

**NORTHEAST TEXAS COMMUNITY COLLEGE**  
**MLAB 2331**  
**IMMUNOHEMATOLOGY SYLLABUS**  
**Fall 2019**

**INSTRUCTOR INFORMATION**

Chantel Sokol BS, MLS(ASCP)<sup>CM</sup>SBB<sup>CM</sup>  
Office: UHS 104  
Phone: (903) 434-8352  
Email: [csokol@ntcc.edu](mailto:csokol@ntcc.edu)

**Office Hours:** Mon. 9:00am-12:30  
Tues. 9:00am-12:30  
Thurs. 9:00am-12:30  
By appt

**COURSE INFORMATION**

<b>Lecture:</b>	R	1:00-2:00 PM	Meets in UHS 221
<b>Laboratory:</b>	R	2:00-3:50 PM	Meets in UHS 226

**Course Description:** Immunohematology is the study of blood antigens and antibodies as applied to situations encountered in blood bank or transfusion service testing. It includes procedures such as: donor selection, component preparation and use, and techniques used to detect antigen/antibody reactions that may adversely affect patient outcome following a transfusion. Therefore, this course will include performance of blood banking procedures such as blood group and Rh typing, antibody screening, antibody identification, and cross-matching.

**Course Goals and Objectives:** The primary goal of this course is to provide students with an understanding of the basic principles and techniques of blood banking procedures. Upon completion of this course, the student should be able to do the following:

- ❖ Describe the structure and function of the immune system as it relates to immunohematology.
- ❖ Describe the donor selection process.
- ❖ Describe the preparation and use of blood components.
- ❖ Identify and describe the characteristics and clinical significance of the ABO, Rh and other blood group systems.
- ❖ Apply the knowledge of basic principles in blood banking to perform routine blood bank procedures used in pretransfusion testing.
- ❖ Perform intermediate level blood bank testing for the resolution of antibody problems, hemolytic disease of the newborn and transfusion reaction workups, demonstrating an understanding of the underlying principles.
- ❖ Demonstrate improvement in the affective traits, including organizational skills, work habits, attitude, interpersonal skills and problem-solving abilities.

**Method of Instruction:** The immunohematology course utilizes a variety of instructional methods, including reading assignments, lectures, laboratory experiments and practice, computer-aided instruction and written assignments. Students are responsible for all reading assignments, lecture material, laboratory and other assignments.

Scan Competency	Immunohematology
Resources	Identify reagents and supplies needed for each lab and organize laboratory procedure so that reagents, supplies and equipment are utilized correctly.
Interpersonal	Recognize limitations of expertise and communicate with instructor when questions arise. Show respect for instructor and peers during class time.
Information	Apply information gained from lecture, laboratory and independent study to problem-solve results provided as case studies or unknowns during laboratory.
Systems	Apply critical thinking skills to problems encountered in the laboratory and theoretical case studies.
Technology	Achieve competency in routine blood bank procedures.

**Learning Resources:**

Required Text: Paula R. Howard. *Concepts of Immunohematology*, 4<sup>th</sup> edition, Mosby/Elsevier Publishing, 2009.  
 Additional Resources: Powerpoint lectures and additional material on internet

**Lecture Grad (75%):**

4 Exams 75%  
 Homework 25%

**Grading Scale**

A ≥90%  
 B 80-89%  
 C 70-79%  
 D 60-69%  
 F <60%

**Laboratory grade (25%)** Lab reports/attendance/participation 50%  
 2 Lab practicals (midterm and final) 50%

*A minimum grade of “C” is required in both the lecture and laboratory components of all Medical Laboratory Technician courses. Failure to meet the minimum passing score in each area will result in a “D” for the course and dismissal from the program.*

### **Classroom Expectations:**

1. Attend all classes and labs, be on time and remain in class for the entire period.

*If students are habitually late, the classroom door will be locked at the start of class.*

If you must leave early, please inform the instructor before class begins.

2. Complete assigned readings before I lecture over each topic.
3. Be prepared to take notes and participate in class.
4. You must EARN your grade; I do not GIVE grades, so study, study, study!  
Average study time is 2-3 hours per hour of lecture/class time a week.
5. Be respectful of your classmates and instructors.
6. Turn off cell phones/pagers or set to vibrate.

**Attendance and Absences:** You are expected to attend ALL scheduled lectures and labs and take the exams as scheduled. You will be held responsible for all information covered in lecture. *If you will be absent, inform the instructor by phone or email at least 15 minutes BEFORE class begins. Absences will be counted as unexcused if the instructor is not informed in a timely manner. Excessive unexcused absences will result in loss of points from your grade. More than two unexcused absences will result in a reduction of five (5) points being subtracted from your final grade (percentage). More than five unexcused absences will result in the student being dropped from the course. Two unexcused late class attendance equals one unexcused absence.*

**Makeup Policy:** There will be no makeup for quizzes. Late homework will NOT be accepted unless there is a valid excuse (to be determined by the instructor). The student is responsible for requesting a makeup when they are unable to attend a regularly scheduled examination and must schedule the makeup within 2 days of the absence. Makeup exams will be scheduled only in the event of an EXCUSED absence. If the test is not made-up, the student will receive a zero for that exam. Makeup work for laboratory assignments will only be scheduled in the event of an EXCUSED absence.

### **COURSE OUTLINE/SCHEDULE**

**NOTE:** *The class schedule is subject to change by the instructor when deemed necessary or appropriate.*

#### **Unit 1&2: Quality and Safety Issues; Basic sciences and reagents – Weeks 1-3**

Chapters 1-4

Objectives:

- Describe regulatory agencies that govern activities in the blood bank and apply their regulations.
- Differentiate quality assurance (QA) from quality control (QC).
- Identify responsibilities of the QA department.
- Discuss the importance of job descriptions and personnel qualifications.
- Compare and contrast proficiency and competency testing.
- List the elements of and explain the importance of a well-written SOP
- Compare and contrast good record keeping with poor record keeping.
- Define calibration, preventative maintenance, and QC requirements; discuss the importance of each in reporting accurate results.

- Compare the role of innate and acquired immunity in the overall process of immunity, including the role of phagocytes, T and B cells.
- Define the following terms: antigen, immunogen, epitope and antigenic determinants
- Identify the basic molecular structure of an immunoglobulin molecule.
- Compare and contrast IgG and IgM antibodies.
- Describe the major events in the primary and secondary immune response, differentiating between them.
- Identify the major forces that influence the binding of antigen and antibody.
- Describe the two stages of the agglutination reaction, describe the different gradings associated with these reactions and discuss the factors that influence these stages in vitro.
- Describe the basic principles of antiglobulin testing, differentiating between direct and indirect antiglobulin tests.
- Describe the basic principles of routine testing in the immunohematology laboratory, listing several routine tests performed.
- Discuss the principles of potency and specificity as it relates to polyclonal and monoclonal antibodies.
- Describe the reagents available for ABO and D typing. Define Rh control and explain its purpose.
- Describe the different types and purposes of reagent RBCs.
- Describe the principles of gel technology, microplate techniques and solid-phase RBC adherence techniques.
- Differentiate phenotype from genotype.
- Define the following terms: gene, allele, haplotype, polymorphic; differentiate between homozygous and heterozygous.
- Describe the dosage effect and explain its significance in blood bank testing.
- Differentiate between recessive, dominant and codominant inheritance.
- Explain the Mendelian Laws of independent assortment and independent segregation and describe how they apply to blood group antigen inheritance.

### **Unit 3: Major Blood Groups – Weeks 4-5**

Chapters 5-7

Objectives:

- Define a blood group system with regard to blood group antigens and their inheritance.
- Given an ABO phenotype, determine possible ABO genotypes
- Describe the biochemical and serologic characteristics of the ABO antibodies
- List the cells, body fluids and secretions where ABO antigens can be located.
- Describe the relationships among the ABO, H and Se genes; differentiating between type 1 and 2 oligosaccharide structures and state where each is located.
- Describe the formation of the H antigen from the gene product and its relationship to ABO antigen expression
- Discuss the importance of the subgroups of A and B in transfusion medicine
- Define ABO discrepancy, including different causes, testing patterns and method of resolution

- Define the terms universal donor and universal recipients as they apply to RBC and plasma products
- Describe the current genetic theory of the inheritance of the Rh system antigens, discussing the genetic theories behind Fisher-Race and Weiner terminologies
- Predict the Rh genotype given a phenotype; listing the five major antigens of the Rh system
- Define weak D and list the genetic circumstances that cause this phenotype
- Discuss the Rh system antibodies, including reactivity and characteristics
- List sources of error in Rh typing and methods of solving each problem
- Discuss how the antigens of the Lewis blood group system differ from those of other blood groups such as ABO
- Describe the serologic characteristics and clinical significance of anti-Le<sup>a</sup>, anti-Le<sup>b</sup>, anti-I, anti-I and anti-P antibodies
- Discuss the biochemical nature, serologic characteristics and clinical significance of the antigens of the Kell, MNSs, Duffy, Kidd, Lutheran, Gerbich and Diego blood group systems
- Define MHC and explain the importance of MHC in human physiology
- Compare and contrast the serologic characteristics and clinical relevance of antibodies associated with each blood group system, identifying unique characteristics

#### **Unit 4: Pretransfusion testing – Weeks 6-8**

Chapters 8-10

Objectives:

- Define atypical or unexpected antibodies and explain how they are formed
- Discuss the purpose of the antibody screen and how positive results contribute to the identification process
- Compare and contrast the autocontrol and direct antiglobulin test
- Describe the reagent RBC panel and antigram with regard to antigen and ABO type
- Define phase of reactions and its significance, including how reaction strength contributes to antibody resolution
- Describe the process of ruling out antibodies on a pane, including the “rule of three.”
- Discuss the possible causes of ABO discrepancies due to: weakly reactive or missing antigens, weakly reactive or missing antibodies, unexpected antigens and unexpected antibodies
- Formulate a testing strategy to follow when performing serologic investigation of an ABO discrepancy, including prewarming, adsorption and elution procedures
- List methods of enhancing weak IgG antibodies
- Define compatibility testing and describe seven procedures that constitute routine compatibility testing
- Define and differentiate between major crossmatch and minor crossmatch
- Briefly discuss the purpose of the autocontrol
- Discuss alloimmunization and situations that may stimulate it
- When given a diagram, accurately grade agglutination reactions

- Compare and contrast direct and indirect antiglobulin tests
- Discuss the selection of crossmatch compatible whole blood, RBCs, plasma, platelets and cryoprecipitate for transfusion.
- Discuss strategies for transfusion when compatible blood cannot be located
- Describe how crossmatching is handled in the massive transfusion situation
- Discuss the performance and interpretation of the 3 steps that should be part of the preliminary laboratory investigation of any suspected hemolytic transfusion reaction

## **Unit 5: Clinical Considerations in Immunoematology – Week 9**

Chapters 11-12

Objectives:

- Define autoantibody and alloantibody
- Categorize the adverse complications of transfusion
- Compare and contrast the features of an acute versus a delayed immune mediated hemolytic transfusion reaction
- Discuss the mechanisms that can effect non-immune mediated RBC destruction
- Describe the major features of the following immune mediated nonhemolytic transfusion reactions: febrile, urticarial, anaphylactic, transfusion-related acute lung injury and transfusion associated graft versus host disease
- Discuss the mechanism and clinical features of the bacterial contamination of blood products
- List unique transfusion problems and issues surrounding each of the following conditions: massive transfusion, neonatal transfusion, therapeutic pheresis, burns and liver disease
- Identify the steps taken in the transfusion service on receipt of a patient sample post reaction, including testing required in the investigation of transfusion reactions and the rationale for selecting these tests
- Define hemolytic disease of the newborn (HDN) and describe the etiology of the disease
- List three types of HDN based on antibody specificity
- State three criteria that are necessary for HDN to develop
- Describe the routine prenatal testing necessary to diagnose, monitor and treat HDN
- Compare and contrast ABO-HDN versus HDN associated with other blood group antibodies
- Describe the uses of RhIG in the prevention of HDN due to anti-D
- Explain the principle, interpretation and significance of the Kleihauer-Betke acid elution
- Discuss the pathophysiology and transfusion needs of patients with sickle cell disease, thalassemia and autoimmune disease
- Describe the pathophysiology of acute blood loss and massive transfusion therapy

## **Unit 6: Blood Collection and Component Preparation – Weeks 10-11**

Chapters 13-16

Objective:

- Explain the rationale and approaches for pre-donation screening
- Determine whether a donor is eligible to donate based on the results of the donor's medical history and physical evaluation
- Describe the confidential exclusion procedure and the reason for its use
- Explain the informed consent process for blood donation
- List possible adverse donor reactions
- Compare and contrast allogeneic and autologous donor criteria
- List the required tests performed on allogeneic and autologous donor blood, including when CMV screening is performed
- Describe the principle of nucleic acid and Western blot testing for testing donor blood samples
- Define storage lesion and the elements that change during blood storage
- Compare the anticoagulant and preservative solutions with regard to expiration and content
- Describe the steps in blood component preparation, including how the theory of differential centrifugation is applied
- Describe the proper method of preparation, storage characteristics, shelf life, and labeling requirements of all blood components
- List the 11 items that must be included on the final product label
- Discuss appropriate storage conditions, temperatures and shipping for all blood components

**Students with Disabilities:** It is the policy of Northeast Texas Community College to provide reasonable accommodations for qualified individuals who are students with disabilities. This College will adhere to all applicable federal, state and local laws, regulations and guidelines with respect to providing reasonable accommodations as required to afford equal educational opportunity. It is the student's responsibility to arrange an appointment with a College counselor to obtain a Request for Accommodations form. For more information, please refer to the Northeast Texas Community College catalog or student handbook.

**Academic Honesty:** All students are expected to maintain high standards of integrity and honesty in all academic work. Northeast Texas Community College may initiate disciplinary proceedings against a student accused of scholastic dishonesty. Scholastic dishonesty includes, but is not limited to, statements, acts, or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work material that is not one's own. Scholastic dishonesty may involve, but is not limited to, one or more of the following acts: cheating, plagiarism, collusion, use of annotated texts or teacher's editions, and/or falsifying academic records.

**Plagiarism** is defined as the appropriation of any person's work and the unacknowledged incorporation of that work in one's own work offered for credit.

**Cheating** is defined to include the following: copying from another student's paper; using materials during a test not authorized by the person giving the test; collaborating with any other

person during the test without permission; knowingly obtaining, using, buying, selling, transporting, or soliciting in whole or in part the content of test not yet administered; substituting for another student or permitting any other person to substitute for oneself; copying computer or Internet files, using someone else's work for assignments as if it were one's own, or any other dishonest means of attempting to fulfill the requirements of a course.

**Collusion** is defined as the unauthorized collaboration with any person in preparing work offered for credit.

Students are expected to uphold the school's standard of conduct relating to academic honesty. Students assume full responsibility for the content and integrity of the academic work they submit. The guiding principle of academic integrity shall be that a student's submitted work, examinations, reports, and projects must be that of the student's own work. Students shall be guilty of violating the honor code if they:

1. Represent the work of others as their own.
2. Use or obtain unauthorized assistance in any academic work.
3. Give unauthorized assistance to other students.
4. Modify, without instructor approval, an examination, paper, record, or report for the purpose of obtaining additional credit.
5. Misrepresent the content of submitted work.

The penalty for violating the honor code is severe. Any student violating the honor code is subject to receive a failing grade for the course and will be reported to the Office of Student Affairs. If a student is unclear about whether a particular situation may constitute an honor code violation, the student should meet with the instructor to discuss the situation.



**Tentative Exam Schedule:**

<b>Exam</b>	<b>Unit/Topics Covered</b>	<b>Date</b>
1	Chapters 1-4	Sep. 12
2	Chapters 5-8	Oct. 10
3	Chapters 9-16	Nov. 21
Final	Comprehensive	Dec. 12

**Tentative Laboratory Schedule:**

<b>Date</b>	<b>Lecture</b>	<b>Laboratory Topic/Assignment</b>
Aug. 29	Ch1-2	Lab Orientation/QC demonstration
Sept. 5	Ch3-4	ABO and D forward typing (slide)
Sept. 12	Test 1 (Ch1-4)	ABO and D forward and reverse typing (tube)
Sept. 19	Ch5-6	ABO and D typing gel method
Sept. 26	Ch7	Antigen Typing
Oct. 3	Ch8	Antibody screen gel and tube method
Oct. 10	Test 2 (Ch5-8)	Midterm Lab Practical (T&S-tube)
Oct. 17	Ch9-10	Crossmatch procedure tube and gel method
Oct. 24	Ch11-12	Antibody identification
Oct. 31	Ch13-14	Antibody identification
Nov. 7	Ch15-16	TxRxn workup
Nov. 14	Review	Fetal screen
Nov. 21	Test 3 (Ch9-16)	Donor interview/Physical
Nov. 28	Thanksgiving	Thanksgiving
Dec. 5		Final Lab Practical
Dec. 12	Final Exam Ch (1-16)	

**Student Contract for MLAB 2431**

I, \_\_\_\_\_, have received, read and understand the syllabus for  
MLAB 2431 Immunohematology, offered at Northeast Texas Community College.

\_\_\_\_\_  
Student's signature

\_\_\_\_\_  
Date

**Current Contact Information:**

Phone: \_\_\_\_\_

Cell phone: \_\_\_\_\_

Preferred email address: \_\_\_\_\_