

## CLINICAL LABORATORY SCIENCE TECHNOLOGY 111

### COURSE DESCRIPTION

#### Introduction to Clinical Laboratory Science Technology 2(2)

Introduction of the student to the profession of laboratory medicine. This includes: organizational structure of hospitals and laboratories; medical ethics; related medical terminology; quality assurance; laboratory safety; calculations and knowledge of the basic routine laboratory tests.

*Prerequisite: High School Graduation or GED and acceptance in the Clinical Laboratory Science Technology Program or Phlebotomy Program.*

**Offered Fall Semester**

### COURSE PLACEMENT

First Semester of Clinical Laboratory Science Technology and Phlebotomy Programs

### COURSE FACULTY

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### ACCOMMODATION STATEMENT

A student with a disability who desires special accommodations must inform the Office of Special Needs (O.S.N.) of their disability and need for accommodations. The reason for this is to provide support services to enable a qualified student to be successful. If you are a person with a disability who needs accommodations or assistance, contact the Ms. Theo Scott at the O.S.N. located in Room 115 of the Learning Resource Center, or call at LCCC extension 4058 or 440-366-4058. Students attending the Phlebotomy Program on the campus of Terra Community College are still required to register with LCCC's Office of Special Needs to be evaluated and receive accommodations.

## ELECTRONIC DEVICE POLICY

If electronic devices such as pagers and cellular telephones go off during class, it is disruptive to the educational process, as well as disrespectful to the instructor and fellow classmates. For this reason, use of these devices during class time is PROHIBITED. Students are to TURN OFF their cellular phones and pagers when entering class and store them away. ***There are to be no phones, pagers, PDAs, or any other electronic devices on the desktop during class, quizzes, or exams. THE USE OF CELL PHONES AND PAGERS IS ALSO PROHIBITED DURING ASSIGNED CLINICAL HOURS.*** If a student's cell phone or pager goes off during class, the student will be expected to ***leave class immediately and will not be permitted to return that day.*** If a quiz or exam is being taken, the student will be required to turn in the quiz / exam immediately and leave class, accepting the grade based on the points scored on the portion of the quiz / exam completed.

**Calculator Policy:** During the first semester of the Program, students will be instructed in CLSC 111 the approved type of calculator to be used for all quizzes and exams in the Program. Students are required to purchase the assigned calculator and keep it the entire two years in the Program. It will be the only calculator permitted to be used during quizzes and exams in any CLSC course. Each student must have their own calculator. There will be no sharing of calculators allowed during testing periods.

## PROGRAM ACADEMIC INTEGRITY POLICY

Students caught cheating on any examination or laboratory assignment will be subject to disciplinary action. "Cheating" is defined by ***irregular behaviors*** as observed by Program faculty that include but are not limited to: copying a classmate's answers to test questions or laboratory worksheet questions, allowing a classmate to copy one's answers to test questions or laboratory worksheet questions, looking at a classmate's paper during a quiz or exam *or giving the appearance of looking around the room during a quiz or exam*, falsifying laboratory results, and plagiarism of writing from another source.

**Quizzes and Exams:** Anyone caught cheating on a quiz or exam will be given a score of "zero" for that quiz or exam, and be issued a written Deficiency Notice documenting the incident. If a student is caught cheating on a quiz or exam a second time, they will be immediately dismissed from the Program and receive a grade of "F" for the course.

**College Laboratory:** Anyone caught not doing their own work in the college laboratory (bench testing or written assignments) will be given a written Deficiency Notice documenting the incident and be expected to repeat that laboratory assignment. If a student is caught cheating in the college laboratory a second time, they will be immediately dismissed from the Program and receive a grade of "F" for the course. If written answers to worksheet questions are too similar from two different students, ***both students will be disciplined for cheating according to this policy.*** Students are to answer college laboratory worksheet questions independently and in their own words!

**Clinical Assignments:** Anyone caught lying or cheating in any way at their clinical site will be given an Unsatisfactory (U) clinical grade and immediately dismissed from the clinical site.

## FINAL GRADE EVALUATION

- A. The Final Letter Grade in CLSC 111 will be based on the points accumulated from 6 quizzes worth 20 points each, and Midterm and Final Exam worth 100 points each.

NOTE: The lowest quiz score will be dropped and not counted toward your final grade. Students absent on a quiz day (for any reason) will receive a 0.0 for their first missed quiz. Subsequent missed quizzes may be made up at the discretion of the instructor, and at the first mutually agreeable available time. **One point will be deducted from the score of a make-up quiz for each day that has passed since the date the quiz was originally given. In addition, the student will not be permitted to complete any "extra credit" questions that were part of the original version of the quiz.**

A Midterm Exam and a Final Exam will be given. Examination make-ups will be made at the discretion of the instructor and may require a physician's statement documenting student illness. If an Exam is taken late for any reason, **FIVE POINTS will be deducted from the score of the Exam for EACH DAY that has passed since the date the Exam was originally given. In addition, the student will not be permitted to complete any "extra credit" questions that were part of the original version of the Exam.** Students who cannot take exams as scheduled in any event are expected to **schedule the test ahead of schedule** with the instructor if at all possible.

- B. The following grading scale will be used in all Phlebotomy and CLSC Technology Program courses:
- A = 93 – 100 %
  - B = 85 – 92 %
  - C = 77 – 84 %
  - D = 69 – 76 %
  - F = below 69 %
- C. All students must obtain at least a "C" letter grade in CLSC 111 to continue to the next CLSC or PHBT course in their sequence.

**REQUIRED TEXTBOOK:** There is NO required textbook for this course.

**REFERENCE TEXTBOOK:** Linne, Jean and Ringsrud, Karen, *Clinical Laboratory Science: The Basics*, Mosby Inc., 1999.

## CLSC 111 GRADE RECORD SHEET

Below is a Student Grade Record Sheet that can be used for recording your quiz and exam scores throughout the semester:

Quiz	Student Score	Possible Score
Quiz 1	_____	20
Quiz 2	_____	20
Quiz 3	_____	20
Quiz 4	_____	20
Quiz 5	_____	20
Quiz 6	_____	20
<hr/>		
<b>Midterm Exam</b>	_____	100
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<b>Total Pre-Final Points</b> (drop lowest quiz)	_____	200
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<b>FINAL EXAM SCORE</b>	_____	100
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<b>TOTAL COURSE POINTS</b>	_____	300

GRADING SCALE		
Grade	Percent	Points
A	93-100%	278-300 points
B	85-92%	254-277 points
C	77-84%	230-253 points
D	69-76%	206-229 points
F	0-68%	0-205 points

### ANGEL COURSE MANAGEMENT SYSTEM

Throughout the program, the CLSC faculty may use the online ANGEL course management system to enhance the content and the activities of a course. In addition, faculty make use of the system's gradebook program, so that students can access their current quiz, exam, and overall course grades at any time. **Be aware that, while this feature of ANGEL is convenient, the gradebook does not represent a student's official course grade at any time.** Grades in ANGEL may be revised at any time at the discretion of the instructor. The only official grade awarded to a student is the final course grade entered by faculty into the LCCC WebReg system. Instructions for accessing course grades through the ANGEL system are on the following page.

## ACCESSING YOUR GRADES THROUGH ANGEL

- ANGEL works best with Internet Explorer (may not always work with Netscape)
- From the LCCC home page (www.lorainccc.edu) click on **Angel Login**
- When the Angel page comes up, bookmark it as one of your **Favorites**

(The Angel website does not reside on the LCCC server and does not have to be accessed through the LCCC website. If you have it bookmarked you can access it even when the LCCC server is down.)

- Before attempting to log onto Angel, be sure to read **Required Angel Technical Settings** on the web page. You may need to change some settings in your browser in order for Angel to work (unblock cookies, etc.).
- Log onto Angel with your Student Number and password.

When logging onto Angel for the first time, your **LCCC ID Number** and **Password** are both your LCCC student number. You will then be prompted to change your password after login.

- From your personal Homepage, click on the appropriate course.
- On the Course page, click on **Report** (the last tab on the top right of the page).
- On the **Reports Console** page, choose **Grades** in the **Category** drop-down window.
- Click **Run** in the lower right corner of the displayed page.
  
- Your grades for the entire course will now be displayed, including your overall average course grade with your lowest quiz score dropped. You will need to scroll down through the grade page to see everything.

NOTE: Because the grade book is set up to drop your lowest quiz score, when you have only taken Quiz #1, your overall average score will display as 0% (F). The grade book is dropping your Quiz #1 score. DON'T PANIC! Your overall grade will be correct after Quiz #2 is entered!

## EXPECTED COURSE OUTCOMES

### COGNITIVE:

At the end of this course, the student will be able to:

1. Describe the profession of clinical laboratory science (medical technology) as it relates to issues of accreditation, certification, licensure, and other legislature and regulatory topics
2. Identify various levels of personnel in a clinical laboratory, including the education, qualifications, and professional duties of each.
3. Identify safety protocols and precautions necessary for safe practice in a clinical laboratory.
4. Describe quality assurance and quality control protocols used to ensure the accuracy and precision of clinical laboratory data.
5. Demonstrate knowledge of the various departments in a clinical laboratory, including the most commonly performed laboratory tests in each department.

**EXPECTED COURSE OUTCOMES (continued)****AFFECTIVE:**

At the end of this course, the student will be able to:

6. Demonstrate an ethical and professional attitude in all aspects of their course performance, adhering to all program policies and procedures as delineated in the Program Student Handbook.

**LCCC GENERAL EDUCATION OUTCOMES**

Recognizing the responsibility of the Clinical Laboratory Science Technology and Phlebotomy Programs to address the General Education outcomes established by the College, the content of this course has been developed to include these Outcomes:

<b>General Education Outcomes</b>	<b>Corresponding Course Outcomes</b>
In4: Apply personal, professional, social and civic values.	#6

***See the complete LCCC General Education Policy in the current College Catalog.***

**CLSC 111 2008 LECTURE SCHEDULE**

Lecture Times: Mondays 1:00 - 2:50 p.m.

WEEK	LECTURE DATES	TOPIC
1	8/18	Introduction to the Course Syllabus Introduction to the Profession
2	8/25	Introduction to the Profession
3	9/1	<b>LABOR DAY: No Classes</b>
4	9/8	Laboratory Safety
5	9/15	<b>Quiz #1;</b> Laboratory Safety
6	9/22	<b>Quiz #2;</b> Laboratory Safety Quality Assurance Programs and Quality Control (QC)
7	9/29	Quality Assurance Programs and Quality Control (QC)
8	10/6	<b>Quiz #3;</b> Urinalysis
9	10/13	Urinalysis, Serology
10	10/20	<b>MIDTERM EXAM</b>
11	10/27	Microbiology
12	11/3  <b>11/7 (Friday)</b>	<b>Quiz #4;</b> Microbiology; Hematology  LAST DAY TO COMPLETE WITHDRAWAL FROM CLASSES AND RECEIVE A "W" FOR FALL SEMESTER
13	11/10	Hematology; Coagulation
14	11/17	<b>Quiz #5;</b> Immunohematology
15	11/24  <b>11/27-11/28</b>	Chemistry  <b>Thanksgiving Holidays!</b>
16	12/1  12/2-12/3 (T & W)	<b>Quiz #6;</b> Chemistry  <b>READING DAYS [NO CLASSES]</b>
17	Wednesday 12/10	LCCC FINAL EXAM 12:00 – 1:50pm <b>TCC FINAL EXAM:</b> Tuesday 12/11 time TBA

**LECTURE 1: INTRODUCTION TO THE PROFESSION****LECTURE OUTLINE**

- I. Medical Technology or Clinical Laboratory Science
  - A. Definition
  - B. Why do Physicians order laboratory tests?
  - C. Laboratory's Role in Assessing Body Functions
- II. Overall Functions of the Laboratory
- III. The U.S. Health Care System
- IV. Professional Service Departments of a "Full-Service" Hospital
- V. The Clinical Laboratory Organization Structure
- VI. Laboratory Personnel
  - A. Pathologists
    1. qualifications
    2. responsibilities
  - B. Laboratory Managers
    1. qualifications
    2. responsibilities
  - C. Department Supervisors
    1. qualifications
    2. responsibilities
  - D. Medical Technologists/Clinical Laboratory Scientists
    1. qualifications
    2. responsibilities
  - E. Medical Laboratory Technicians/Clinical Laboratory Technicians
    1. qualifications
    2. responsibilities
  - F. Phlebotomists
    1. qualifications
    2. responsibilities
- VII. Major Differences Between the Four Classes of Laboratory Personnel
  - A. Education and Training
  - B. Degree of Independent Judgment

- VIII. The Clinical Laboratory Improvement Act - 1988
  - A. Complexity Model
    - 1. Waived Tests
      - a. Definition
      - b. Personnel Standards/Requirements
    - 2. Moderately-Complex Tests
      - a. Definition
      - b. Personnel Standards/Requirements
    - 3. Highly-Complex Tests
      - a. Definition
      - b. Personnel Standards/Requirements
  
- IX. HIPAA (Health Insurance Portability and Accountability Act)
  - A. Definition
  - B. Implications for Healthcare Workers
  - C. Considerations in the Laboratory
  - D. Case Examples
  
- X. Definition of Terms
  - A. Registration - Certification
    - 1. Definition
    - 2. Agencies
  - B. Accreditation
    - 1. Definition
    - 2. Agency
  - C. Licensure
    - 1. Definition
    - 2. States
  
- XI. Student Qualities in a Laboratory Program
  
- XII. Career Mobility
  - A. Phlebotomist
  - B. MLT/CLT
  
- XIII. Laboratory Departments
  - A. Urinalysis
  - B. Microbiology
  - C. Serology [Immunology]
  - D. Hematology
  - E. Coagulation
  - F. Immunohematology [Blood Bank]
  - G. Chemistry
  - H. Special Chemistry
  - I. Histology/Cytology
  - J. Laboratory office
  
- XIV. Students' Inter-personal Relationships with other Personnel
- XV. Code of Ethics

## LECTURE 1: INTRODUCTION TO THE PROFESSION

### LECTURE OBJECTIVES

At the end of this unit, the student will be able to:

1. Define the term medical technology or clinical laboratory science and describe the general role of the laboratory in assessing body functions.
2. Describe the two major reasons that physicians order laboratory tests.
3. Describe the overall functions of a clinical laboratory, stating four aspects of assuring quality test results.
4. State two factors that are important in the developing and monitoring of a quality assurance program in a laboratory.
5. Describe the general health care system in the United States, and where laboratory tests are performed.
6. Identify the Professional Service Departments in a full service hospital.
7. Explain the organization structure of a full service clinical laboratory.
8. Define and differentiate between the two areas of pathology under the supervision of a pathologist.
9. Identify the laboratory personnel qualifications and responsibilities for each of these levels of laboratory personnel:
  - a. Laboratory Director (Pathologist)
  - b. Laboratory manager (Chief Medical Technologist)
  - c. Department Supervisor
  - d. MT / CLS
  - e. MLT / CLT
  - f. Phlebotomist.
10. Identify two general differences between the four classes of laboratory personnel.
11. Summarize the CLIA 88 complexity model and identify the personnel standards/requirements for each of the test complexity categories.
12. Define the abbreviations HIPAA and PHI, and list the information included as PHI.
13. Define “informed consent”, and list eight exceptions to the requirement for informed consent allowed by HIPAA.
14. List and discuss five considerations that HIPAA affects in the laboratory workplace.
15. Summarize the impact of HIPAA on the daily activities of personnel in the clinical laboratory.

16. Give examples of cases where the regulations of HIPAA would direct the actions of laboratory workers and describe the correct procedures for handling these situations.
17. Define the terms registration, certification, licensure and accreditation.
18. Identify the agencies involved with registration, certification, licensure and accreditation and describe their function as they apply to hospitals, Clinical Laboratory Science/Medical Laboratory programs, students, and graduates.
19. Identify those agencies that currently offer certifying examinations for laboratory personnel.
20. Identify those agencies that accredit educational programs in clinical laboratory sciences.
21. Identify those agencies that accredit hospitals and clinical laboratories.
22. Describe five qualities or aptitudes, which are desirable to find in clinical laboratory personnel.
23. Illustrate the career mobility in the field of clinical laboratory science/medical laboratory technology.
24. Identify the specific departments, which are part of a full service clinical laboratory.
25. Describe the following appropriate relationships, which should be maintained with the following:
  - a. Pathologists
  - b. Physicians
  - c. Supervisors
  - d. Other Laboratory Personnel
  - e. Other Hospital Personnel
  - f. Patients
26. Define what is meant by a Code of Ethics.
27. Describe seven major points that should serve as a Code of Ethics to guide the professional conduct of Clinical Laboratory personnel and students.
28. Describe six major points that should serve as a Code of Ethics to guide the personal conduct of Clinical Laboratory personnel and students.

## **LECTURE 2: LABORATORY SAFETY**

### **LECTURE OUTLINE**

#### **PART 1: LABORATORY GENERAL SAFETY**

- I. Safety Manuals
  - A. Contents
- II. Emergency Precautions to Ensure Employee Safety
  - A. Posted Plans for Evacuation
  - B. Exit Routes
  - C. Location of Safety Devices
- III. Agencies that regulate Laboratory Workplace Safety
  - A. OSHA
  - B. CLSI
  - C. CDC
  - D. CAP

#### **PART 2: LABORATORY HAZARDS**

- I. Biohazards
  - A. Definition
  - B. Means of Acquiring an Accidental Biological Infection in the Workplace
  - C. Biohazard Symbol
  - D. Method and Significance of Proper Labeling
  - E. Infection Control Programs for Control of Biohazard Risk
  - F. Laboratory Risk and Management of Biohazards
    1. Universal Precautions
    2. Specific Guidelines
    3. Other Definitions
    4. Body Fluids – greatest risk of disease transmission
    5. Most Important Specimen-Borne Infections
    6. Major routes of viral transmission
    7. First Aid Procedures
    8. Limiting Risk to Specimen-Borne Infections or Biohazards
- II. Chemical Hazards
  - A. Classifications of Chemicals
  - B. Material Safety Data Sheets (MSDS)
  - C. Spill Procedure for Chemical Spills
  - D. Storage and Transporting Techniques
  - E. Hazard Warning Labels - National Fire Protection Association
    1. Colors
    2. Numerical System Indicating the Severity of the Hazard
- III. Other Clinical Laboratory Hazards

- IV. Decontamination of Work Surfaces
- V. Autoclaves
  - A. Function/Purpose
  - B. Sterilization Method
  - C. Quality Assurance
- VI. Handling of Infectious Waste
  - A. Definition
  - B. OSHA Standards for Proper Waste Disposal
  - C. OSHA Approved Containers
  - D. Final Decontamination
- VII. First-Aid Procedures for Common Emergencies
- VIII. Major General Rules for Safety in the Clinical Laboratory

## LECTURE 2: LABORATORY SAFETY

### LECTURE OBJECTIVES

After the end of this unit, the student will be able to:

1. Describe the contents necessary in a clinical laboratory's SAFETY MANUAL.
2. Explain the EMERGENCY PRECAUTIONS a clinical laboratory must take to ensure employee safety.
3. Explain the role of the following agencies in setting and enforcing safety standards:
  - a. OSHA
  - b. CLSI
  - c. CDC
  - d. CAP
4. Define the term "biohazard".
5. Identify nine methods of acquiring an accidental biological infection in a clinical laboratory environment.
6. Identify the biohazard symbol (label) and explain the method and significance of labeling containers properly.
7. Describe the contents and guidelines of an Infectious Control Program for a clinical laboratory.
8. Define the term "universal precautions" or "Standard Precautions".
9. List eight (8) guidelines that are part of "universal precautions" or "Standard Precautions".
10. Define the terms PPE and "engineering controls" in reference to infection control in the laboratory.
11. Identify those body fluids which pose the greatest risk of disease transmission for those persons whose activities involve contact with them.
12. List the most important specimen-borne infections which are of major concern in a health care setting.
13. Explain the major routes of transmission for the most important specimen-borne infections identified above in objective #12.
14. Explain the first aid procedures for skin puncture and mucous membrane exposure to infectious body fluids.

15. Identify and describe the methods, materials, equipment and procedures which are used to limit the risk of exposure to specimen-borne infections or biohazards in general.
16. Explain the types or classifications of chemical hazards found in a clinical laboratory and give examples of each.
18. Describe the information contained on Material Safety Data Sheets (MSDS) and how MSDSs are used in a clinical laboratory.
19. Describe the proper storage techniques for clinical laboratory chemicals and the precautions one must take when transporting and using hazardous chemicals.
20. Explain the identification system used for Hazard Warning Labels developed by the National Fire Protection Association.
21. Identify other hazards encountered in the clinical laboratory environment.
22. Explain the proper method of pipetting body or chemical fluids in a clinical laboratory.
23. Describe the proper method of cleaning and disinfecting (decontaminating) clinical laboratory work surfaces.
24. Identify the solution most common ascribed to disinfect work surface areas in a clinical laboratory.
25. Explain the function and purpose of an autoclave.
26. Identify the usual time, pressure and temperature settings of a autoclave to sterilize biological material or equipment.
27. Identify the method and materials used to ensure an autoclave is working properly (quality assurance).
28. Define the term "infectious waste", as described by OSHA.
29. Explain the OSHA standards for proper laboratory waste disposal.
30. Describe the OSHA approved containers used for disposal of sharps and body fluid specimens.
31. Identify the two methods used for final decontamination of laboratory waste.
32. Identify the basic first aid procedures for the following common emergencies:
  - a. Alkali or acid burns on the skin or in the mouth.
  - b. Alkali or acid burns in the eye.
  - c. Heat burns.
  - d. Minor cuts.
  - e. Serious cuts.
33. List and explain thirteen (13) major general rules for safety in the clinical laboratory.

**LECTURE 3: QUALITY ASSURANCE PROGRAMS AND QUALITY CONTROL****LECTURE OUTLINE**

- I. Quality Assurance Program
  - A. What is Quality Assurance?
  - B. Elements of a Quality Assurance Program
    1. Commitment of the Institution / Department
    2. Facilities and Resources
    3. Technical Competence
    4. Quality Control Procedures
      - a. Pre-analytical variables
      - b. Analytical variables
      - c. Statistical methods of quality control
      - d. Post-analytical variables
  
- II. Quality Control of Laboratory Test Procedures
  - A. What is quality control?
  - B. How is it used?
  - C. Why is it used?
  - D. How do you evaluate the results of QC material?
  - E. Types of error detected by using QC material
    1. Accuracy and Precision
    2. Systematic error
    3. Random error
  - F. Sources of analytical error
  - G. QC Observations to look for
    1. Outliers
    2. Trends
    3. Shifts
  - H. Review of analytical error
  - I. Errors QC material cannot control
    1. Inter-Individual
    2. Intra-Individual
    3. Pre-analytical
    4. Post-analytical
  - J. Methods other than QC used to ensure precise and accurate patient data

**LECTURE 3: QUALITY ASSURANCE PROGRAMS AND QUALITY CONTROL****LECTURE OBJECTIVES**

At the end of this unit, the student will be able to:

1. Define what is meant by Quality Assurance and give two synonyms for this term.
2. List and describe the four key elements of a quality assurance program.
3. List and define three different types of variables that quality assurance programs should control.
4. Describe the material used for quality control procedures and compare its makeup to that of patient samples being tested.
5. Explain why quality control material should be handled with the same precautions used for actual patient samples.
6. Describe how QC material is used in an analytical method.
7. Explain why quality control material is used in analytical methods.
8. Describe the process of evaluating the results of QC material to determine if the results are acceptable.
9. Describe how the known QC range is calculated for a given QC material.
10. Calculate the lowest and highest acceptable values of a QC range when it is expressed in a " $\pm 2$  SD" format.
11. Identify the ONE (only) category of error that QC material can detect.
12. Define and differentiate "accuracy" and "precision" of an analytical method.
13. Define "systematic" and "random" error, and relate each term to either accuracy or precision.
14. Suggest possible sources of systematic variation in an analytical method.
15. Suggest possible sources of random variation in an analytical method.
16. Define the terms outlier, trend, and shift and describe how each of these can be recognized when evaluating QC data.
17. List and explain four types of error that QC material CANNOT predict or control.
18. Describe five methods other than QC results that are used to ensure precise and accurate patient data.

# **LECTURE 4: URINALYSIS**

## **LECTURE OUTLINE**

- I. Urinalysis
  - A. Definition
  - B. Tasks Performed in the Department of Routine Urinalysis
    1. Physical Characteristics of Urine
    2. Chemical Characteristics of Urine
    3. Microscopic Examination
- II. Abbreviations
- III. Routine Urinalysis
  - A. Importance
  - B. Urine Specimen
- IV. Routine Urinalysis Procedure
  - A. Physical Characteristics
  - B. Chemical Analysis
  - C. Microscopic Analysis
  - D. Correlations
    1. Chemistry Stix Results with Microscopic Results
  - E. Changes seen in urine specimens not properly preserved
- V. Fecal Occult Blood
  - A. Definition
  - B. Clinical Significance
  - C. Hemocult Test
    1. Method
    2. Results

## LECTURE 4: URINALYSIS

### LECTURE OBJECTIVES

At the end of this unit, the student will be able to:

1. Define the term "urinalysis."
2. Describe the tasks performed in the department of urinalysis.
3. Describe the meaning of the following abbreviations associated with urinalysis:
 

a. UA	j. HPF (hpf)	s. >
b. PKU	k. LPF (lpf)	t. <
c. pH	l. g/dL	u. WBC
d. QNS	m. mg/dL	v. RBC
e. ASAP	n. trace	w. SSA
f. UTI	o. 1+	x. OR
g. TUR	p. 2+	y. ER
h. GTT	q. 3+	
i. hCG	r. 4+	
4. Define and give examples of intrinsic and extrinsic abnormalities that can be identified by performing urinalysis.
5. Describe the type of urine specimen (time of day) appropriate for a routine urinalysis and two reasons why this is important.
6. Identify the type of container used to collect specimens for routine urinalysis.
7. Identify the urine specimen time limit for analysis.
8. Identify the storage requirement for a specimen for routine urinalysis if the urine cannot be processed within one hour.
9. Describe the difference between a random urine specimen, freshly voided urine specimen and a clean "Mid Stream" catch urine specimen.
10. Explain the physical and chemical changes that occur in a urine specimen if the urine is not examined within 1 hour of collection.
11. Identify the best urine preservative.
12. Describe two reasons for allowing urine to come to room temperature before analysis.
13. Identify the physical characteristics of a urine specimen and describe their clinical significance.
14. Describe the proper procedure for using the urine chemistry strips.

15. Identify the chemical tests performed by the use of reagent strips on a routine urine specimen and describe their clinical significance.
16. Identify the specific confirmation tests and tablet tests that are used on a routine urine specimen and describe the circumstances in which they are used.
17. Describe the performance of a urine microscopic examination.
18. Describe the normal constituents found in a microscopic examination of a urine sediment.
19. Identify the abnormal findings in a microscopic urine sediment and describe their significance.
20. Compare the urine chemistry strip results and the microscopic examination results to ensure accuracy and precision of reported test data.
21. Describe the clinical significance of the fecal occult blood test.
22. Explain the procedure and method for measuring fecal occult blood.

**LECTURE 5: SEROLOGY*****LECTURE OUTLINE***

- I. Serology
  - A. Definition
  - B. Specimens
  - C. Tasks
  - D. Abbreviations
  - E. Antigens -vs- Antibodies
  - F. Titer
    - 1. Definition
    - 2. Purpose
    - 3. Diagnostic Titer
  - G. Agglutination
    - 1. Definition
    - 2. Principles
    - 3. Agglutination Tests and Their Clinical Significance
      - a. RA [Rheumatoid Arthritis]
      - b. RPR [Syphilis]
      - c. CPR [Acute Infections]
      - d. MONO [Infectious Mononucleosis]
  - H. ELISA
    - 1. Definition
    - 2. Tests
    - 3. ELISA Method for  $\beta$ -hCG

**LECTURE 5: SEROLOGY****LECTURE OBJECTIVES**

At the end of this unit, the student will be able to:

1. Define the terms antigen, antibody, and serology.
2. Identify the type of specimens used in serology.
3. Describe the tasks performed in the department of serology.
4. Describe the meaning of the following abbreviations associated with serology:
 

a. VDRL	k. anti-HBc	u. STS
b. RPR	l. anti-HBe	v. HTLV-I
c. FTA-ABS	m. anti-HBs	w. SLE
d. MHA-TP	n. hCG	x. ASO
e. RA	o. EBV	y. ANA
f. CRP	p. CEA	z. AIDS
g. HIV-I	q. CSF	aa. HAV
h. HBsAg	r. HLA	bb. IgE
i. IgG	s. IgM	cc. Mono
j. Ag	t. Ab	
5. Define the term "titer".
6. Describe the reasons for performing a titer on a patient's serum.
7. Explain the meaning of a "acute" and "convalescent" titers, and describe how these are used to determine when a titer is diagnostic.
8. Define and describe the principle of agglutination test procedures.
9. Describe the following agglutination test methods and describe their clinical significance:
  - a. RA
  - b. RPR
  - c. CRP
  - d. Mono
  - e. Cold Agglutinin
10. Define the term "ELISA."
11. Identify the tests methods which utilize the ELISA technique.
12. Describe the ELISA test method used for detecting  $\beta$ -hCG.

**LECTURE 6: MICROBIOLOGY*****LECTURE OUTLINE***

- I. Microbiology
  - A. Definition
  - B. Specimens
  - C. Sterile and Aseptic Techniques
  - D. Tasks
  - E. Abbreviations
  - F. Specimens
    - 1. Urine Culture
    - 2. Throat Culture
    - 3. Sputum Culture
    - 4. Stool Culture
    - 5. Urogenital Culture
    - 6. CSF Culture
    - 7. Blood Culture
  - G. Primary Plating
    - 1. Definition
    - 2. Types of Primary Plating
      - a. Selective Media
      - b. Differential Media
  - H. Gram Stain
    - 1. Purpose
    - 2. Components
  - I. Microorganisms
    - 1. Gram Staining Characteristics
      - a. Gram Positive Microorganisms
      - b. Gram Negative Microorganisms
    - 2. Microorganism Shape
      - a. Cocci
      - b. Bacilli
    - 3. Growth Requirements
      - a. Aerobic Environment
      - b. Anaerobic Environment
- II. Infections
  - A. Nosocomial Infections
    - 1. Definition
    - 2. Common nosocomial infections
  - B. Most Common Pathogenic Microorganisms
    - 1. Urine Culture
    - 2. Throat Culture
    - 3. Sputum Culture
    - 4. Stool Culture
    - 5. Wound Culture
    - 6. Urogenital Culture
    - 7. Blood Culture

- 8. CSF Culture
- C. Methods of Identification
  - 1. Biochemical Reactions
  
- III. Antibiotic Susceptibility Tests
  - A. Definition
  - B. Methods
    - 1. Kirby-Bauer
    - 2. MIC
  
- IV. Acid Fast Bacilli
  - A. Processing and Handling Specimens
  - B. Pathogenic Acid Fast Bacilli
  
- V. Mycology
  - A. Definition
  - B. Classification
  - C. Collection Techniques
  
- VI. Parasitology
  - A. Definition
  - B. Classification
  - C. Collection Techniques
  
- VII. Viruses
  - A. Definition
  - B. Pathogenic Viruses
  - C. Specimens

**LECTURE 6: MICROBIOLOGY****LECTURE OBJECTIVES**

At the end of this unit, the student will be able to:

1. Define the term "microbiology."
2. Identify the common types of specimens used in microbiology.
3. Differentiate between sterile and antiseptic techniques and explain the differences between disinfectants and antiseptics.
4. Describe the tasks performed in the department of microbiology.
5. Describe the meaning of the following abbreviations associated with microbiology:

a. MIC	i. GC	q. KOH
b. O & P	j. STD	r. CO <sub>2</sub>
c. Staph	k. BAP	s. E. coli
d. Strep	l. MAC	t. modified TM
e. URI	m. THIO	u. PVA
f. UTI	n. GPC	v. SABs
g. TB	o. GNB	w. AFB
h. GI	p. GNC	x. GPB
6. Describe the specimen collection process of the following:
  - a. urine culture
  - b. throat culture
  - c. sputum culture
  - d. stool culture
  - e. urogenital culture
  - f. csf culture
  - g. blood culture
  - h. wound culture
7. Describe the proper handling and storage of the specimens for culture identified above.
8. Define the term "primary plating", and draw a diagram of the inoculation procedure of the specimens identified above.
9. Differentiate between laboratory media which is considered "selective" media versus "differential" media.
10. Describe the Gram Staining process and explain the purpose of the Gram Stain.
11. Differentiate between Gram POSITIVE microorganisms and Gram NEGATIVE microorganisms.

12. Describe the difference between microorganisms that are classified microscopically as "cocci" and "bacilli."
13. Describe the difference between aerobic and anaerobic microorganisms.
14. Define the term "nosocomial infection."
15. Identify the most common microorganisms associated with causing nosocomial infections.
16. Identify the primary pathogenic microorganisms associated with the following specimens:
  - a. urine culture
  - b. throat culture
  - c. sputum culture
  - d. stool culture
  - e. wound culture
  - f. urogenital culture
  - g. blood culture
  - h. csf culture
17. Identify the methods used to identify pathogenic microorganisms.
18. Describe meaning of "antibiotic susceptibility" testing.
19. Differentiate between "sensitive" and "resistant" antibiotic susceptibility patterns in the Kirby-Bauer method.
20. Identify and describe the two laboratory techniques used to perform antibiotic susceptibility testing.
21. Describe the handling and processing techniques used for specimens for acid fast bacilli (AFB).
22. Identify the most pathogenic AFB microorganism.
23. Define the term "mycology".
24. Describe the four major classifications of fungi.
25. Explain the collection techniques used for obtaining specimens for fungi.
26. Define the term "parasitology."
27. Differentiate between protozoa and metazoa.
28. Describe the major classifications of the protozoa and metazoa.
29. Explain the collection techniques used for obtaining specimens for parasites.

30. Define the term "virus."
31. Identify the most common pathogenic viruses.
32. Identify the type of specimens collected for viral disease detection.

**LECTURE 7: HEMATOLOGY****LECTURE OUTLINE**

- I. Hematology
  - A. Definition
  - B. Specimens
  - C. Tasks
  - D. Abbreviations
  - E. Clinical Significance
    - 1. RBCs
    - 2. WBCs
    - 3. Platelets (thrombocytes)
  - F. Classification of White Blood Cells
  - G. Complete Blood Count
  - H. WBC Differential
    - 1. Method
    - 2. Preparation of Blood Film
    - 3. Normal White Blood Cells in peripheral blood circulation
    - 4. "Shift to the Left"
  - I. Hemocrit
    - 1. definition
    - 2. microhematocrit method
  - J. Anemia
    - 1. Definition
    - 2. Classification
    - 3. Types
  - K. Leukemias
    - 1. Definition
    - 2. Classification
    - 3. Types
  - L. Erythrocyte Sedimentation Rate
    - 1. Clinical Significance
    - 2. method
  - M. Reticulocyte Count
    - 1. Clinical Significance
    - 2. method

**LECTURE 7: HEMATOLOGY****LECTURE OBJECTIVES**

At the end of this unit, the student will be able to:

1. Define the term "hematology."
2. Identify the type of specimens used in hematology.
3. Describe the tasks performed in the department of hematology.
4. Describe the meaning of the following abbreviations associated with hematology:

a. RBC	i. Sed Rate	q. Mono
b. WBC	j. diff	r. Lymph
c. Hgb	k. CBC	s. Band
d. Hct	l. ESR	t. Seg
e. MCV	m. IDA	u. EDTA
f. MCH	n. PA	v. Retic
g. MCHC	o. PMN	w. Baso
h. RDW	p. Eos	
5. Differentiate between red blood cells, white blood cells and platelets and describe their function and clinical significance.
6. Differentiate between white blood cells that are classified as granulocytes and agranulocytes.
7. Identify those tests that are included in a complete blood count (CBC) and describe their clinical significance.
8. Describe the clinical significance of the RBC indices.
9. Describe the "differential count" and explain its clinical significance.
10. Describe the process of making a blood film (smear).
11. Explain the variations in the blood film making process used to make a blood film thinner or thicker.
12. Identify the normal white blood cell types found in normal peripheral blood circulation and state their normal relative percentages.
13. Explain the meaning of a "shift to the left."
14. Define the term "hematocrit."

15. Describe the clinical significance of the hematocrit.
16. Explain the method used to measure a patient's hematocrit using the microhematocrit method.
17. Define the term "anemia."
18. Describe how anemias are classified and give one example of each.
19. Define the term "leukemia."
20. Describe how the leukemias are classified and give four categories of leukemias.
21. Describe the clinical significance of the ESR.
22. Explain the method used to measure a patient's ESR.
23. Describe the clinical significance of the Retic Count.
24. Explain the method used to measure a patient's Retic Count.

## LECTURE 8: COAGULATION

### LECTURE OUTLINE

- I. Coagulation
  - A. Definition
  - B. Specimens
  - C. Tasks
  - D. Abbreviations
  - E. Components - Blood Vessel Injury
    1. Blood Vessels
    2. Platelets
    3. Coagulation Factors
  - F. Platelets
    1. Biological Function
    2. Platelet Function Tests
    3. Clinical Significance
  - G. Plasma Coagulation Factors
    1. Coagulation Cascade Scheme
    2. Tests Used to Measure the Coagulation Pathways
      - a. PT
        - 1.) Clinical Purpose
          - a.) Monitor Oral Anticoagulant Therapy
          - b.) Measure the Coagulation Factors Associated with the Extrinsic and Common Pathways
      - b. APTT
        - 1.) Clinical Purpose
          - a.) Monitor Heparin Therapy
          - b.) Measure the Coagulation Factors Associated with the Intrinsic and Common Pathways
  - H. Other Coagulation Tests
    1. Fibrinogen
      - a. Clinical Significance
    2. FSP/FDP/D-Dimer
      - a. Clinical Significance
    3. Factor Assays
      - a. Clinical Significance
  - I. Fibrinolysis
    1. Definition
    2. Tests
    3. DIC [Disseminated Intravascular Coagulation]
      - a. Definition
      - b. Clinical Significance

## LECTURE 8: COAGULATION

### LECTURE OBJECTIVES

At the end of this unit, the student will be able to:

1. Define the term "coagulation."
2. Identify the type of specimens used in coagulation.
3. Describe the tasks performed in the department of coagulation.
4. Describe the meaning of the following abbreviations associated with coagulation:
  - a. PT
  - b. APTT
  - c. FSP
  - d. FDP
  - e. D-Dimer
  - f. DIC
5. Briefly explain those components involved in blood coagulation after blood vessel injury.
6. Review the biological function of platelets and list the three phase of their activity.
7. Identify those laboratory tests which measure specific platelet function.
8. Define the terms "thrombocytopenia" and "thrombocytosis" and identify two causes of each.
9. Briefly explain the plasma coagulation cascade scheme.
10. Differentiate between the extrinsic, intrinsic and common pathways of coagulation.
11. Identify the coagulation pathways associated with the PT and APTT tests.
12. Explain the clinical significance of performing PT and APTT testing, including the medications each test is used to monitor.
13. Explain the clinical significance of the following coagulation tests:
  - a. Fibrinogen
  - b. FSP / FDP / D-Dimer
  - c. Factor Assays
14. Define the term "fibrinolysis."
15. Identify those laboratory tests, which measure fibrinolysis.
16. Explain the clinical significance of DIC.

**LECTURE 9: IMMUNOHEMATOLOGY****LECTURE OUTLINE**

- I. Immunohematology [Blood Bank]
  - A. Definition
  - B. Specimens
  - C. Tasks
  - D. Major ABO Blood Groups
  - E. Rh
  - F. Clinical Ramifications of Improper ABO and Rh Typing
  - G. Abbreviations
  - H. Collecting Blood from a Volunteer Donor
    - 1. Questions
    - 2. Screen
    - 3. Patient Arm Preparation
  - I. Laboratory Tests - Donor Blood
  - J. Blood Components
  - K. -pheresis
  - L. Laboratory Tests - Patient Receiving a Blood Transfusion
    - 1. ABO and Rh Blood Type
    - 2. Antibody Screen
    - 3. Major Crossmatch
  - M. STAT X-Match
    - 1. Definition
    - 2. Clinical Significance
  - N. Prenatal Screen
    - 1. Definition
    - 2. Purpose
  - O. Transfusion Reactions
    - 1. Definition
    - 2. Clinical Significance
    - 3. Types of Transfusion Reactions
  - P. Autologous Donation
    - 1. Definition
    - 2. Purpose
    - 3. General Requirements

**LECTURE 9: IMMUNOHEMATOLOGY****LECTURE OBJECTIVES**

At the end of this unit, the student will be able to:

1. Define the term "immunohematology."
2. Identify the type of specimens used in immunohematology.
3. Describe the tasks performed in the department of immunohematology.
4. Identify the four major ABO blood groups and state the antigens and antibodies that each blood group possesses.
5. Define the term "Rh."
6. Describe the meaning of the following abbreviations associated with immunohematology:
 

a. ABO	i. AABB	q. IAT
b. Rh	j. D & C	r. Cryo
c. X-match	k. TUR	s. FFP
d. HBV	l. Ab	t. HDN
e. AIDS	m. Ag	u. PC
f. HIV	n. HCV	
g. RPR	o. HLA	
h. Type and Cross	p. DAT	
7. Describe the process of collecting a unit of blood from a volunteer donor.
8. Identify and describe the clinical significance of nine laboratory tests which are performed on donor blood before it can be used.
9. Identify the different blood components that can be made from a unit that has been drawn from a donor.
10. Identify the most common transfused blood component.
11. Explain the meaning of the term "-pheresis."
12. Identify and describe the clinical significance of three laboratory tests which are performed on a patient who will receive blood.
13. Explain the clinical significance of a STAT X-match.
14. Describe the meaning and purpose of prenatal screening.

15. Describe the symptoms and cause of an immediate acute type of hemolytic transfusion reaction.
16. Name two common non-hemolytic transfusion reactions and describe the symptoms and cause of each.
17. Define the term "Autologous Donation."
18. Describe the purpose of Autologous Donation and general requirements for Autologous Donation.

**LECTURE 10: CHEMISTRY****LECTURE OUTLINE**

- I. Chemistry
  - A. Definition
  - B. Specimens
  - C. Tasks
  - D. Abbreviations
  - E. Electrolytes
  - F. Cardiac Profile
  - G. Renal Profile
  - H. Liver Profile
  - I. Thyroid Profile
  - J. Lipid Profile
  - K. Therapeutic Drugs -vs- Drugs of Abuse
  - L. Peak -vs- Trough Therapeutic Drug Levels
    1. Peak Drug Level
    2. Trough Drug Level
  - M. Hemolysis -vs- Lipemia
    1. Hemolysis
      - a. Definition
      - b. Causes of Hemolysis
      - c. Tests Which are Influenced by Hemolysis
    2. Lipemia
      - a. Definition
      - b. Causes of Lipemia
      - c. Tests Which are Influenced by Lipemia

**LECTURE 10: CHEMISTRY****LECTURE OBJECTIVES**

At the end of this unit, the student will be able to:

1. Define the term "chemistry."
2. Identify the type of specimens used in chemistry.
3. Describe the tasks performed in the department of chemistry.
4. Describe the meaning of the following abbreviations associated with chemistry:

a. Na	r. TDM	ii. NH <sub>3</sub>
b. K	s. AMI	jj. pH
c. Cl	t. GTT	kk. T <sub>4</sub>
d. HCO <sub>3</sub>	u. Ca	ll. T <sub>3</sub>
e. tCO <sub>2</sub>	v. PO <sub>4</sub>	mm. TSH
f. CK	w. BUN	nn. TIBC
g. LD	x. UA	oo. PSA
h. AST (SGOT)	y. Fe	pp. AFP
i. ALT (SGPT)	z. Cu	qq. FSH
j. GGT	aa. A/G	rr. LH
k. ALP	bb. CEA	ss. hCG (β-hCG)
l. ACP	cc. FBS	
m. HDL	dd. Li	
n. LDL	ee. NaCl	
o. VLDL	ff. M	
p. VVLDL	gg. N	
q. TP	hh. Mg	

5. Identify those tests that comprise the "electrolytes."
6. Identify four tests that would be part of a "cardiac profile."
7. Identify two tests that would be associated with a "renal profile."
8. Identify four tests that would be associated with a "lipid profile."
9. Identify four tests that would be associated with a "liver profile."
10. Identify four tests that would be associated with a "thyroid profile."
11. Differentiate between "therapeutic" drugs and "drugs of abuse."

12. Differentiate between "peak" and "trough" therapeutic drug levels.
13. Define the terms "hemolysis" and "lipemia."
14. Identify those chemistry laboratory tests which are influenced by hemolysis and lipemia, including the test the is most affected by hemolysis.

**LECTURE 11: VENIPUNCTURE**

- I. Venipuncture
  - A. Importance
  - B. Inspiring Confidence
  - C. Building Self-Confidence
- II. Blood
  - A. Blood-Tissue
  - B. General function
    - 1. Red Blood Cells
    - 2. White Blood Cells
    - 3. Platelets
  - C. Composition
  - D. Types of leukocytes
    - 1. Granulocytes
    - 2. Agranulocytes
  - E. Normal Reference Values
    - 1. Red Blood Cells
    - 2. White Blood Cells
    - 3. Platelets
  - F. Plasma composition
  - G. Blood specimen
    - 1. Whole blood
    - 2. Plasma
    - 3. Serum
  - H. Anticoagulants
  - I. Drawing order
  - J. Department preference
- III. Sites for Venous Collection
  - A. Forearm
  - B. Hand/Wrist
  - C. Foot
  - D. Femoral Artery

#### IV. Venipuncture Sites to Avoid

- A. Scars
- B. Mastectomy
- C. Hematoma
- D. I.V.
- E. Fistula
- F. Cannula
- G. Arteries

#### V. Safety Precautions

#### VI. Blood Collection Procedure

- A. Organization
- B. Patient Identification
- C. Preparation of Equipment
- D. Preparation of Patient
- E. Venipuncture Technique
- F. Inverting Anticoagulated Samples
- G. Labeling of Specimens
- H. Clean-Up
- I. Care of Patient
- J. Departure

#### VII. Timed Blood Specimens

- A. Therapeutic Drug Monitoring
- B. OGTT

#### VIII. Complications in Blood Collection

- A. I.V.
- B. Syncope
- C. Failure to Draw Blood
  - 1. Needle Position
  - 2. Vacuum
  - 3. Hematoma
  - 4. Edema
  - 5. Hemoconcentration
  - 6. Seizure
  - 7. Nausea
  - 8. Refusal
  - 9. Missing Patient
  - 10. Patient Reaction
  - 11. Isolation

IX. Factors Affecting the Specimen

- A. Physiological
- B. Hemolysis
  - 1. Definition
  - 2. Causes
  - 3. Affected Tests

X. Quality Control

- A. Definition
- B. Specimen Rejection
- C. Responsibility

XI. Micro Skin Puncture

- A. Types of Patients
- B. Sites
- C. Laboratory Tests

**LECTURE 11: VENIPUNCTURE****OBJECTIVES:**

At the end of this unit, the student will be able to:

1. Describe why blood drawing is important.
2. Identify four ways, in which you can inspire confidence in the hospital patients that you draw.
3. Describe ways in which to gain confidence in your own ability.
4. Explain the reason for blood to be classified as a tissue.
5. Identify the specific type of tissue associated with blood.
6. Describe, in detail, the function of the specific cell types and amount of blood in an adult.
7. Name the three general classifications of formed elements (cells) in blood and describe their function.
8. Define the medical root words associated with the formed elements in blood.
9. Describe the composition of blood.
10. Name the types of white blood cells normally found in peripheral blood.
11. Define the medical root words associated with leukocytes found in peripheral blood.
12. List the normal reference values (numbers) for all the formed elements in blood.
13. Identify the chemical composition of blood plasma.
14. Differentiate between the three forms in which blood is generally tested in the laboratory, and identify those forms, which contain fibrinogen.
15. Describe the color, effect, mode of action, precautions, and use of the commonly used anticoagulants in the B-D Hemogard closure system.
16. Arrange the types of blood collection tubes in their proper blood drawing order.
17. Name the blood collection tubes most commonly used in the different laboratory departments.
18. Describe the various venous sites from which blood may be drawn and those sites to avoid.
19. Explain the safety precautions a phlebotomist must take in performing blood-drawing procedures.

20. Describe in detail the chronological order of the collection of blood from a patient.
  - a. organization
  - b. patient identification
  - c. preparation of equipment
  - d. preparation of patient
  - e. venipuncture technique
  - f. inverting anticoagulated samples
  - g. disposal of contaminated needle
  - h. labeling of specimens
  - i. clean up
  - j. care of patient after venipuncture
  - k. remove gloves/wash hands
  - l. departure from room
21. Explain what is meant by a "timed" specimen.
22. Describe the glucose tolerance test (GTT).
23. Identify the blood collection tube used for drawing GTT samples and explain why this tube is used.
24. Identify several complications found in blood drawing and propose solutions to solve these difficulties.
25. Identify which physiological factors can have an affect on laboratory specimens and which tests they affect.
26. Discuss ways in which hemolysis occurs and how hemolysis can be prevented.
27. Identify the most common cause of hemolysis.
28. Identify those tests, which are most influenced by hemolysis and describe how they are altered.
29. Discuss the role and responsibility of laboratory personnel in the acceptance and rejection of laboratory specimens.
30. Propose four reasons for collecting micro skin puncture blood samples.
31. Identify the most common sites for obtaining micro skin puncture samples from patients.
32. Identify the tests, which are part of Ohio's Newborn Screening Program.
33. Identify the anticoagulant used when drawing arterial blood gas samples.
34. Describe the arterial blood gas drawing procedure.
35. Identify several collection errors associated with arterial blood gas and describe how these collection errors influence blood gas results.
36. Describe how blood gas samples should be transported to the laboratory and how improper transport influences blood gas results.

**Outside of class time, students formally enrolled in the Clinical Laboratory Science Technology or Phlebotomy Program are required to meet the following Laboratory objectives:**

At the end of these laboratory assignments, the student will be able to:

1. perform a successful venipuncture collecting two tubes of blood on a minimum of three (3) adult volunteers in the on-campus college laboratory before completing their venipuncture clinical rotation. The checklist on the following pages will be used to evaluate their performance.
2. centrifuge blood specimens to obtain acceptable plasma and serum samples for laboratory testing.
3. perform the necessary mathematical calculations necessary to prepare a given volume of a specific % concentration of solution, then use an analytical balance to measure the assigned solute and prepare the solution.
4. perform the necessary mathematical calculations necessary to prepare a given volume of a specific molar concentration of solution, then use an analytical balance to measure the assigned solute and prepare the solution.
5. perform the necessary mathematical calculations necessary to prepare a given volume of a specific normal concentration of solution, then use an analytical balance to measure the assigned solute and prepare the solution.

**LORAIN COUNTY COMMUNITY COLLEGE  
DIVISION OF ALLIED HEALTH & NURSING  
CLINICAL LABORATORY SCIENCE TECHNOLOGY AND PHLEBOTOMY**

**VENIPUNCTURE**

**CHECKLIST**

Student's Name: \_\_\_\_\_ Date \_\_\_\_\_

VENIPUNCTURE			
OBJECTIVES: The student:	Performed	Performed, Needs More Practice	Not Performed
1. Greets the patient in a friendly, tactful manner.			
2. Identifies self and explains the procedure to the patient.			
3. <b>*Identifies the patient by using the two-step method of patient identification.</b>			
4. Dons gloves on DOMINANT hand.			
5. Assembles the needle to the holder/ Safety Device			
6. Selects appropriate blood drawing materials to bring to the patient's bedside.			
7. Places the blood drawing materials on the appropriate side of the patient's arm.			
8. Ties the tourniquet smoothly and tightly.			
9. Has the patient close their hand to make a fist.			
10. Selects an appropriate vein within a reasonable amount of time.			
11. Dons glove on NONDOMINANT hand.			
12. Cleanses the venipuncture site with the appropriate antiseptic in the appropriate manner.			
13. Cleanses gloved index finger of the NONDOMINANT hand with the antiseptic.			
14. Inserts the FIRST evacuated collection tube into the Vacutainer Holder/ Safety Device			
15. Removes the needle sleeve carefully, rotates the Vacutainer Holder so the needle bevel is in the <b>UP</b> position.			
16. Holds the Vacutainer Holder using an appropriate hand position.			
17. Performs the venipuncture technique smoothly following these steps:			
a. <b>FEELS</b> the vein again with the NONDOMINANT index finger <b>ABOVE</b> the intended puncture site.			
b. <b>MARKS</b> the intended site with the needle tip without touching the patient's skin with the needle, approximately 1/4 inch <b>BELOW</b> the intended puncture site.			
c. <b>ANCHORS</b> the vein appropriately with the NONDOMINANT thumb and/or index finger.			
d. <b>STICKS</b> the vein with a smooth and quick motion.			

VENIPUNCTURE [Continuation]				
Objective: The student:		Performed	Performed, Needs More Practice	Not Performed
18.	Squeezes the FIRST evaluated collection tube onto the rear end of the needle in the Vacutainer Holder without moving the needle in the patient’s arm.			
19.	Calmly moves or changes the position of the needle if blood does <i>NOT</i> flow into the FIRST evacuated collection tube in the appropriate manner.			
20.	When blood begins to flow into the FIRST evacuated collection tube, has the patient relax their hand.			
21.	Fills the evacuated collection tubes in the correct order, and changes tubes smoothly without moving the needle.			
22.	<b>*Releases the tourniquet <i>BEFORE</i> removing the needle.</b>			
23.	Removes the last filled evacuated tube from the Vacutainer Holder <b><i>BEFORE</i></b> withdrawing the needle from the patient’s arm.			
24.	Places a cotton ball or gauze pad gently over the puncture site, then withdraws the needle smoothly from the patient’s arm, applying pressure to the site with the cotton ball or gauze pad <b><i>AFTER</i></b> withdrawing the needle.			
25.	<b>*Uses safe technique to click the safety device closed on a hard surface without using fingers.</b>			
26.	<b>*Properly disposes of the Needle-Safety Device Assembly in a puncture –resistant sharps container.</b>			
27.	Has the patient hold the puncture site.			
28.	Picks up the blood-filled evacuated collection tubes and inverts them.			
29.	Labels all blood-filled evacuated collection tubes appropriately.			
30.	<b>*Checks the patient’s puncture site and applies bandage if appropriate.</b>			
31.	Cleans up all supplies and waste from the patient’s bed, and discards waste in appropriate containers.			
32.	Re-secures bed railings if they were put down.			
33.	Removes gloves			
34.	Washes or Sanitizes Hands			
35.	Leaves patient courteously			

**\*While failure to perform any of the required steps in the venipuncture procedure can result in an unsuccessful draw, those marked with an asterisk (\*) indicate critical steps. If not performed appropriately will be designated as unsuccessful and will not count towards the required venipuncture quota or competency check-off, regardless of the number of tubes of blood drawn.**

## **CLSC 111 LECTURE OUTLINES**