



INSTRUCTIONAL PACKAGE

MLT 120
Immunochemistry

Effective Term
Spring 2023

INSTRUCTIONAL PACKAGE

Part I: Course Information

Effective Term: Spring 2023

COURSE PREFIX: MLT 120

COURSE TITLE: Immunohematology

CONTACT HOURS: 6 hours

CREDIT HOURS: 4 hours

RATIONALE FOR THE COURSE:

This course introduces the theory and practice of blood banking, including the ABO, RH and other blood group systems, compatibility testing, and HDN.

COURSE DESCRIPTION:

This course introduces the theory and practice of blood banking, including the ABO, RH and other blood group systems, compatibility testing, and HDN.

PREREQUISITES/CO-REQUISITES:

Co-Req MLT 115, MLT 131, and 205; pre-Req MLT 102 and MLT 105 with a minimum grade of C

REQUIRED MATERIALS:

Please visit the [BOOKSTORE](#) online site for most current textbook information. Use the direct link below to find textbooks.

Enter the semester, course prefix, number and section when prompted and you will be linked to the correct textbook.

ADDITIONAL REQUIREMENTS:

Lab coats and goggles are required for the lab skills portion

TECHNICAL REQUIREMENTS:

Access to Desire2Learn (D2L), HGTC's learning management system (LMS) used for course materials.

Access to myHGTC portal for student self-services.

College email access – this is the college's primary official form of communication.

STUDENT IDENTIFICATION VERIFICATION:

Students enrolled in online courses will be required to participate in a minimum of one (1) proctored assignment and/or one (1) virtual event to support student identification verification. Please refer to your Instructor Information Sheet for information regarding this requirement.

CLASSROOM ETIQUETTE:

As a matter of courtesy to other students and your professor, please turn off cell phones and other communication/entertainment devices before class begins. If you are monitoring for an emergency, please notify your professor prior to class and switch cell phone ringers to vibrate.

Part II: Student Learning Outcomes**COURSE LEARNING OUTCOMES and ASSESSMENTS*:**

After successful completion of this course, the student will be able to:

1. Describe Quality Assurance and Regulation of the Blood Industry and Safety Issues in the Blood Bank
2. Describe Immunology Basic Principles and Applications in the Blood Bank
3. Explain the use and applications of Blood Banking Reagents
4. Differentiate Blood Group Systems and population Genetics
5. Describe Pretransfusion Testing: Antibody Detection and Identification and Compatibility Testing
6. Explain Transfusion Therapy in Selected Patients
7. Explain Donor Selection and Phlebotomy
8. Describe Blood Component Preparation and Therapy

Chapter One

1. List the elements of, and explain the importance of, a well-written standard operating procedure (SOP)
2. Define and describe the purpose behind root-cause analysis in error management
3. Properly dispose of laboratory waste material
4. List safety equipment and protective devices
5. Recognize the need for accident reporting
6. Conduct testing using safety principles

Chapter Two

1. Describe the characteristics of antigens that are located on RBCs, white blood cells, and platelets
2. Compare and contrast immunoglobulin M (IgM) and IgG antibodies with regard to structure, function, and detection by agglutination reactions
3. Distinguish the primary and secondary immune responses with regard to immunoglobulin class, immune cells involved, level of response, response time, and antibody affinity
4. List the variables in the agglutination test that affect sensitization and lattice formation
5. Outline the biologic effects mediated by complement proteins in the clearance of RBCs
6. Recognize hemolysis in an agglutination reaction and explain the significance

Chapter Three

1. Describe the relationship of potency and specificity to blood banking reagents
2. Compare and contrast polyclonal and monoclonal antibodies
3. Describe the reagents available for ABO and D typing
4. Define the reagent control, and describe its purpose
5. Describe the different types and purposes of reagent red blood cells (RBCs)
6. Describe the basic principles of antiglobulin testing
7. Identify the indications for implementing DATs and IATs
8. Discuss the different sources of possible errors in the performance of antiglobulin testing
9. Compare and contrast the composition and appropriate uses of polyspecific and monospecific antiglobulin reagents
10. Discuss the role of potentiators in immunohematologic testing
11. Describe the functions of the following potentiators in immunohematologic testing: low-ionic-strength solution, bovine serum albumin, polyethylene glycol, and proteolytic enzymes
12. Define and identify common lectins used in blood banking
13. Describe the principles of gel technology, microplate techniques, and solid-phase RBC adherence techniques

Chapter Four

1. Define the term blood group system with regard to genetic terms
2. Differentiate phenotype from genotype
3. Define the following terms: gene, allele, haplotype, and polymorphic
4. Distinguish homozygous from heterozygous, and provide an example using blood group system alleles
5. Explain phenotype frequency and how it is used to find compatible red blood cell (RBC) units
6. List the applications of molecular testing methods to the field of blood banking
7. Describe the molecular techniques used to identify RBC antigens and their advantages over hemagglutination methods

Chapter 5

1. Define a blood group system with regard to blood group antigens and their inheritance
2. Explain Landsteiner's rule
3. Describe the formation of the H antigen from the gene product and its relationship to ABO antigen expression
4. Discuss the selection of whole blood, red blood cell, and plasma products for transfusions
5. Compare and contrast the A1 and A2 phenotypes with regard to antigen structure and serologic testing
6. Determine the possible ABO genotypes with an ABO phenotype
7. Describe the ABO blood group system antibodies with regard to immunoglobulin class, clinical significance, and in vitro serologic reactions

8. List the technical errors that may result in an ABO discrepancy
9. Define the acquired B antigen and B(A) phenotypes; discuss the ABO discrepancies that would result from these phenotypes and methods used in resolving these discrepancies
10. List reasons for missing or weakly expressed ABO antigens and the test methods used to resolve these discrepancies
11. Describe ABO discrepancies caused by extra reactions in serum testing and how they can be resolved
12. Discuss the Bombay phenotype with regard to genetic pathway, serologic reactions, and transfusion implications

Chapter 6

1. Explain how the D antigen was named Rh
2. Describe the current genetic theory of the inheritance of Rh system antigens
3. Discuss the biochemistry of the Rh system, including the gene products and antigen structures
4. Compare and contrast the genetic theories behind the Fisher-Race and Wiener terminologies and translate from one to the other
5. Compare the Rosenfield and International Society of Blood Transfusion (ISBT) terminologies with the Fisher-Race and Wiener terminologies, and discuss their uses
6. Predict the Rh genotype given a phenotype
7. Define weak D, and list the genetic circumstances that cause this phenotype
8. Explain the test for the weak D antigen and the importance of an appropriate control
9. Describe the characteristics of the Rh system antibodies and their clinical significance with regard to transfusion and hemolytic disease of the fetus and newborn (HDFN)

Chapter 7

1. Identify the major antigens within the other blood group systems
2. List the frequencies of the observed phenotypes and the association of phenotypes with ethnic group diversity
3. Describe the biochemical characteristics of antigens within each blood group system
4. Describe the genetic mechanisms for antigens within each blood group system
5. Compare and contrast the serologic characteristics and clinical relevance of the antibodies associated with each blood group system
6. Identify unique characteristics of selected blood group systems regarding disease association and biologic functions

Chapter 8

1. Discuss the purpose of the antibody screen and how positive results contribute to the identification process
2. Compare and contrast the autocontrol and direct antiglobulin test (DAT)

3. Explain why patient information regarding transfusion or pregnancy history, age, race, and diagnosis helps in the process of antibody identification
4. Discuss how the reaction strength contributes to antibody resolution
5. Describe the process of ruling out antibodies on a panel
6. Explain the rule of three with regard to antibody identification
7. Describe the properties of a high-titer, low-avidity antibody and techniques for identifying or avoiding reactivity
8. Explain the importance of a control when performing antibody neutralization
9. Discuss the use of and potential problems with the prewarming procedure
10. List methods of enhancing weak immunoglobulin G (IgG) antibodies
11. Explain the process of identifying the specificity of a cold autoantibody and techniques to avoid cold autoantibody reactivity
12. Describe the process and limitations of adsorption techniques as they apply to warm and cold autoantibodies
13. Define the elution procedure, and list the methods and purposes of this test

Chapter 9

1. List the procedures included in the routine compatibility test, and explain their purpose
2. Explain the AABB's Standards for Blood Banks and Transfusion Services as related to compatibility testing
3. Discuss the selection of crossmatch-compatible whole blood, red blood cells (RBCs), plasma, platelets, and cryoprecipitate for transfusion
4. Discuss strategies for transfusion when compatible blood cannot be located
5. Discuss limitations of crossmatching
6. Describe how crossmatching is handled in the massive transfusion situation
7. Discuss the advantages and issues related to computer crossmatching
8. Explain the elements of patient identification and their importance in compatibility testing
9. Explain the use of a typing and screening protocol and a maximum surgical blood order schedule
10. Explain how compatibility testing is carried out for an infant younger than 4 months of age
11. Discuss the principles of autologous blood crossmatching

Chapter 10

1. Compare and contrast the forces driving the move to automation in the transfusion service
2. Identify the potential benefits and challenges associated with a change to automation
3. Define the characteristics of an ideal instrument for blood bank testing
4. Evaluate a vendor, base technology, and instrument for desired features
5. Compare and contrast gel technology and solid-phase red cell adherence (SPRCA) assays
6. Compare and contrast the automated platforms available for a transfusion service

Chapter 11

1. List common signs and symptoms of adverse transfusion reactions
2. Distinguish between acute and delayed transfusion reactions, and give examples of each
3. Discuss the mechanisms that can cause immune- and nonimmune-mediated red blood cell (RBC) destruction
4. Compare and contrast the distinguishing features of the following transfusion reactions: febrile, urticarial, and anaphylactic reactions; transfusion-related acute lung injury; and transfusion-associated graft-versus-host (GVH) disease
5. Discuss the causes and clinical features of the bacterial contamination of blood products
6. Describe the clinical features and patients at risk for a transfusion reaction caused by circulatory overload

Chapter 12

1. Discuss the cause of hemolytic disease of the fetus and newborn (HDFN)
2. Contrast the metabolism of bilirubin in the fetus and the newborn
3. Correlate the tests included in an initial prenatal workup with their significance in predicting HDFN
4. Distinguish clinically significant and insignificant antibodies in terms of causing HDFN
5. Explain the primary value of performing antibody titration, and state what results are considered significant
6. List the tests routinely performed on cord blood cells when HDFN is suspected, and discuss possible sources of error when performing each test
7. Compare and contrast the clinical and laboratory findings in ABO HDFN versus HDFN caused by anti-D antibody
8. Discuss the composition, eligibility criteria, and principle of Rh immune globulin (RhIG)
9. Explain the principle, interpretation, and significance of a positive rosette test for fetomaternal hemorrhage
10. Outline the principle, interpretation, and significance of Kleihauer-Betke acid elution
11. Evaluate laboratory test results for postpartum samples, and determine if RhIG should be administered
12. Calculate the dose of RhIG, given the fetomaternal hemorrhage results
13. Explain the selection of blood for an intrauterine exchange transfusion with regard to ABO and D phenotype

Chapter 13

1. Describe the required donor registration information and why it is necessary
2. Explain the importance and discuss the content of the blood donor educational materials
3. Compare the donor medical history criteria intended for protecting the donor with questions that protect the recipient
4. Analyze health history examples that could cause a permanent, indefinite, or temporary deferral
5. List the physical examination criteria for allogeneic blood donation

6. Apply the physical examination guidelines to potential blood donor situations
7. Determine the eligibility status of donors when common medications and recent vaccines are part of the donor history
8. Select eligible donors, and identify donors for deferral
9. List possible adverse donor reactions and appropriate treatment
10. Compare and contrast allogeneic and autologous donor criteria
11. List various forms of autologous donations
12. Describe the apheresis procedure, the products that can be collected, and the donor requirements for each
13. Discuss the reason for directed donation and the donor criteria for this procedure

Chapter 14

1. List the required tests performed on allogeneic and autologous donor blood
2. Describe the enzyme-linked immunosorbent assay (EIA), and differentiate among sandwich, indirect, and competitive EIA techniques
3. Describe the principle of nucleic acid testing for donor blood samples
4. Compare and contrast internal and external controls in EIA testing
5. Compare and contrast test sensitivity with test specificity
6. Describe when cytomegalovirus (CMV) screening is performed
7. State the frequency of positive tests on blood donated for allogeneic transfusion
8. Define look-back investigation and the Food and Drug Administration (FDA) requirements with regard to hepatitis C virus (HCV) and human immunodeficiency virus (HIV) testing on blood donors
9. State the reason for performing bacterial detection tests on plateletpheresis products

Chapter 15

1. Explain the benefits of component separation
2. Define storage lesion, and list the elements that change during blood storage
3. Compare the anticoagulant and preservative solutions with regard to expiration and content
4. Illustrate the steps in blood component preparation
5. Given certain patient clinical conditions, state the blood component most appropriate for their transfusion needs
6. State the storage temperature and storage limits for each blood component
7. Given laboratory quality control test measurements, determine which component products meet acceptable AABB standards and Food and Drug Administration (FDA) guidelines
8. List the labeling requirements common to all blood components and the International Society of Blood Transfusion (ISBT) 128 advantages
9. Discuss the importance of monitored storage equipment for blood components and the alarm requirements

Chapter 16

1. Describe the pathophysiology of acute blood loss and massive transfusion therapy
2. Discuss the transfusion requirements and causes of bleeding during cardiac surgery
3. Describe the unique hematologic problems and transfusion therapy issues associated with neonates
4. Discuss the pathophysiology and transfusion needs of patients with sickle cell disease, thalassemia, and autoimmune disease
5. Compare and contrast the various applications of therapeutic apheresis and the conditions and diseases associated with its use
6. Discuss the transfusion issues unique to chronic renal disease patients and how the use of erythropoietin affects the need for red blood cell (RBC) transfusions
7. List several alternatives for transfusion of blood products and their application in coagulation-deficient, trauma, and oncology patients

MLT 120 Lab objectives

Week One

1. Practice RBC cell suspensions
2. Complete the Safety Quiz for MLT lab

Week Two

1. Discuss ABO typing reagents
2. Practice tube agglutination Reaction Strength
3. Explain the agglutination reaction results and grading

Week Three

1. Explain the principle of the ABO and RH(D) Testing- Tube method
2. Discuss the procedure of the test performed
3. Discuss the interpretation of the results
4. Discuss considerations for the ordering of the test.

Week Four

1. Explain the principle of the Cell washing- Manual Tube method
2. Discuss the procedure of the test performed
3. Discuss the interpretation of the Antiglobulin test results
4. Discuss considerations for the ordering of the test.

Week Five

1. Explain the principle of the Antibody Screening- Tube method
2. Discuss the procedure of the test performed
3. Discuss the interpretation of the results
4. Discuss considerations for the ordering of the test.

Week Six

1. Explain the principle of the Antibody identification test.
2. Discuss the procedure of the test performed
3. Discuss the interpretation of the results
4. Discuss considerations for the ordering of the test.

Week seven

1. Explain the principle of the Gel methodology for Immunohematology
2. Discuss the procedure of the test performed
3. Discuss the interpretation of the results
4. Discuss considerations for the ordering of the test.
5. Discuss the Ortho Workstation parts and principle

Week eight

1. Explain the principle of the Compatibility Testing
2. Discuss the procedure of the test performed
3. Discuss the interpretation of the results
4. Discuss considerations for the ordering of the test.
5. Discuss the Ortho Workstation parts and principle

Week nine

1. Explain responsibility of hosting a local blood drive
2. Explain the donor requirements

Week ten

1. Explain the principle of the Direct Antiglobulin Testing (DAT)
2. Discuss the procedure of the test performed
3. Discuss the interpretation of the results
4. Discuss considerations for the ordering of the test.
5. Discuss the Ortho Workstation parts and principle

Week eleven

1. Explain the principle of the Indirect Antiglobulin Testing
2. Discuss the procedure of the test performed
3. Discuss the interpretation of the results
4. Discuss considerations for the ordering of the test.
5. Discuss the Ortho Workstation parts and principle

Week twelve

1. Explain the principle of the Antibody Identification
2. Discuss the procedure of the test performed
3. Discuss the interpretation of the results

4. Discuss considerations for the ordering of the test.
5. Interpret gel methodology results

Week thirteen

1. Give accurate ABO type and antibody screen results for an unknown specimen

****Students – please refer to the Instructor’s Course Information sheet for specific information on assessments and due dates.***

Part III: Grading and Assessment

EVALUATION OF REQUIRED COURSE MEASURES/ARTIFACTS*:

Students’ performance will be assessed, and the weight associated with the various measures/artifacts are listed below.

EVALUATION*

Chapter Tests	50%
Lab Assignments	15%
Homework Assignments	10%
Final Exam	25%
	100%

****Students, for the specific number and type of evaluations, please refer to the Instructor’s Course Information Sheet.***

GRADING SYSTEM:

Please note the College adheres to a 10-point grading scale A = 100 – 90, B = 89- 80, C = 79 – 70, D = 69 – 60, F = 59 and below.

Grades earned in courses impact academic progression and financial aid status. Before withdrawing from a course, be sure to talk with your instructor and financial aid counselor about the implications of that course of action. Ds, Fs, Ws, WFs and Is also negatively impact academic progression and financial aid status.

The Add/Drop Period is the first 5 days of the semester for **full term** classes. Add/Drop periods are shorter for accelerated format courses. Please refer to the [academic calendar](#) for deadlines for add/drop. You must attend at least one meeting of all of your classes during that period. If you do not, you will be dropped from the course(s) and your Financial Aid will be reduced accordingly.

Part IV: Attendance

Horry-Georgetown Technical College maintains a general attendance policy requiring students to be

present for a minimum of 80 percent (80%) of their classes in order to receive credit for any course. Due to the varied nature of courses taught at the college, some faculty may require up to 90 percent (90%) attendance. Pursuant to 34 Code of Federal Regulations 228.22 - Return to Title IV Funds, once a student has missed over 20% of the course or has missed two (2) consecutive weeks, the faculty is obligated to withdraw the student and a student may not be permitted to reenroll. **Instructors define absentee limits for their class at the beginning of each term; please refer to the Instructor Course Information Sheet.**

Part V: Student Resources



THE STUDENT SUCCESS AND TUTORING CENTER (SSTC):

The SSTC offers to all students the following **free** resources:

1. **Academic tutors** for most subject areas, **Writing Center support**, and **college success skills**.
2. Online **tutoring** and academic support resources.
3. Professional and interpersonal communication **coaching** in the EPIC Labs.

Visit the [Student Success & Tutoring Center](#) website for more information. To schedule tutoring, contact the SSTC at ssc@hgtc.edu or self-schedule in the Penji iOS/Android app or at www.penjiapp.com. Email ssc@hgtc.edu or call SSTC Conway, 349-7872; SSTC Grand Strand, 477-2113; and SSTC Georgetown, 520-1455, or go to the [Online Resource Center](#) to access on-demand resources.



STUDENT INFORMATION CENTER: TECH Central

TECH Central offers to all students the following **free** resources:

1. **Getting around HGTC:** General information and guidance for enrollment, financial aid, registration, and payment plan support!
2. Use the [Online Resource Center \(ORC\)](#) including Office 365 support, password resets, and username information.
3. **In-person workshops, online tutorials and more services** are available in Desire2Learn, Student Portal, Degree Works, and Office 365.
4. **Chat with our staff on TECH Talk**, our live chat service. TECH Talk can be accessed on the student portal and on TECH Central's website, or by texting questions to (843) 375-8552.

Visit the [Tech Central](#) website for more information. Live Chat and Center locations are posted on the website. Or please call (843) 349 – TECH (8324), Option #1.



HGTC LIBRARY:

Each campus location has a library where HGTC students, faculty, and staff may check out materials with their HGTC ID. All three HGTC campus libraries are equipped with computers to support academic research and related school work; printing is available as well. Visit the [Library](#) website for more information or call (843) 349-5268.

STUDENT TESTING:

Testing in an **online/hybrid** course and in **make-up exam** situations may be accomplished in a variety of ways:

- Test administered within D2L
- Test administered in writing on paper
- Test administered through Publisher Platforms (which may have a fee associated with the usage)

Furthermore, tests may have time limits and/or require a proctor.

Proctoring can be accomplished either face-to-face at an approved site or online through our online proctoring service. To find out more about proctoring services, please visit the [Online Testing](#) section of the HGTC's Testing Center webpage.

The **Instructor Information Sheet** will have more details on test requirements for your course.

DISABILITY SERVICES:

HGTC is committed to providing an accessible environment for students with disabilities. Inquiries may be directed to HGTC's [Accessibility and Disability Service webpage](#). The Accessibility and Disability staff will review documentation of the student's disability and, in a confidential setting with the student, develop an educational accommodation plan.

Note: It is the student's responsibility to self-identify as needing accommodations and to provide acceptable documentation. After a student has self-identified and submitted documentation of a disability, accommodations may be determined, accepted, and provided.

STATEMENT OF EQUAL OPPORTUNITY/NON-DISCRIMINATION STATEMENT:

Horry-Georgetown Technical College prohibits discrimination and harassment, including sexual harassment and abuse, on the basis of race, color, sex, national or ethnic origin, age, religion, disability, marital or family status, veteran status, political ideas, sexual orientation, gender identity, or pregnancy, childbirth, or related medical conditions, including, but not limited to, lactation in educational programs and/or activities.

TITLE IX REQUIREMENTS:

All students (as well as other persons) at Horry-Georgetown Technical College are protected by Title IX—regardless of their sex, sexual orientation, gender identity, part- or full-time status, disability, race, or national origin—in all aspects of educational programs and activities. Any student, or other member of the college community, who believes that he/she is or has been a victim of sexual harassment or sexual violence may file a report with the college's Chief Student Services Officer, campus law enforcement, or with the college's Title IX Coordinator or designee.

*Faculty and Staff are required to report incidents to the Title IX Coordinators when involving students. The only HGTC employees exempt from mandatory reporting are licensed mental health professionals (only as part of their job description such as counseling services).

INQUIRIES REGARDING THE NON-DISCRIMINATION/TITLE IX POLICIES:

Student and prospective student inquiries concerning Section 504, Title II, Title VII, and Title IX and their application to the College or any student decision may be directed to the Vice President for Student Affairs.

Dr. Melissa Batten, VP Student Affairs

Title IX, Section 504, and Title II Coordinator

Building 1100, Room 107A, Conway Campus

PO Box 261966, Conway, SC 29528-6066

843-349-5228

Melissa.Batten@hgtc.edu

Employee and applicant inquiries concerning Section 504, Title II, and Title IX and their application to the College may be directed to the Vice President for Human Resources.

Jacquelyne Snyder, VP Human Resources

Affirmative Action/Equal Opportunity Officer and Title IX Coordinator

Building 200, Room 205B, Conway Campus

PO Box 261966, Conway, SC 29528-6066

843-349-5212