiology of malaria and babesiosis and detect each corresponding parasite on a peripheral blood smear.

<u>Iron Metabolism and Hypochromic Anemias, Megaloblastic Anemia, Aplastic Anemia and Related Disorders</u>

64. Discuss heme synthesis and inherited heme synthesis disorders.
65. Define and describe etiology, pathophysiology, clinical features, laboratory results, peripheral blood smear characteristics, treatment, and prognosis for the following anemias:
    - Iron deficiency anemia
    - Anemia of chronic disease
    - Sideroblastic anemia and other iron related disorders
    - Megaloblastic anemia
    - Nonmegaloblastic macrocytic anemia
    - Acquired and congenital aplastic anemia
    - Pure red cell aplasia

<u>Intracorpuscular Defects</u>

66. Define and describe etiology, pathophysiology, clinical features, laboratory results, peripheral blood smear characteristics, treatment, and prognosis for the following hemolytic anemias with intracorpuscular defects

- Hereditary spherocytosis
- Hereditary elliptocytosis
- Hereditary pyropoikilocytosis

67. Differentiate hereditary defects involving red cell membrane based on RBC membrane proteins.
68. Describe characteristics of hereditary disease associated with red cell membrane defects.
69. Differentiate hereditary diseases associated with erythrocyte membrane cation permeability
    - Hereditary stomatocytosis
    - Hereditary xerocytosis

RBC Enzyme Deficiencies

70. Discuss the pathogenesis, clinical features, and laboratory findings associated with glucose-6-phosphate dehydrogenase (G-6-PD) deficiency, pyruvate kinase (PK) deficiency, and methemoglobin reductase deficiency.

Hemoglobinopathies

71. Define hemoglobinopathies and describe characteristics.
72. Define and describe etiology, pathophysiology (including amino acid substitution), clinical features, laboratory results, peripheral blood smear characteristics, treatment, and prognosis for the following hemoglobinopathies:
    - Sickle cell disease and trait
    - Hemoglobin C disease and trait
    - Hemoglobin D disease and trait
    - Hemoglobin E disease and trait
    - Hemoglobin O-Arab disease and trait
    - Hgb Oman disease and trait
73. List laboratory tests used for the diagnosis of hemoglobinopathies
74. Discuss characteristics of Hgb S and other abnormal hemoglobins (Hgb S/C, Hgb S/D, Hgb S/OArab, and Hgb S/Beta Thalassemia).
75. Differentiate hemoglobinopathies based on clinical and laboratory findings.
76. Identify unstable hemoglobins and hemoglobin variants with altered O_2 affinity.
77. Describe methemoglobinemia.

Thalassemia

78. Discuss the hemoglobin defect and diagnostic laboratory findings in thalassemia.
79. Identify characteristics of beta and alpha thalassemias (i.e., Hgb Bart and Hgb H).
80. Differentiate thalassemia from iron deficiency anemia based on clinical and laboratory findings.
81. Describe hereditary persistence of fetal hemoglobin (HPFH) and the lab tests used to aid in the diagnosis.

Extracorpuscular Defects

82. Discuss erythrocyte senescence (extravascular and intravascular hemolysis).
83. List mechanisms of immune hemolysis.
84. Differentiate alloimmune and autoimmune hemolytic anemia.
85. Characterize immediate and delayed hemolytic transfusion reactions.
86. Describe the causes of hemolytic disease of the newborn.
87. Characterize warm autoimmune hemolytic anemia.
88. List features of cold agglutinin syndrome.
89. Explain the principle of the Donath-Landsteiner test used for paroxysmal cold hemoglobinuria.
90. Compare the mechanisms for drug-induced immune hemolytic anemia.
91. Discuss the causes and characteristics of non-immune hemolytic anemia.

Anemia Associated with Systemic Diseases

92. Define and describe etiology, pathophysiology, clinical features, laboratory results, peripheral blood smear characteristics, treatment, and prognosis for anemias associated with the following systemic diseases:
    - Chronic disease
    - Renal disease
    - Infection
    - Liver disease and alcoholism
    - Endocrine disorders
    - Malignancy
    - HIV/AIDS
    - Infancy/prematurity
93. Discuss pre-examination variables that may mimic an anemia.

WBC Disorders

94. Discuss characteristics of qualitative and quantitative disorders of neutrophils.
95. Define neutrophilia, eosinophilia, basophilia, monocytosis, and lymphocytosis and list causes for each.
96. Define and describe etiology, pathophysiology, clinical features, laboratory results, peripheral blood smear characteristics, treatment, and prognosis for the following WBC disorders
    - Chronic granulomatous disease
    - Pelger-Huët anomaly
    - May-Hegglin anomaly
    - Chediak-Higashi syndrome
    - Alder-Reilly anomaly
    - Specific granule anomaly
    - Infectious mononucleosis

Leukemia

97. Define leukemia and classify according to acute, chronic, myeloid, and lymphoid types
98. Classify acute myelogenous leukemia (M0-M7) and acute lymphoblastic leukemia (L1-L3) using the FAB classification system.
99. Describe WHO classification of acute leukemias.
100. Differentiate acute and chronic leukemia based on clinical and laboratory features.
101. Discuss the cytochemistry stains, immunophenotypic markers, cytogenetic studies, and cell morphology used to classify leukemias.
102. Explain the mode of treatment and prognosis for leukemias.
103. List the etiology, clinical features, diagnostic findings, and mode of treatment for chronic lymphocytic leukemia and chronic myelogenous leukemia.
104. Compare and contrast malignant lymphoproliferative disorders
    - Acute lymphoblastic leukemia
    - Chronic lymphocytic leukemia
    - Chronic prolymphocytic leukemia
    - Hairy cell leukemia
    - Lymphoma
    - Sézary syndrome
    - Adult T-cell leukemia
    - Plasma cell dyscrasia

Chronic Myeloproliferative Disorders

105. Define chronic myeloproliferative disorder.
106. Define and describe etiology, pathophysiology, clinical features, laboratory results, peripheral blood smear characteristics, treatment, and prognosis for the following
    - Polycythemia Vera
    - Idiopathic myelofibrosis
    - Essental thrombocythemia
107. Differentiate polycythemia vera (PV) from primary, secondary, and relative erythrocytosis based on laboratory and clinical findings.

Myelodysplastic Syndromes (MDS)

108. Discuss the etiology, pathogenesis, clinical symptoms, classification, laboratory results, diagnostic criteria, treatment, and prognosis for myelodysplastic syndromes (MDS).

Lymphomas

109. Discuss the etiology, pathogenesis, clinical symptoms, classification, laboratory results, diagnostic criteria, treatment, and prognosis for Hodgkin and Non-Hodgkin lymphomas.

Multiple Myeloma and Related Plasma Cell Disorders

110. Discuss the etiology, pathogenesis, clinical symptoms, classification, laboratory results, diagnostic criteria, treatment, and prognosis for monoclonal gammopathies including
    - Multiple myeloma
    - Waldenstrom's macroglobulinemia
    - Other plasma cell disorders

Lipid (Lysosomal) Storage Disease and Histiocytosis

111. List the lipid storage diseases.
112. Discuss the etiology of the lipid storage diseases and name the enzyme deficiency found in each of them.
113. Compare and contrast the clinical features and laboratory findings of Gaucher's disease, Niemann-Pick and Tay Sachs
114. Discuss the characteristics of histiocytosis disorders
115. Distinguish characteristics of the following lipid storage diseases: Gaucher's disease, Niemann-Pick disease, and Tay Sachs disease.
116. Describe the characteristics of mucopolysaccharidosis disorders.
117. Discuss characteristics of histiocytosis disorders.
118. Evaluate laboratory data from case studies and predict the appropriate disease and/or condition.

Instrumentation

119. Describe principle operation of the analyzers and equipment used in routine and special hematology procedures.
120. Discuss the test performance, quality control, and reagent usage for all instruments used in routine and special hematology procedures.
121. Evaluate automated cell counter results, including histograms and scatterplots in association with cellular (WBC, RBC, platelet) distribution.
122. Define flow cytometry and distinguish the three main components of flow cytometry technology.
123. Define cluster designation and explain the clinical application to flow cytometry.

HEMOSTASIS

Outline

I. Introduction to Hemostasis
II. Disorders of Primary Hemostasis
III. Disorders of Plasma Clotting Factors
IV. Introduction of the Fibrinolytic, Coagulation, and Kinin Systems
V. Introduction to Thrombosis and Anticoagulant Therapy
VI. Coagulation Procedures

Learning Objectives

Upon completion, the student should be able to:

Introduction to Hemostasis

1. Define the terms: coagulation, fibrinolysis, petechiae, ecchymosis, and hemorrhage.
2. List the major and minor systems involved in maintaining hemostasis.
3. Describe the events that take place in primary hemostasis. List medications that can interfere with primary hemostasis and how they interfere.
4. Name the three structural zones of platelets.
5. Describe composition and functions of the peripheral zone, sol-gel zone, and organelle zone.
6. Outline steps in platelet plug formation and describe the process of platelet adhesion and aggregation.
7. Describe the events that take place in secondary hemostasis.
8. Name the product responsible for stabilization of the hemostatic plug.
9. Differentiate the characteristics for the contact coagulation proteins, prothrombin proteins, and fibrinogen group.
10. Compare and contrast the following coagulation systems: extrinsic, intrinsic, and common pathway, including factors and their association with PT and PTT tests.
11. Describe the events that take place in fibrinolysis.
12. Interpret the use of the prothrombin time test in monitoring hemostasis.
13. Interpret the use of the activated partial thromboplastin time test in monitoring hemostasis.
14. Compare the thrombin-mediated reactions in hemostasis.
15. Evaluate lab data and select the appropriate coagulation system.

Disorders of Primary Hemostasis

16. Describe the laboratory tests that may be utilized in the evaluation of quantitative and qualitative platelet disorders.
17. Discuss pathophysiologic processes that cause thrombocytopenia and thrombocytopenic disorders caused by each process (acquired qualitative platelet disorders; pregnancy-associated; HELLP; HIT).
18. Define immune-mediated thrombocytopenia.

19. Describe how the diagnosis of idiopathic thrombocytopenic purpura (ITP) is made.
20. List conditions associated with autoimmune and alloimmune thrombocytopenia.
21. Compare ITP, thrombotic thrombocytopenic purpura (TTP), and HUS.
22. List the characteristics of the inherited platelet membrane defects.
23. Compare and contrast Bernard-Soulier syndrome and Glanzmann's thrombasthenia.
24. Describe the types of von Willebrand's disease (vWD) and outline the management of bleeding for each vWD type.
25. Evaluate lab data to differentiate von Willebrand's disease, Bernard-Soulier syndrome, and hemophilia A.
26. Explain the pathophysiology responsible for storage pool and platelet release defects and how it relates to laboratory studies used for diagnosis of these disorders.
27. Differentiate reactive thrombocytosis from primary thrombocytosis and the hemostatic problems expected.
28. Differentiate the vascular disorders associated with purpura.
29. Compare and Contrast vascular and connective tissue disorders.

<u>Disorders of Plasma Clotting Factors</u>

30. List various defects that impair the coagulation system.
31. List clotting factors and their synonymous names.
32. Name the vitamin-K dependent factors.
33. Compare and contrast hemophilia A and von Willebrand's disease.
34. Evaluate lab data and select appropriate disease or condition (hemophilia A, hemophilia B, and hemophilia C).
35. Discuss laboratory methods used to identify factor deficiencies.
36. Describe circulating anticoagulants and inhibitors.
37. Name laboratory methods used to identify anticoagulants and inhibitors (i.e., lupus anticoagulant).
38. Discuss various etiologies and treatment modalities for various factor deficiencies.
39. Identify genetic mutations (i.e., Factor V Leiden) known to affect factor II and factor V and the consequences thereof.

<u>Introduction of the Fibrinolytic, Coagulation, and Kinin Systems</u>

40. Name the components of the coagulation and fibrinolytic systems.
41. Discuss the physiologic interactions of these proteolytic systems.
42. Interpret the clinical and laboratory abnormalities associated with disseminated intravascular coagulation.
43. Evaluate the laboratory abnormalities associated with primary fibrinolysis versus disseminated intravascular coagulation.

Introduction to Thrombosis and Anticoagulant Therapy

44. Name the natural anticoagulants and inhibitors present in plasma.
45. Define the role of endothelium in thrombogenesis.
46. Explain the mechanism of thrombin/thrombomodulin.
47. Compare and contrast the protein C and protein S systems.
48. List the inherited causes of thrombophilia in order of frequency of occurrence.
49. Name the risk factors and acquired conditions with hypercoagulable states.
50. Interpret the laboratory tests used to evaluate patients with hypercoagulable states.
51. Describe the issues to consider in laboratory testing in patients with thrombosis.
52. Evaluate lab data and select the appropriate disease or condition (ex. lupus anticoagulant, antiphospholipid syndrome, deep vein thrombosis [DVT], pulmonary embolism [PE]).
53. Describe the mechanism of heparin-induced thrombocytopenia.
54. Interpret laboratory tests used for evaluation of heparin-induced thrombocytopenia.
55. Explain the mechanism of action and understand the conditions in which heparin, oral anticoagulant, and thrombolytic agents are used.
56. Differentiate the most common laboratory tests used to monitor oral anticoagulant therapy (i.e., Coumadin therapy).
57. List laboratory tests to monitor heparin therapy.

Coagulation Procedures

58. Correlate platelet function test results with clinical conditions.
59. Explain the use of the activated partial thromboplastin time and prothrombin time and proper specimen collection.
60. Analyze activated partial thromboplastin time mixing study results and select the appropriate factor deficiency(ies) or inhibitor(s).
61. Explain the principle behind an anti-Xa heparin assay.
62. Explain the use of the thrombin time, reptilase time, and activated clotting time (ACT).
63. List conditions with low and high fibrinogen levels.
64. Relate clinical conditions to measurements of von Willebrand Factor activity and antigen.
65. Identify methods for laboratory diagnosis of protein C and protein S deficiencies.
66. List criteria for the laboratory diagnosis of lupus anticoagulants.
67. Identify various endpoint detection methodologies employed by coagulation instrumentation.
68. List the factors in aged serum and adsorbed plasma.
69. Evaluate laboratory data using aged serum and adsorbed plasma and select the appropriate factor deficiency(ies).

CLINICAL ROTATION - HEMATOLOGY

Psychomotor Behavior Objectives

At the end of this rotation, the students should be able to:

1. Properly use the telephone system and computer system in accordance with lab policy.
2. Identify specimens for testing according to lab policy.

    a. type (i.e., serum, plasma, whole blood, body fluid)
    b. anticoagulant vs. non-additive tubes
    c. storage temperature (if applicable)
    d. label or requisition
    e. sample quantity

3. List preanalytical, analytical, and postanalytical variables that will affect test results according to laboratory policy and reference materials.

    a. distribution and handling of blood specimens and other body fluids
    b. reporting results
    c. test analysis

4. Adhere to safety procedures according to regulatory agencies and laboratory safety policy (100% compliance).

    a. disinfect countertops
    b. proper waste/sharps disposal
    c. fire equipment

5. Comply with HIPAA (confidentiality) established guidelines in accordance with hospital policy.
6. Organize workload in an efficient manner (i.e., STATs, ASAPs, routines) according to laboratory policy.
7. Explain the operational principle of the routine hematology instruments without the aid of reference materials.
8. Perform routine start-up procedures on routine hematology equipment according to laboratory policy.
9. Operate and perform instrument maintenance on routine hematology equipment according to the manufacturer's guidelines and laboratory policy.
10. Select correct standards and controls for routine hematology equipment; perform, interpret, and record QC values within established acceptable ranges.
11. Run patient samples using routine hematology equipment; interpret and compare results to established reference values or interpretation of the technologist.
12. Interpret RBC indices according to anemia classification without the aid of reference materials.
13. Evaluate abnormal patient results with the aid of references and a medical technologist.
14. Set up and interpret special hematology procedures according laboratory policy.
15. Replenish reagents, diluents, and keep clean work area according to laboratory policy.

16. Troubleshoot problems with supervision or with the use of reference material (i.e., interfering substances, instrument malfunctions, patient critical values).
17. Perform differentials, RBC morphology, and platelet estimates on adults and children matching the interpretation of the manual differential within $\pm$ 2 SD
18. Perform a manual reticulocyte count with 95% ± 5% accuracy.
19. Make stool for polys smears and evaluate and report findings with 100% accuracy.
20. Analyze and evaluate unknown specimens; report findings with 95% ± 5% accuracy as reported by the technologist.

Affective Behavior Objectives

1. Exhibits confidence in abilities, consistent with present level of experience.
2. Recognizes limitations and asks for guidance and/or assistance when necessary.
3. Admits mistakes readily, takes steps to correct them, does not rationalize or blame others for the mistakes, and learns from them.
4. Presents neat, clean appearance and complies with hospital and departmental dress code, including ID badges.
5. Exhibits a working knowledge and acceptance of hospital and laboratory policies (patient right to privacy).
6. Maintains considerate, caring, and friendly attitude toward patients, co-workers, health professionals, and visitors.
7. Expresses oneself effectively in written, verbal, and/or non-verbal communication.
8. Listens to and follows directions in a positive manner.
9. Demonstrates willingness and the ability to work effectively with others.
10. Accepts suggestions to improve performance and modifies behavior accordingly.
11. Demonstrates consistently the ability to produce quality work with acceptable accuracy.
12. Organizes work for maximum efficiency and priority (ex: STAT, ASAP).
13. Confirms identity of patient and/or specimen and is able to determine if specimen is acceptable for analysis.
14. Verifies abnormal results before reporting and is aware of normal results.
15. Reports test results on patients accurately and legibly onto workcards and/or worklists.
16. Utilizes computer properly to order tests, enter results, and obtain information.
17. Demonstrates the ability to read and understand written procedures by following printed instructions.
18. Transfers information and/or work experience from one situation to another (ex: lecture to lab, dept to dept, procedure to procedure).
19. Retains information and/or knows where to look for the information if forgotten (ex. results, procedures, supplies).
20. Arrives on time to the department at the beginning of the shift, and returns promptly from lunch, breaks, and class.
21. Notifies technologist when leaving for lunch, break, class, or other activity.
22. Follows standard of attendance, notifies the department in case of absence or tardiness.
23. Utilizes time effectively when work is complete, and looks for other tasks to do without being reminded.

24. Leaves equipment and/or work area clean, neat, and well-stocked without being reminded.
25. Offers assistance throughout the department as the situation dictates.
26. Locates test results and/or specimens as needed and without assistance.
27. Accepts responsibility for his/her duties and work area.
28. Adheres to safety rules as outlined in the Laboratory Safety Manual.
29. Demonstrates the ability to locate and select Safety Data Sheets for handling and disposing of chemicals, if necessary.
30. Uses personal protective equipment (lab coat, gloves, face shield) when appropriate.

4246 CLINICAL IMMUNOLOGY/IMMUNOHEMATOLOGY

4246 CLINICAL IMMUNOLOGY/IMMUNOHEMATOLOGY 6 Semester Hours

Lectures on immunologic (antigen-antibody) responses, serological methodology and theory of immunohematology as applied to blood groups, types, compatibility testing, and blood components. Supervised laboratory instruction in immunology and immunohematology methodology, with emphasis on clinical decisions and medical significance. Includes quality control, computer applications, instrumentation, quality assurance/improvement, safety and governmental regulations.

COARSE GOALS

- To provide an overview of immunology and molecular genetics theory with emphasis on clinical significance relating to medical application.
- To provide knowledge of immunology, HLA, molecular genetics, and cytogenetics, and an understanding of test principles and equipment used in these areas.
- To provide an understanding of the concepts, clinical practices, and techniques associated with modern transfusion medicine.
- To increase the understanding of Immunohematology through practical application, performing routine procedures, and preparing blood components for transfusion.
- To prepare students to become competent and confident medical laboratory scientists in the Transfusion Services department of the laboratory.

DIDACTIC COURSE

IMMUNOLOGY/GENETICS

Outline

I. Genetics (Molecular, Cytogenetics, Biochemical Genetics)
II. Overview of Immunology
III. Antigens and Antibodies
IV. Cellular Activities of the Immune Systems
V. Soluble Mediators
VI. Agglutination Methods
VII. Infectious Diseases
VIII. Streptococcus
IX. Syphilis
X. Tickborne Diseases
XI. Toxoplasmosis
XII. Cytomegalovirus
XIII. Infectious Mononucleosis
XIV. Rubella Infection
XV. Acquired Immunodeficiency Syndrome
XVI. Hypersensitivity
XVII. Autoimmune Disorders
XVIII. Systemic Lupus Erythematosus
XIX. Rheumatoid Arthritis
XX. Histocompatibility Testing
XXI. Math Computation

Learning Objectives

Upon completion, the student should be able to:

1. Explain the principle of molecular genetics.
2. Define common terms used in the molecular lab.
3. Differentiate characteristics of the DNA and RNA molecules.
4. Describe DNA sequencing.
5. Describe the polymerase chain reaction (PCR) amplification technique.
6. Differentiate test principle of in-situ (FISH), Southern Blot, PCR methods, and MicroArray.
7. Discuss diagnostic value of molecular testing.
8. Name tests currently using PCR technology.
9. Describe the first line of defense, natural immunity, and adaptive immunity as body defense systems against microbial diseases.
10. Name and describe the characteristics of each of the five immunoglobulin classes.
11. Describe the characteristics of a primary and secondary (anamnestic) response.
12. Describe the method of production of a monoclonal antibody.
13. Discuss the role of cellular immunity and humoral immunity.
14. Discuss the function of primary and secondary lymphoid tissue.

15. Compare disorders with immunologic (lymphocytic or plasma cell) origin.
16. Explain the biologic functions of the complement system.
17. Assess complement levels from laboratory data.
18. Compare various other types of nonspecific mediators of the immune system (e.g., cytokines, interleukins, tumor necrosis factor, hematopoietic growth factors, and chemokines).
19. Discuss the clinical applications of C-reactive protein.
20. Compare acute-phase reactant methods.
21. Describe the principles of agglutination and precipitation methods.
22. Compare the characteristics of latex agglutination, flocculation test, direct bacterial agglutination, indirect or passive hemagglutination, and hemagglutination and Ouchterlony tests.
23. Describe characteristics in the acquisition and development of infectious diseases.
24. Explain how the body develops immunity to bacterial, parasitic, fungal, viral, rickettsial, and mycoplasmal diseases.
25. Describe the laboratory detection of immunologic responses.
26. Describe the etiology, epidemiology, signs and symptoms, complications, and lab testing of streptococcal infection, syphilis, toxoplasmosis, CMV, infectious mononucleosis, EBV, rubella.
27. Describe the principles involved in a single dilution and a serial dilution utilizing the components of volume, concentration, and titer and associate with clinical significance (i.e., acute or convalescent phase).
28. Describe the etiology, epidemiology, signs and symptoms, treatment, prevention, and diagnostic evaluation of Rocky Mountain Spotted Fever, and Lyme, Ehrlichiosis, Babesiosis, Leptospirosis diseases, human immunodeficiency virus (HIV-1), systemic lupus erythematosus (SLE), rheumatoid arthritis (RA).
29. Discuss laboratory evaluation of antinuclear antibodies.
30. Define hypersensitivity and anaphylactic reactions.
31. Describe the nature of autoimmune disorders.
32. Explain the clinical application of histocompatibility testing.
33. Evaluate case studies and choose appropriate disease or disorder.

CLINICAL ROTATION – IMMUNOLOGY

Psychomotor Behavior Objectives

Upon completion of this rotation, the student will:

1. Identify appropriate specimens for immunology testing according to:
    a. Type (i.e., plasma, serum, whole blood)
    b. Labeling requirements
    c. Gross appearance
    d. Sample requirements
2. Organize workload in an efficient matter (i.e., STATs, ASAPs, routines) according to laboratory policy.
3. Explain principle and significance of each of the following tests according to laboratory policy:
    a. RPR
    b. CSF VDRL
    c. Fluorescence antibody testing (ANA) - CD reference tutorial
    d. EIA microtiter, DSX assays (Rubella, EBV, CMV, H. pylori, mycoplasma), Syphilis
    e. Agglutination test (Streptozyme, Mono Test, RPR, CSF VDRL)
    f. Immunodiffusion test (fungal)
    g. Luminex (ANA, ENA, DNA), HSV I/II, Vasculitis (anti-MPO, anti-PR3, anti-GBM)
    h. ImmunoCap Specific and Total IgE
    i. Human karyotyping by situ hybridization
    j. Nucleic acid extraction
    k. PCR amplification
    l. Viral quantitation
    m. Genotyping assay
    n. Real-time PCR
    o. Gel electrophoresis
    p. Liquid Chromatography and Tandem Mass Spectrometry
4. Select correct controls and perform QC testing; record values within acceptable ranges on maintenance sheets.
5. Perform the following procedures with 100% accuracy:
    a. RPR
    b. CSF VDRL
    c. Streptozyme
    d. Monospot test
    e. Immunodiffusion test (fungal serology: Histoplasmosis, Coccidioides, Candida, Aspergillus, and Blastomycosis)
    f. via DSX: CMV G and M, Rubella G, EBV G and M, H. pylori, Mycoplasma IgG, Syphilis
    g. Mycoplasma IgM
    h. via Luminex: ANA, ENA, DNA, ANCA, HSV)
    i. via ImmunoCAP: Allergy-specific and total

j. Karyotyping (with supervision)
k. Nucleic Acid Extraction (with supervision)
l. Polymerase chain reaction and restriction enzyme digestion (with supervision)

6. Interpret reactions of tests listed in objective #5 according to laboratory policy (i.e., matching the interpretation of the medical technologist):
    a. Positive or reactive
    b. Negative or non-reactive
    c. Serial dilution (titer is indicated)
    d. Cross reactivity
7. Using reference materials, discuss different ANA patterns associated with disease states.
8. Set up dilutions and calculate dilution (i.e., titer) with 100% accuracy (RPR, Streptozyme).
9. Using reference materials, state conditions which may cause false reactions of RPR.
10. Operate and perform instrument maintenance according to manufacturer's requirements and laboratory policy:
    a. Luminex
    b. Dynex DSX
    c. Micropipettes (Rainin, Ovation, MLA)
    d. ImmunoCAP 250
11. Troubleshoot problems with supervision or with the use of reference material (i.e., interference substances, instrument malfunctions, patient critical values).
12. Record results on worksheet and/or in computer with 100 % accuracy.
13. Replenish reagents, diluents, and keep clean work area according to laboratory policy.
14. Adhere to safety procedures according to regulatory agencies and laboratory policy.
15. Comply with HIPAA (i.e., confidentiality) established guidelines and hospital policy.

Affective Behavior Objectives

Upon completion of the rotation in this department, the student shall demonstrate a professional attitude by the following behaviors:

1. Exhibits confidence in abilities, consistent with present level of experience.
2. Recognizes limitations and asks for guidance and/or assistance when necessary.
3. Admits mistakes readily, takes steps to correct them, does not rationalize or blame others for the mistakes, and learns from them.
4. Presents neat, clean appearance and complies with hospital and departmental dress code, including ID badges.
5. Exhibits a working knowledge and acceptance of hospital and laboratory policies (patient right to privacy).
6. Maintains considerate, caring, and friendly attitude toward patients, co-workers, health professionals, and visitors.
7. Expresses oneself effectively in written, verbal, and/or non-verbal communication.
8. Listens to and follows directions in a positive manner.
9. Demonstrates willingness and the ability to work effectively with others.

10. Accepts suggestions to improve performance and modifies behavior accordingly.
11. Demonstrates consistently the ability to produce quality work with acceptable accuracy.
12. Organizes work for maximum efficiency and priority (ex: STAT, ASAP).
13. Confirms identity of patient and/or specimen and is able to determine if specimen is acceptable for analysis.
14. Verifies abnormal results before reporting and is aware of normal results.
15. Reports test results on patients accurately and legibly onto workcards and/or worklists.
16. Utilizes computer properly to order tests, enter results, and obtain information.
17. Demonstrates the ability to read and understand written procedures by following printed instructions.
18. Transfers information and/or work experience from one situation to another (ex: lecture to lab, dept to dept, procedure to procedure).
19. Retains information and/or knows where to look for the information if forgotten (ex. results, procedures, supplies).
20. Arrives on time to the department at the beginning of the shift, and returns promptly from lunch, breaks, and class.
21. Notifies technologist when leaving for lunch, break, class, or other activity.
22. Follows standard of attendance, notifies the department in case of absence or tardiness.
23. Utilizes time effectively when work is complete, and looks for other tasks to do without being reminded.
24. Leaves equipment and/or work area clean, neat, and well-stocked without being reminded.
25. Offers assistance throughout the department as the situation dictates.
26. Locates test results and/or specimens as needed and without assistance.
27. Accepts responsibility for his/her duties and work area.
28. Adheres to safety rules as outlined in the Laboratory Safety Manual.
29. Demonstrates the ability to locate and select Safety Data Sheets for handling and disposing of chemicals, if necessary.
30. Uses personal protective equipment (lab coat, gloves, face shield) when appropriate.

DIDACTIC COURSE

Immunohematology (Blood Bank/Transfusion Services)

Outline

I. Fundamentals of Genetics: Blood Bank Applications
II. Immunology: Review and Applications
III. ABO and H Blood Group Systems
IV. ABO Subgroups and Bombay Phenotype
V. Resolving ABO Typing Discrepancies
VI. Secretor and Soluble ABH Antigens
VII. The Rh Blood Group System
VIII. Hemolytic Disease of the Newborn and Fetus

IX. Antibody Identification: Antibody Screen
X. Antibody Identification: Direct Antiglobulin Test
XI. The Lewis, I, P and Globoside Blood Groups
XII. Other Blood Groups: MNS
XIII. Other Blood Group Systems: Kell, Duffy, Kidd, Lutheran
XIV. HTLA Antibodies
XV. Compatibility Testing
XVI. Antibody Identification: Antibody Panel
XVII. Antibody Identification: Selected Cell
XVIII. Antibody Identification: Enzyme
XIX. Selection of Appropriate RBCs for Transfusion
XX. Antigen Typing and QC
XXI. Donor Screening and Blood Collection
XXII. Component Preparation
XXIII. Blood Component Preservation and Storage
XXIV. Component Therapy
XXV. Transfusion Issues in Selected Patient Populations
XXVI. Adverse Effects of Blood Transfusion: Immediate and delayed reactions, diseases
XXVII. Autoimmune and Drug-Induced Immune Hemolytic Anemias
XXVIII. Safety
XXIX. Quality Control, Quality Assurance, Quality Improvement
XXX. Record Keeping and Computers
XXXI. Hematopoietic Progenitor Cells
XXXII. HLA Blood Group

Learning Objectives

Upon completion, the student should be able to:

1. Discuss the basic genetic inheritance principles.
2. Construct an inheritance pedigree from provided data.
3. Apply genetic terminology associated with gene transmission, gene interaction, and genotype frequencies.
4. List the four ABO blood types and their respective antigens, including weak subgroups, secretor gene association, and Bombay and para-Bombay genotypes.
5. Resolve ABO discrepancies based on given information.
6. Describe the following: chimerism, polyagglutination, rouleaux, and mixed field agglutinations.
7. Identify the most common red blood cell group systems, their antigens, and respective antibodies from an antibody identification panel.
8. Compare and contrast the principle of the following antibody identification methods: LISS, Gel, solid phase, Peg, and enzyme-treated RBCs.

9. Calculate the percentage of compatible units of blood in random donors when a patient is presented with single or multiple antibodies.
10. Discuss the etiology, clinical features, and laboratory findings of hemolytic disease of the newborn (HDN), including screening and diagnostic blood bank tests.
11. Calculate the appropriate dose of RhIg (Rh immune globulin) to be given to Rh-negative mothers when they give birth to an Rh-positive child, or when they have a large fetomaternal bleed.
12. State the special needs of neonatal transfusion therapy, and special cases concerning exchange transfusion and extra corporeal membrane oxygenation (ECMO).
13. Explain the principle of blood transfusion utilization and blood component therapy (red blood cells, fresh frozen plasma, platelets, and cryoprecipitate).
14. Calculate the approximate increase in hemoglobin and hematocrit in a patient who received red blood cells.
15. Discuss the clinical application of platelet pheresis and platelet concentrate, and their respective increase in platelet counts in a non-bleeding patient.
16. Evaluate a case study of a questionable transfusion reaction, post-transfusion work-up, and possible treatment.
17. Differentiate the etiology, clinical features, and laboratory findings of the following:
    a. immediate transfusion reaction
    b. delayed transfusion reaction
    c. transfusion-transmitted risk associated with hepatitis, CMV, HIV, and bacteria

CLINICAL ROTATION – IMMUNOHEMATOLOGY (BLOOD BANK/TRANSFUSION SERVICES)

Psychomotor Behavior Objectives

Upon completion of this rotation, the student will:

1. Identify patient specimen labeling and specific age requirements according to AABB Standards and laboratory policy.
2. Perform specimen accessioning according to laboratory policy.
3. Perform patient file check on each received specimen according to AABB Standards and laboratory policy.
4. Identify the appropriate specimen for each procedure listed according to the Blood Bank Standard Operating Procedure Manual:
    a. ABO/Rh
    b. Antibody screen and identification
    c. Antigen typing
    d. Red cell compatibility testing (immediate spin and AHG crossmatch)
    e. Cord blood testing

f. Fetalscreen
g. Eluates (discussion only)
h. DAT

5. Organize workload in an efficient matter (i.e., STATs, ASAPs, routines) according to laboratory policy.
6. Recognize the importance of each step of the following procedures according to manufacturer's recommended methodology and Blood Bank Standard Operating Procedure Manual:
    a. Tube labeling
    b. Preparation of red cell suspensions
    c. Accurate reagent/sample dispensing
    d. Effect of hemolysis/lipemia/clots on test results
    e. Stability of reagents/samples
    f. Testing sequence
    g. Effect of testing phases on reagents/samples (IS, 37ºC, AHG)
    h. Effect of enhancement on testing (LISS, saline, enzymes, PEG)
7. Discuss the principle of operation of the Tango according to laboratory policy and manufacturer's recommended methodology.
8. Operate the following instruments according to manufacturer's requirements:
    a. Heat blocks
    b. Refrigerators
    c. Freezers
    d. Waterbaths
    e. Centrifuges
    f. Blood component irradiator
    g. Sterile connecting device
9. Select correct controls and perform QC testing and record values within established acceptable ranges.
10. Perform the following procedures with 100% accuracy:
    a. ABO and Rh typing
    b. Antibody screen (LISS)
    c. Antibody identification panel
    d. Antigen typing on patient and donor units
    e. Rh phenotyping and genotyping
    f. Weak D typing
    g. DAT
    h. Fetalscreen
    i. Crossmatching (IS, AHG, EC)
11. Issue blood components under the supervision of a medical laboratory scientist according to established lab policy.
12. Analyze problems in procedures and troubleshoot according to AABB Standards and lab policy.
    a. ABO typing discrepancies
    b. Mixed field reactions

c. File check discrepancies
d. Component issue discrepancies
e. Specimen problems (labeling, gross appearance)
f. Transfusion reactions

13. Order and receive blood components from blood supplier according to laboratory policy.
14. Perform ABO/Rh confirmation typing on PRBC units from blood supplier with 100 % accuracy.
15. Explain the importance of component processing procedures according to AABB Standards and laboratory policy:
    a. Storage requirements
    b. Expiration date/time requirements
    c. Component labeling requirements
    d. Aseptic technique
    e. Special requirements (irradiation, leukoreduction, CMV-negative)
    f. Indications for transfusion
    g. Component selection
16. Process the following components/products (thawing, pooling, aliquoting, etc.) according to AABB Standards and laboratory policy:
    a. Packed red blood cells
    b. Fresh frozen plasma
    c. Platelets
    d. Cryoprecipitate
    e. Rh immune globulin (RHIG)
17. Record results on workcard, worksheet, and/or in the computer with 100% accuracy.
18. Replenish reagents, diluents, and keep clean work area in accordance to laboratory policy.
19. Adhere to safety procedures according to OSHA and laboratory policy.
20. Comply with HIPAA (confidentiality) established guidelines.

Affective Behavior Objectives

Upon completion of the rotation in this department, the student shall demonstrate a professional attitude by the following behaviors:

1. Exhibits confidence in abilities, consistent with present level of experience.
2. Recognizes limitations and asks for guidance and/or assistance when necessary.
3. Admits mistakes readily, takes steps to correct them, does not rationalize or blame others for the mistakes, and learns from them.
4. Presents neat, clean appearance and complies with hospital and departmental dress code, including ID badges.
5. Exhibits a working knowledge and acceptance of hospital and laboratory policies (patient right to privacy).
6. Maintains considerate, caring, and friendly attitude toward patients, co-workers, health professionals, and visitors.
7. Expresses oneself effectively in written, verbal, and/or non-verbal communication.
8. Listens to and follows directions in a positive manner.

9. Demonstrates willingness and the ability to work effectively with others.
10. Accepts suggestions to improve performance and modifies behavior accordingly.
11. Demonstrates consistently the ability to produce quality work with acceptable accuracy.
12. Organizes work for maximum efficiency and priority (ex: STAT, ASAP).
13. Confirms identity of patient and/or specimen and is able to determine if specimen is acceptable for analysis.
14. Verifies abnormal results before reporting and is aware of normal results.
15. Reports test results on patients accurately and legibly onto workcards and/or worklists.
16. Utilizes computer properly to order tests, enter results, and obtain information.
17. Demonstrates the ability to read and understand written procedures by following printed instructions.
18. Transfers information and/or work experience from one situation to another (ex: lecture to lab, dept to dept, procedure to procedure).
19. Retains information and/or knows where to look for the information if forgotten (ex. results, procedures, supplies).
20. Arrives on time to the department at the beginning of the shift, and returns promptly from lunch, breaks, and class.
21. Notifies technologist when leaving for lunch, break, class, or other activity.
22. Follows standard of attendance, notifies the department in case of absence or tardiness.
23. Utilizes time effectively when work is complete, and looks for other tasks to do without being reminded.
24. Leaves equipment and/or work area clean, neat, and well-stocked without being reminded.
25. Offers assistance throughout the department as the situation dictates.
26. Locates test results and/or specimens as needed and without assistance.
27. Accepts responsibility for his/her duties and work area.
28. Adheres to safety rules as outlined in the Laboratory Safety Manual.
29. Demonstrates the ability to locate and select Safety Data Sheets for handling and disposing of chemicals, if necessary.
30. Uses personal protective equipment (lab coat, gloves, face shield) when appropriate.

4351 TOPICS IN MEDICAL TECHNOLOGY

4351 TOPICS IN MEDICAL TECHNOLOGY **1 Semester Hour**

Lectures on principles and practices of the medical laboratory, including management education (health care delivery systems, ethics, professionalism, communication skills, human resources, and financial management), medical terminology, performance improvement, education methodology, laboratory information systems, safety and governmental regulations, and research design/special projects.

COARSE GOALS

- To provide an overview of phlebotomy, including proper blood collection technique resulting in the collection of a quality blood specimen with minimal patient discomfort.

- To provide the student with basic knowledge in areas of management principles, financial management, human resource management, communication skills, educational principles, current issues in the profession, team leadership and group networking, research design, and continuing education.

- To provide the student with an understanding of computer concepts, the laboratory information system (LIS), and the hospital information system (HIS).

- To provide an introduction to the clinical laboratory, laboratory safety principles, general laboratory practice, and application of laboratory data.

DIDACTIC COURSE

PHLEBOTOMY

Outline

I. Introduction to Blood Collection
II. Venipuncture Equipment
III. Routine Venipuncture
IV. Complications and Additional Techniques
V. Special Venipuncture Collection and Preanalytical Variables
VI. Dermal Puncture
VII. Point-of-Care Testing
VIII. IV Insertion and Central Venous Catheter Access

Learning Objectives

Upon completion, the student should be able to:

1. Know how to collect and handle blood specimens for analysis and the differences between serum, plasma, and whole blood.
2. Know the safety precautions when collecting blood samples, universal (standard) precautions, and equipment safety to include sharps for needle disposal
3. Discuss procedures to prevent hemolysis
4. Describe how to collect blood in collecting tubes for analysis (clotted blood and anticoagulated blood) and employ proper order of draw when collecting blood in multiple types of vacuum tubes
5. Discuss anticoagulants, and know effects of improper anticoagulant use
6. Know procedure for blood culture collection
7. Know the proper labeling of blood tubes including sentinel event with blood bank arm bands
8. Explain infant blood collection through heel puncture
9. Discuss patient identification and their rights
10. Discuss the roles of the major parts of the body.
11. Describe safety in the healthcare setting.
12. Explain personal wellness.
13. Discuss infection control in the hospital.

LABORATORY MANAGEMENT

Outline

I. Health Care Systems
II. Organizational Structure
III. Principles of Leadership
IV. Management Functions
V. Managerial Problem Solving
VI. Human Resources Management
VII. Communication Skills
VIII. Planning and Financial Management
IX. Quality Program for Healthcare Systems
X. Accreditation, Licensure, and Regulations
XI. Resume/Cover Letter
XII. Professional Advancement/Alternate Career Paths
XIII. Professional Issues/Ethical Considerations
XIV. Group Dynamics and Teamwork

Learning Objectives

Upon completion, the student should be able to:

1. Describe the health care system in the United States.
2. Differentiate the professional cultures among health care profession groups.
3. Define administration and management.
4. Discuss management to include, purchasing, inventory control, human resource management, time management, motivation, decision making, and communication.
5. Assess the duties of a laboratory manager to include: purchasing, billing, cost accounting, personnel, budget, and education.
6. Construct an administrative laboratory organization chart and a technical laboratory organization chart.
7. Explain the phases of the administrative process.
8. Discuss the importance and roles of human resource management in an organization.
9. Discuss the rights of healthcare employees and the laws that protects them in the work place.
10. Discuss the different decision making approaches: authoritarian, democratic, consensus, laissez-faire.
11. List the steps involved in problem-solving.
12. Describe the use of discipline in the management of employees.
13. Outline the different types of budgets used in the management of finances.
14. Define: cost management, cost analysis, cost accounting.
15. Define motivation.
16. Compare and contrast management styles - Theory X and Theory Y.
17. Explain Maslow's Hierarchy of needs concerning employee motivation.
18. Discuss the Two-factor Theory as it relates to the motivation and satisfaction of employees.
19. Define communication.
20. List modes, levels, and barriers of communication.
21. Define work ethics.

22. Discuss why work ethic is so important in the information age workplace and why it will continue to be important in the future.
23. State the role of interpersonal skills as an aspect of work ethic.
24. Develop strategies for improving interpersonal skills.
25. Discuss how initiative is an important part of work ethic.
26. Evaluate one's own initiative, and to learn to use initiative in appropriate and productive ways in the workplace.
27. State the importance of being dependable and identifying areas for improving personal dependability.
28. Discuss the importance of professionalism among healthcare employees.
29. Recognize related worker characteristics that employers are seeking.
30. Discuss the CLIA of 1988.
31. List several general industry standards (Code of Federal Regulations) related to the laboratory.
32. Discuss HIPAA and the Privacy Rule.
33. Explain when healthcare information can be released according to HIPAA.
34. Discuss Clinical Laboratory Safety and OSHA.
35. Differentiate between accreditation and certification.
36. List several health care accrediting agencies.
37. List several certifying agencies for laboratory personnel.
38. List the standards by which clinical laboratory professionals practice their profession.
39. Discuss the evolution quality management in the laboratory.
40. State the importance of scientific research.
41. Explain the process of critical analysis of publications to include initial appraisal and content analysis in order to be an informed consumer of research publications.
42. Explain research protocol (ie., purpose, design, source of population, analysis).
43. Discuss the ethical principles for research.
44. List the steps for reading a scientific research paper.
45. Define critical pathways.
46. Define clinical pathways.
47. Explain the use of clinical algorithms for the solution of problems.
48. Define performance improvement.
49. Discuss quality control necessary in the clinical laboratory and for point-of-care testing
50. Discuss proficiency testing and appropriate corrective action
51. Understand the differences between accuracy and precision.

EDUCATIONAL METHODOLOGY

Learning Objectives

Upon completion, the student should be able to:

1. Define learning.
2. Compare and contrast the major learning and behavioral theories.
3. Identify the knowledge, skills and attitudes the graduate of an educational program should possess.
4. List the components of an objective.
5. List the three domains of learning behaviors.
6. Identify strategies for curriculum development.

7. Outline teaching strategies commonly used in the delivery of a lesson.
8. Compare and contrast norm referencing verus criterion referencing.
9. Define the taxonomy levels of test items.
10. Identify the taxonomy levels of test items on examinations.
11. Discuss at least four types of test questions of examinations.
12. Compare continuing education opportunities for medical technologists.
13. List several ways to master test-taking skills.
14. Manage and present information pertaining to the job of a Medical Technologist to an audience.

LABORATORY INFORMATION SYSTEM

Learning Objectives

Upon completion, the student should be able to:

1. Understand laboratory computer systems.
2. State the difference between hardware and software, and give examples.
3. Differentiate operating system software from application software, and give examples of each.
4. Discuss the function of input, output and processing information.
5. Discuss the types of networks based on their size, topology, and design.
6. Construct a diagram of a hospital information system demonstrating how each module relates to another.
7. Discuss patient confidentiality issues with laboratory information system.
8. Differentiate patient labels produced by laboratory information systems.
9. Evaluate various laboratory information systems and rank each one.
10. Assess the advantages and disadvantages of laboratory information system instrument interfaces and list the types of interfaces.
11. Estimate the computer skill levels required for various laboratory positions.

LABORATORY SAFETY

Learning Objectives

Upon completion, the student should be able to:

1. Discuss standard precautions and safety.
2. Describe the importance of safety in the laboratory.
3. List the five classes of fires
4. Outline the classes of fire extinguishers.
5. Outline RACE and PASS in reference to fire safety.
6. Describe the importance of electrical, chemical, and radiation safety.
7. List basic first aid practices.
8. Discuss the importance of personal wellness and identify ways to control stress.
9. Define nosocomial infection.
10. Describe the universal precautions utilized in the hospital setting.

CLINICAL ROTATION - PHLEBOTOMY

Psychomotor Behavior Objectives

At the end of this rotation, the students should be able to:

I. Obtaining Blood Samples

1. Identify correct patient properly
2. Select appropriate containers for specimens and know requirements for container identification
3. Know physiological aspects of blood collection
4. Prepare patient for various tests
5. Select proper venipuncture site
6. Perform venipunctures
7. Collect specimen in proper tube draw sequence
8. Perform skin punctures
9. Perform heel punctures on infants
10. Provide proper post care of venous, arterial, & skin puncture sites
11. Handle blood samples to maintain specimen integrity
12. Label transfusion services (blood bank) specimens according to proper protocol
13. Perform blood cultures according to proper protocol

II. Specimen Collection and Processing

1. Properly handle non-blood specimens to maintain their integrity
2. Properly collect and handle specimens with time/temperature requirements
3. Properly collect and handle specimens for blood cultures
4. Select proper station for specimen delivery
5. Process specimens for shipping
6. Instruct patient in the collection of urine specimens
7. Instruct patient in the collection of other specimens

III. Time Management and Assignment Organization

1. Read physician orders and requisitions
2. Set priorities for specimen collection
3. Schedule time intervals for tolerance tests
4. Schedule time intervals for drug-dependent tests
5. Refer problems to supervisor appropriately
6. Cooperate with co-workers in the completion of assignments

IV. Professional Communications

1. Develop and use proper and professional communication skills with staff, patients, and families
2. Use proper technique and etiquette for answering the telephone
3. Inform patients of special test

V. Clerical Skills and Duties

1. Chart or file laboratory-generated reports properly
2. Enter, retrieve, and verify patient collection data and special notations using appropriate sources
3. Maintain inventory levels, order and restock supplies

4. Employ computer skills to include using HLAB and Mobile Care Phlebotomy

VI. Safety Standards and Procedures

1. Identify appropriate regulatory and standard-setting agencies
2. Know the use of material safety data sheets
3. Employ Universal/Standard precautions
4. Employ infection control and isolation techniques
5. Recognize patient problems related to syncope, nausea, and other complications

VII. Legal, Ethical, and Professional Considerations

1. Know principles of liability regarding the practice of phlebotomy
2. Perform duties professionally, ethically, and legally, adhering to criminal justice and civil rights acts
3. Employ professional conduct and appearance in the performance of duties

VIII. Terminology, Anatomy, and Physiology

1. Employ basic terminology including suffixes, prefixes, and root words
2. Know basic anatomy
3. Know basic physiological systems

Affective Behavior Objectives

Upon completion of the rotation in this department, the student shall demonstrate a professional attitude by the following behaviors:

1. Exhibits confidence in abilities, consistent with present level of experience.
2. Recognizes limitations and asks for guidance and/or assistance when necessary.
3. Admits mistakes readily, takes steps to correct them, does not rationalize or blame others for the mistakes, and learns from them.
4. Presents neat, clean appearance and complies with hospital and departmental dress code, including ID badges.
5. Exhibits a working knowledge and acceptance of hospital and laboratory policies (patient right to privacy).
6. Maintains considerate, caring, and friendly attitude toward patients, co-workers, health professionals, and visitors.
7. Expresses oneself effectively in written, verbal, and/or non-verbal communication.
8. Listens to and follows directions in a positive manner.
9. Demonstrates willingness and the ability to work effectively with others.
10. Accepts suggestions to improve performance and modifies behavior accordingly.
11. Demonstrates consistently the ability to produce quality work with acceptable accuracy.
12. Organizes work for maximum efficiency and priority (ex: STAT, ASAP).
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17. Demonstrates the ability to read and understand written procedures by following printed instructions.
18. Transfers information and/or work experience from one situation to another (ex: lecture to lab, dept to dept, procedure to procedure).
19. Retains information and/or knows where to look for the information if forgotten (ex. results, procedures, supplies).
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21. Notifies technologist when leaving for lunch, break, class, or other activity.
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24. Leaves equipment and/or work area clean, neat, and well-stocked without being reminded.
25. Offers assistance throughout the department as the situation dictates.
26. Locates test results and/or specimens as needed and without assistance.
27. Accepts responsibility for his/her duties and work area.
28. Adheres to safety rules as outlined in the Laboratory Safety Manual.
29. Demonstrates the ability to locate and select Safety Data Sheets for handling and disposing of chemicals, if necessary.
30. Uses personal protective equipment (lab coat, gloves, face shield) when appropriate.

THE RIGHT FIT

Do your research and make sure you are prepared for the career path you have chosen.
By Diane Hendrickson
Last updated on: April 11, 2011 | Posted on: March 14, 2011

Is this the right field for me (aka, who am I and why am I here)? I, as a student, have asked myself this on many occasions.
Let's face it. Starting a clinical lab career at any level is a challenge. Students must tackle difficult subject matter, demonstrate competency in clinicals, pass a certification exam, and land their first job in a new field (ideally with plenty of coffee on hand).
I must admit I do seem particularly inquisitive on late nights before a test, or at 4:15 a.m., when I get up to go to clinical. However, I think there is a lot of value in asking this question in the light of day.

Due Diligence
I have, in an effort to determine if I am unusual in contemplating the issue, asked fellow classmates and coworkers how they came to the conclusion that they should embark on their own journey in the field. I remain unimpressed with the answers. It would seem that, at least among those I have casually polled, many did not put a lot of thought into it.
Given the gravity of the decision, I am amazed. Considering all of the hard work and effort (and money) it takes to successfully complete a clinical lab science program, we owe it to ourselves to do some serious research to help determine whether or not this career is a good fit for us.
Additionally, medical lab personnel staffing levels are critically low. It is equally important for the industry that as many students as possible find their way through programs, pass the certification exams, and get jobs in the field.
Disclaimer: I did most of this research beforehand. Some of it has only occurred to me while undergoing the process. We cannot know everything there is to know until we experience it, in which case, we will have more things to consider.
If you have not done your due diligence, start now. Here are some important questions to ask yourself (if they have not occurred to you previously).

- What will the daily responsibilities of this job be? I strongly suggest taking a tour of a lab beforehand.
- Do I mind standing for long hours at a time?
- Do I like shift work? What shift would I most like to work? Are there jobs available on that shift?
- How good am I technically? Do I have good hand/eye coordination?
- Do I exhibit excellent attention to detail?
- Can I work quickly with a high degree of accuracy?
- Do I have any problem working with hazardous chemicals and body fluids of every kind?
- What are my career goals?
- Do I just want/need a job, or do I want to grow with a career?

- What are my salary expectations?
- How much education is needed to reach my salary goal in this career?
- If more education is needed, are there schools available? Can I afford to go?
- Am I entering the field early enough to reach my salary goals over time?
- Similarly, is there enough time to build up enough seniority in the field to make a decent wage compared to other fields you could get into?
- Does my personality fit this career path?

  In my experience, the most awesome tool for evaluating predisposition is a personality test. You can find many online, often for free or little cost. They have helped me tremendously in determining exactly where my strengths and weakness are, and in what career situations I will find the most satisfaction. Answer the following questions:

- Am I able to accept criticism/feedback?
- Am I a conscientious worker?
- Do I work well with others on a team?
- Can I work alone without much supervision?

Now I have gotten you off to a good start. It's time to hear from you. What questions do you have? I look forward to hearing from you.

Diane Hendrickson is a clinical lab student in Asheville, NC. She has a Bachelor of Arts degree in Communications, with a background in marketing/communications and writing.

Article can be viewed at: http://laboratorian.advanceweb.com/Features/Articles/The-Right-Fit.aspx

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Comanche County Memorial Hospital
SCHOOL OF
Medical Laboratory Science

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Time : June - July

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Junior Science Majors!!!!!

Do you want to have first hand experience of MLS school before you apply?

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Application Deadline:
First Friday in May

You must meet CCMH requirements for final acceptance.

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SHADOWING PROGRAM APPLICATION

ProjectedMLS School Internship Year: _____ to _____

NAME: _____ SS#: (_____) – (_____) – (_____)
(Last) (First) (Maiden/Middle)

PRESENT
ADDRESS: _____ Tele: (_____) _____
(Street/Box #) (City) (State) (Zip)

E-MAIL ADDRESS: _____

NAME OF UNIVERSITY: _____

CURRENT COLLEGE ADVISOR: _____

TOTAL COLLEGE HOURS COMPLETED: _____ OVERALL GRADE POINT AVERAGE: _____

HONORS & ACTIVITIES AT COLLEGE: _____

_____

_____

HIGH SCHOOL ATTENDED: _____
(Name) (Address) (Date Graduated)

IN YOUR OWN HANDWRITING, PLEASE STATE WHY YOU ARE INTERESTED IN MEDICAL LABORATORY SCIENCE:

SHADOWING HOURS REQUESTED:

- ☐ 16 hours (minimum)
- ☐ 20 hours
- ☐ 30 hours
- ☐ 40 hours (maximum)
- ☐ Other _____

DATE AVAILABLE:

_____

DAYS AVAILABLE AND TIME:

_____

_____

_____

I HEREBY DECLARE THAT ALL OF THE ABOVE STATEMENTS ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.

Signed:_____ Date: _____ 201_____

Print Name:_____

PLEASE ENCLOSE THE FOLLOWING, and mail to Comanche County Memorial Hospital Lab; Stacey Paryag, MPA, AHI(AMT), MLS(ASCP)CM; Program Director; 3401 West Gore Boulevard, Lawton, OK 73505.

- ☐ Completed application (this form)
- ☐ Current college transcript (unofficial/photocopy acceptable)

Application Deadline: First Friday in May

A Certificate of Participation is awarded to the applicant upon successful completion.

Comanche County Memorial Hospital
SCHOOL OF
Medical Laboratory Science

Address: P.O. Box 129
3401 W Gore Blvd,
Lawton, OK 73505.
Tel: (580) 704-7650
Fax: (580) 585-5462
Website: www.ccmhmlsschool.org

Program Director: Stacey Paryag-Stevens, MPA, AHI(AMT), MLS(ASCP)^{CM}
Email: stacey.paryag@ccmhhealth.com

WHAT MEDICAL LABORATORY SCIENTIST DO

The Medical Laboratory Scientist (MLS) is responsible for confirming the accuracy of test results and reporting laboratory findings to the pathologist and other doctors. Laboratory results account for approximately 80 percent of the information used by a doctor to establish a diagnosis.

The MLS must recognize erroneous results and know how to correct them. They monitor, screen, and troubleshoot analytical devices including calibration, quality control, run-by-run assessment, statistical control of observed data, and recording normal operations. To maintain the integrity of the laboratory process, the medical technologist recognizes factors that could introduce error and rejects contaminated or sub-standard specimens. The MLS is also a trained Phlebotomist. Medical Laboratory Scientists work in six major areas of the laboratory: Microbiology, Chemistry, Urinalysis, Blood Bank, Immunology, and Hematology.

All Medical Laboratory Scientists are problem-solvers, like challenges and embrace responsibilities**.**

Educational Requirements

Medical Laboratory Scientists complete a baccalaureate degree program that includes in depth courses for each major discipline as well as management and education courses. Such courses are offered through a hospital-based program that provides the senior year for students from affiliated universities. College graduates who meet a program's prerequisites are also eligible to apply to a medical laboratory science program.

How to Become a Medical Laboratory Scientist

1) Medical Laboratory Scientists (also known as medical technologists or clinical laboratory scientists) must have a B.S. degree.
2) To work as an MLS, you need to be certified by the Board of Certification (BOC) of the American Society for Clinical Pathology (ASCP) once you have a degree.
3) To be eligible to take the MLS Board of Certification examination, you must complete a clinical internship accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS). These programs prepare students with a combination of lectures and clinical rotations in hematology, clinical chemistry, microbiology, mycology, parasitology, immunology, immunohematology (blood bank), and sometimes genetics.

An MLS who gains experience in one of the special areas of the laboratory has the opportunity to advance to a specialist level by taking a specialist examination from a certifying agency.

For someone who chooses a career in the medical laboratory, the exploration never ends.

OUR PROGRAM

Comanche County Memorial Hospital School of Medical Laboratory Science is committed to educate competent Medical Laboratory Scientists with the knowledge and skills necessary to demonstrate entry-level proficiency in all areas of the laboratory and to possess basic management skills, knowledge of educational methodology, hospital and laboratory information systems, and research methods.

Our MLS School is the only accredited program in Southwest Oklahoma by the National Accrediting Agency of Clinical Laboratory Sciences ((NAACLS) 5600 N. River Rd. Suite 720, Rosemont, IL 60018-5119; Ph:773.714.8880; Fax: 773.714.8886; www.naacls.org; info@naacls.org). NAACLS granted re-accreditation to CCMH MLS School March 2017 for 10 years, which will be valid until 2027 for fulfilling all requirements after review of paper and site inspection in 2016. Our program is currently meeting NAACLS program outcome standards of performance and is in good standing.

Students must have a preferable minimum cumulative GPA of "2.8" on a 4.0 grading scale. Students must have a minimum of a "C" grade in ALL Science classes with a "2.5" Science GPA on a 4.0 grading scale. Prerequisites must be completed prior to admission to the medical laboratory science program. Students must be able to execute our Essential Requirements to be granted acceptance. Final acceptance into our program is contingent upon the applicant successfully passing our required physical exam (stipulated shots), drug screen, and criminal background check performed in July before the start of school.

We must receive your official transcript and completed online MLSGO application with paid application fee (via Paypal to MLSGO) by October 15th for your application to be processed. We must receive all other required documents by November 1st to be granted an interview.

There are two hours of classroom lectures daily on most days throughout the fifty-one weeks of the program. MLS students are also rotated into and taught bench work in eight (8) departments of the laboratory: Microbiology, Serology, Chemistry, Hematology, Urinalysis, Blood Bank, Phlebotomy, and Histology. Acceptable scholastic performance in the School of Medical Laboratory Science is defined as 75% - 100% in both Lecture and Departmental rotation. This program has a zero tolerance policy for subordination, unprofessional behavior, and academic dishonesty.

There is a 180 square foot classroom provided for the exclusive use by the MLS students. Discrimination in the School of Medical Laboratory Science based on race, creed, color, national origin, sex, age or handicap is not tolerated.

Come Join Our Team: We go Above & Beyond and Do It Well!

VISIT WWW.CCMHMLSSCHOOL.ORG FOR MORE INFORMATION!

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One-Year Planner

January	February	March	April
May	**June**	**July**	**August**
September	**October**	**November**	**December**

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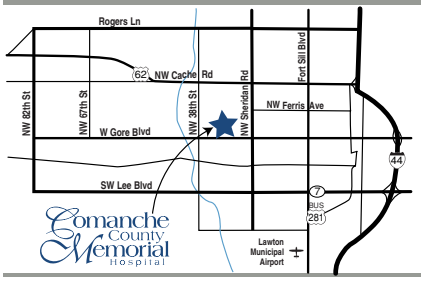
Campus Map

Key

Parking | Drop Off | Heliport | Entrances

Vicinity Map



Building Entrances

BUILDING	ENTRANCE
Comanche County Memorial Hospital	
Main Entrance	1
EMERGENCY	2
Outpatient Center	3
McMahon Memorial Tower	4
Great Plains OB/GYN Clinic	5
Women's Imaging Center	6
Tomlinson Medical Complex	7
McMahon Tomlinson Nursing Center	8

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Join Our Team

We do it Well

Comanche County Memorial Hospital
School of Medical Laboratory Science

3401 West Gore Boulevard • Lawton, Oklahoma

580.704.7650

www.ccmhmlsschool.org