Course Outline

Course Number: MLT 207
Course Title: CLINICAL IMMUNOHEMATOLOGY
Credits: 4

Hours:
Lecture 3/Lab 3

Pre-requisite:
MLT 112, 200

Winter
2016-2017

Course Modification: Due to a late start in the academic year, this course will be taught as an online hybrid lecture the first 2 weeks with in-class lectures and labs beginning Tuesday January 3, 2017

Course description:
This class covers the basic theory and concepts of antigen-antibody reactions as they relate to blood cell transfusions. The structure of blood group antigens and the genetics of their inheritance are closely examined. Antibody production and the role of antibodies in transfusion reactions are studied in depth. Methods are introduced for performing blood grouping and compatibility testing. Proper donor and component selection are also covered. Laboratory sessions in the course help students develop blood banking skills and provide hands on experience in blood bank procedures.

Required Text:
Title: Basic & Applied Concepts of Blood Banking and Transfusion Practices
3rd Edition
Author: Kathy D. Blaney, Paula R. Howard
Publisher: Elsevier 2013

Information resources:
AABB Technical Manual available at the reference desk at the MCCC library
https://www.redcross.org

Course Instructor:
Lisa M Shave MLS(ASCP)™ SBB™
shavel@mccc.edu
Office: 609 570 3387
Office hours: By appointment from January 19-January 2nd.
Starting January 2nd-January 25th: Mondays 11am-2pm or by appointment
MCCC’s General Education Knowledge Goals & Core Skills

General Education Knowledge Goals
Goal 1  Communication - Students will communicate effectively in both speech and writing.
Goal 3  Science - Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.
Goal 8  Diversity - Students will understand the importance of a global perspective and culturally diverse peoples.

Core Skills
Goal A - Written and Oral Communication in English. Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.
Goal B - Critical Thinking and Problem-solving. Students will use critical thinking and problem solving skills in analyzing information.
Goal D - Information Literacy. Students will recognize when information is needed; have the knowledge and skills to locate, evaluate and effectively use information for college level work.
Goal F - Collaboration and Cooperation. Students will develop the interpersonal skills required for effective performance in group situations.
Goal G - Intra-Cultural and Inter-Cultural Responsibility. Students will demonstrate an awareness of the responsibilities of intelligent citizenship in a diverse and pluralistic society, and will demonstrate cultural, global and environmental awareness.

Course Competencies/Goals
Upon completion of this course the student will be able to:

1. Exhibit knowledge of safety and quality control used in a blood bank laboratory. (G3, GB)
2. Describe the function of the human immune system as it applies to the principles of immunology, serology and blood bank testing. (G1,3, GA,B)
3. Apply the biological concepts of genetics and immunology to antigen and antibody development in ABO, Rh, and other blood group systems. (G3, GB)
4. Demonstrate knowledge and the application of principles of serological testing in pre-transfusion and compatibility testing and in the selection of component therapy as they relate to current blood bank practices. (G3, GB)
5. Incorporate knowledge of Hemolytic Disease of the Fetus/Newborn in the evaluation of prenatal, maternal and cord blood testing as it applies to current blood bank practices. (G3, GB)
6. Demonstrate competency in the performance and result evaluation of routine blood bank procedures. (G3, GB)
7. Research and give a classroom presentation on an assigned blood group system. Include information on genotype and phenotype frequencies and ethnic group diversities commonly associated with that system. (G1,3,8, GA,B,D,G)
8. Value working collaboratively using professional communication skills and behavioral attitudes while working with fellow students in the laboratory. (G8, GF,G)
Week 1 (ONLINE)  Introduction to Immunohematology
Upon completion of this unit the student will be able to:

Learning objectives:
1. Compare and contrast innate and acquired immune systems. (G1,3, GA)
2. Describe the molecular characteristics of antigens and antibodies and the attractive forces that bind them. (G1,3, GA)
3. Explain the difference between a primary and secondary immune response. Define ‘anamnestic’ response. (G1,3 GA)
4. Understand the principles of genetics as they apply to blood group antigens in immunohematology. (G3, GB)
5. Explain how RBC, WBC and platelet antigens can elicit an immune response during a transfusion. (G1,3, GA,B)
6. Define the term blood group system with regard to genetic terms. (G1,3, GA,B)
7. Differentiate phenotype from genotype. (G1,3, GA,B)
8. Define the following terms: gene, allele, haplotype and polymorphic. (G1,3, GA,B)
9. Distinguish homozygous from heterozygous. (G1,3, GA,B)
10. Differentiate among recessive, dominant and codominant inheritance. (G1,3, GA,B)
11. Explain Mendelian Laws of independent assortment and segregation and how they apply to blood group inheritance. (G1,3, GA,B)
12. Differentiate between direct and indirect exclusion in parentage testing. (G1,3, GA,B)
13. Explain how to find compatible Red Blood Cell units based on phenotype frequency in the population. (G1,3, GA,B)

Week2 (ONLINE)  Blood Bank Reagents, Quality Assurance/Quality Contorl, ABO & H, Rh group and Blood Typing
Upon completion of this unit the student will be able to:

Learning Objectives:
1. Explain how Safety Practices and Quality Control are implemented in the blood bank. (G1,3, GA,B)
2. Describe the various accrediting and regulatory agencies of a blood bank. (G1, GA)
3. Define Landsteiner’s rule. (G1,3, GA,B)
4. Determine possible ABO genotypes and corresponding phenotypes. (G3, GB)
5. Demonstrate knowledge of the genetics and antigen/antibody production as it pertains to the ABO Blood Group. (G3, GB)
6. Describe the relationships among the ABO, H and Se genes. (G1,3, GA)
7. Compare the A1 and A2 phenotypes with regard to serologic testing. (G1,3, GA,B)
8. List ABO antigen and antibody discrepancies that can occur. Describe test methods for resolving these discrepancies. (G1,3, GA,B)
9. Compare and contrast theories of genetic inheritance for the Rh Blood group system. Translate Fisher-Race and Weiner Rh blood group system terminology. Compare the Rosenfield and ISBT terminology in Rh labeling. (G1,3, GA,B)
10. Describe the characteristics of Rh antibodies. (G1,3, GA)
11. Explain testing method for the weak D antigen. (G1,3, GA,B)
12. Describe the use of blood bank test reagents for routine testing. (G1,3, GA,B)

**Week 3  Pretransfusion Testing (DAT vs IAT), Other Blood Groups and Identification of Antibodies (Antibody Screen and Panels)**

Upon completion of this unit the student will be able to:

**Learning Objectives:**
1. Compare and contrast a direct antiglobulin and indirect antiglobulin test. (G1,3, GA,B)
2. State reasons why a patient may have a positive direct antiglobulin test. (G1,3, GA,B)
3. Identify the major antigens classified within other blood group systems. (G3)
4. Discuss on the online discussion group an assigned blood cell antigen group. (G1,3,8 GA,B,D)
5. List the frequencies of observed phenotypes in other blood group systems and associate the phenotypes with ethnic group diversity. (G1,3,8, GA,G)
6. Classify and state the clinical relevance of the antibodies of other major blood group systems. (G1,3, GA)
7. Define the term unexpected antibodies and state two reasons for their formation. (G1,3, GA,B)
8. Discuss the purpose and the procedure for performing an antibody screen test. (G1,3, GA,B)
9. Explain how patient information, including age, race, pregnancy history and medical diagnosis help in the process of antibody identification. (G1,3,8 GA,B,G)
10. Describe the purpose of a red blood cell panel; define the term antigram as it relates to a red blood cell panel. (G1,3, GA,B)
11. State the significance of the phase & strength of a reaction of an antibody in its identification. (G1,3, GA,B)
12. Demonstrate knowledge of the “rule out” technique. (G3, GB)
13. Explain the “rule of three” with regard to antibody identification. (G1,3, GA,B)
14. Summarize the effects of dosage, temperature, pH, and enhancement techniques with potentiators in antibody identification. (G1,3, GA,B)

**Performance objectives:**
1. Exercise safety practices during laboratory sessions. (G3, GB)
2. Perform quality control procedures before beginning each laboratory assignment. (G3, GB)
3. Correctly perform and interpret results of a DAT & IAT. (G3, GB)
4. Use mono- and polyspecific reagents and Coomb’s check cells when appropriate. (G3, GB)
5. Perform ABO and Rh typing; interpret results using AABB standards. (G3,GB )
6. Recognize and solve ABO discrepancies. (G3, GB)
7. Perform an indirect antiglobulin test for a weak D antigen. (G3, GB)
8. Perform type and screen procedures on blood samples. (G3, GB)
9. Perform antibody identification for single and multiple antibodies using screening cells and red blood cell panels. (G3, GB)

**Week 4  Compatibility Testing, Neonatal/Obstetric Testing &Intro to Blood Collection & Donors**

Upon completion of this unit the student will be able to:

1. Demonstrate knowledge of AABB standards used in compatibility testing. (G3, GB)
2. Discuss the selection of compatible whole blood, packed cells, plasma and platelets for the various ABO blood groups. (G1,3, GA, GB)
3. Explain the difference between an Immediate Spin (IS) and a full Antiglobulin (IgG) crossmatch. (G1,3, GA,B)
4. Explain the protocol for issuing uncrossmatched blood in an emergency release. (G1,3, GA,B)
5. Summarize the etiology (causes) of Hemolytic Disease of the Fetus and Newborn (HDFN). (G1,3, GA,B)
6. State which tests are performed on a mother’s pre-natal blood sample. (G1,3, GA,B)
7. List possible antibodies involved in HDFN. (G1,3, GA)
8. Explain the fetal cell screen (Rosette test) procedure for fetal-maternal hemorrhage. (G1,3, GA,B)
9. Summarize the principle and procedure of the Kleihauer-Betke stain for fetal-maternal hemorrhage. (G1,3, GA,B)
10. Discuss the composition, prescription criteria, dosage and timing of administering of Rh immune globulin (RhIG). (G1,3, GA,B)
11. List laboratory procedures that are performed on cord blood including the washing cord blood to remove Wharton’s jelly. (G1,3, GA)
12. List the criteria used to select compatible blood products for an exchange transfusion on a fetus/newborn. (G1,3, GA,B)
13. Summarize the criteria for screening volunteer blood donors. Explain the registration process, health history review and the physical examination for potential donors. (G1,3, GA)
14. Discuss autologous blood unit collection. (G1,3, GA)
15. Define the terms ‘directed donation’, ‘apheresis’ and ‘therapeutic phlebotomy’. (G1,3, GA)
16. List the required tests performed on allogenic and autologous donor blood units. (G1,3, GA,B)
17. Summarize the requirements for retention of donor records. (G1,3, GA)

Performance objectives
1. Perform compatibility testing on samples of patient and donor blood. (G3, GB)
2. Properly select compatible units for transfusions candidates. (G3, GB)
3. Perform maternal pre-natal testing and newborn cord blood testing. (G3, GB)
4. Evaluate laboratory test results of maternal blood and the baby’s cord blood to determine if an HDFN has occurred. (G3, GB)
5. Evaluate lab test results of maternal blood to determine the need for administration of RhIG. (G3, GB)
6. Practice donor selection protocols in the laboratory. (G3, GB)
7. Test donor unit segments for ABO and Rh grouping. (G3, GB)

Week 5   Blood Components, Transfusion Reactions, Transfusion Therapy and Automation in Blood Bank
Upon completion of this unit the student will be able to:

Learning Objectives
1. Describe the steps performed in preparing components from a unit of whole blood including packed RBCs, fresh frozen plasma (FFP), platelets and cryoprecipitate. (G1,3, GA,B)
2. State the storage times & temperatures for the different blood products and components. (G1,3, GA)
3. Explain the purpose for preparing leukocyte-reduced & irradiated red blood cells. (G1,3, GA,B)
4. State requirements for administering of a unit of whole blood, packed cells, FFP, platelets or cryoprecipitate. (G1,3, GA)
5. State causes of transfusion reactions. Distinguish between symptoms of acute and delayed reactions.
6. Describe the laboratory work-up for a post-blood transfusion reaction. (G1,3, GA,B)
7. Describe the pathophysiology or acute blood loss and massive transfusion therapy. (G1,3, GA,B)
8. Explain the pathophysiology and transfusion needs of patients with sickle cell disease, thalassemia and autoimmune disease. (G1,3, GA,B)
9. Discuss the transfusion requirements of oncology patients. (G1,3, GA,B)
10. Present situations where a bone marrow transplant is required. (G1,3, GA,B)
11. List the appropriate transfusion support for hemostasis disorders. (G1,3, GA,B)
12. Describe the conditions which require therapeutic apheresis. (G1,3, GA,B)
13. Discuss the transfusion requirements and administering of erythropoietin for patients with chronic renal disease. (G1,3, GA,B)
14. Explain the use of automation in routine testing in blood bank laboratories. (G1,3, GA,B)

Performance objectives

1. Distinguish between blood bank components in the laboratory. Explain the storage requirements for each. (G1,3, GA)
2. Perform testing on a blood sample from a patient who experienced a transfusion reaction. (G3, GB)
3. ABO type pre and post transfusion samples and confirm ABO typing of the donor unit. (G3, GB)
4. Antibody test pre and post transfusion samples with the use of enhancement techniques. (G3, GB)
5. Repeat crossmatch with pre and post transfusion samples using immediate spin and antiglobulin phase testing. (G3, GB)
6. Inspect donor unit for bacterial contamination. (G3)
7. Perform an elution and adsorption test. (G3, GB)

PERFORMANCE EXIT LEVEL SKILLS

Upon completion of this unit the student will be able to:

1. Demonstrates an understanding of safety and quality control practices in blood bank. (G3, GB)
2. Exhibits proficiency and accuracy in ABO and Rh typing of random samples at the 100% competency level. (G3, GB)
3. Demonstrates skill and understanding of antibody screening and identification. (G3, GB)
4. Demonstrates proficiency and accuracy in compatibility testing and component selection. Chooses the correct blood donor ABO and Rh type with 100% accuracy. (G3, GB)
5. Given laboratory prepared specimens, the student will select an appropriate donor for the patient and perform the following procedures:
   • Patient – ABO grouping, Rh typing, antibody screening
   • Donor - Confirm ABO grouping, Rh typing, antigen typing if required
   • Compatibility testing
   • Component selection
6. Develop interpersonal skills required for effective performance in a lab setting with fellow students. (GF)

**GRADING POLICY**
1. **Students must earn a 77 or higher.** A final grade of 77 or higher in each Medical Laboratory Technician course is required in order to progress to the next MLT course and to graduate.

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<thead>
<tr>
<th>Lecture (Hybrid)</th>
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<tbody>
<tr>
<td>(Weeks 1+2)</td>
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<tr>
<td>Participation Quizzes</td>
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<td>Homework Assignments</td>
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<td>Exam</td>
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<td>(Weeks 3-5)</td>
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<td>Homework Assignments</td>
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<td>3 Online Quizzes</td>
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<td>In-Class Midterm Exam</td>
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<td>(Week 6)</td>
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<td>In person Final Exam</td>
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<td>Affective Score</td>
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<td>Midterm &amp; Practical</td>
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<td>Final &amp; Practical</td>
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<th>Grading Scale:</th>
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<tr>
<td>A       93-100</td>
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<td>A-      90-92</td>
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<td>B+      87-89</td>
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<td>B       83-86</td>
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<td>B-      80-82</td>
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<td>C+      77 – 79</td>
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<td>C       75-76</td>
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<td>D       74-60</td>
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<td>F       &lt;59</td>
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**Affective Scoring based on Professional Performance**
Affective objectives are behavioral standards that will be implemented during the professional phase of the Medical Laboratory Technology Program. Students will be evaluated by faculty using these standards throughout the course. The student is evaluated on the demonstration of performance that reflects achievement of important objectives for medical laboratory technicians. This professional performance will be evaluated during the laboratory course and will be returned to the student with their all laboratory worksheets submitted. See the last page for a detailed list of the criteria.

**Unsatisfactory Performance**
Unsatisfactory performance in any area of the behavioral standards or failure to keep a grade of 77 or above will require a consultation with the faculty and/or the MLT Program coordinator. The reason for the consultation will be clearly stated, counsel will be given and an action plan will be implemented. The student will be given the opportunity to give a written response. The consultation form will be kept in the student’s file.

**Attendance Policy (ONLINE PORTION)**
Students are expected to sign on to BlackBoard during the first two weeks of this course to access PowerPoint Lecture material, homework assignments and 1st Exam. Each week begins on the Monday and all assignments for that week are due by the Sunday at midnight. All late assignments will have points deducted.

**Attendance Policy (ONLINE PORTION)**
Attend all lecture and laboratory sessions. If an absence is anticipated, please e-mail shavel@mccc.edu or leave a phone message in the MLT Program Coordinator’s office at 609-570-3387. The student is responsible for any material missed. There are no make-up labs. This is an accelerated course and every effort must be made by the student to comprehend missed days in order to successfully complete this course.

**Academic Integrity**
Course work (quizzes, tests, individual assignments and laboratory practicals) must reflect the student’s own work and knowledge. Any prohibited exchange of information by paper, comments or gestures constitutes a violation of academic integrity. All academic integrity violations are reported to the college’s Academic Integrity Committee.

**Support Services for Differing Abilities**
Mercer County Community College is in compliance with both the ADA and section 504 of the Rehabilitation Act. If you have, or believe you have, a differing ability that is protected under the law please contact Arlene Stinson in LB 216, 609 570-3525, stinsona@mccc.edu for information regarding support services.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Read Chapter</th>
<th>Blackboard Assignments</th>
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</table>
| 1    | Mon 12/19/16 thru Sun 12/25/16 | • History of Blood Banking  
• Immunology & Serology  
• RBC, WBC & Platelet Antigens  
• Genetics in blood banking | Websites 1  
1  
3 | Quiz (P), Discussion Quiz (P); HW1 Quiz (P) No assignment |
| 2    | Mon 12/26/16 thru Sun 1/1/17 | • QA/QC, Safety & Regulations  
• Blood bank reagents  
• ABO & H Blood System  
• Rh Blood Group System  
• Pretransfusion Testing  
  a. ABO (Forward/Reverse)  
  b. Rh typing | 16  
2  
4  
5  
4  
5 | Quiz (P)  
Read Blood Typing Procedure & Answer questions for HW2  
EXAM 1 (Weeks ½) due by: Sun 1/1/17 1159 |
| 3    | Mon 1/2/17 - Sun 1/8/17  
Tuesday  
Wednesday  
Thursday | Pretransfusion (DAT/IAT/ABSC)  
Other Blood Group Antigens Identification of Antibodies | 2 (39-48);  
7 (159-162)  
6  
7 (162-186) | HW 1 given  
Blackboard Quiz 1 |
| 4    | Mon 1/9/17 - Sun 1/15/17  
Tues  
Wednesday  
Thursday | Compatibility Testing  
Neonatal & Obstetrics  
Blood Collection & Donors | 8  
11  
12-13 | Written MIDTERM  
HW1 due; HW2 given  
Blackboard Quiz 2 |
| 5    | Mon 1/16/17 - Sun 1/22/17  
Tuesday  
Wednesday  
Thursday | Blood Components  
Adverse Reactions & Tx Therapy  
Automation in Blood Bank | 9  
12 | HW 2 due  
Blackboard Quiz 3 |
<p>| 6    | Wednesday 1/25/16 | Final Exam | | |</p>
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<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Assignments</th>
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<tbody>
<tr>
<td>3</td>
<td>Tues 1/3/17</td>
<td>Safety practices &amp; Quality Control in the blood banking</td>
<td>Read Blood Typing Procedure Pre-Lab Questions ABO Discrepancies Worksheet</td>
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<td>Forward/Reverse Typing</td>
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<td>ABO Discrepancies</td>
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<td>Wed 1/4/17</td>
<td>DAT &amp; IAT</td>
<td>Read Procedure-Pre lab Questions</td>
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<td>Antibody Screen Cells (LISS and PeG)</td>
<td>Read Procedure-Pre lab Questions</td>
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<td>Check cells</td>
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<td>Thurs 1/5/17</td>
<td>Antibody Panels</td>
<td>Read Procedure-Pre lab Questions</td>
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<td>(single/multiple/dosage/autoantibodies)</td>
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<td>Tues 1/10/17</td>
<td>Type and Screen, AB ID &amp; Compatibility Testing Antigen Typing</td>
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<td>Wed 1/11/17</td>
<td>Rh Testing: Fetal cells, Fetal Screens, K-B</td>
<td>Read Procedures-Pre lab Questions</td>
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<td>Thurs 1/12/17</td>
<td>LAB MIDTERM</td>
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<td>Friday 1/13/17</td>
<td>Community Blood Council of NJ @ 10am</td>
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<td>Tues 1/18/17</td>
<td>Blood Donor Questionnaire</td>
<td>Read Procedures for this week Components Worksheet</td>
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<td>Wed 1/19/17</td>
<td>Transfusion Reaction Workup</td>
<td>Read Procedure-Pre lab Questions</td>
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<td>Elutions and Absorptions</td>
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<td>Thurs 1/20/17</td>
<td>LAB FINAL PRACTICUM</td>
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<td>6</td>
<td>Wed 1/25/17</td>
<td>LAB FINAL EXAM BLACKBOARD DUE</td>
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