Course Map

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| **Course Name: Hematology** | **Course Number: MLT 115** |
| **Instructor Name: Kelly Pesek** | **Date:** |
| **Course Objectives / Competencies:** (from syllabus)**Upon completion of this course the student will be able to:** **MLT115-01****Relate the basic principles of hematology testing.****a. Write the various measurements used in hematology in both the conventional and standard international (SI) units.** **b. Demonstrate application of the calculations used in hematology in various laboratory situations.****c. Describe and demonstrate safe work practices in the hematology laboratory.****d. Perform and assess quality assurance (QA) in terms of quality control (QC) in the hematology laboratory.****e. Discuss pre-analytical, analytical and post-analytical variables and assess the accuracy of control and patient results.****Correlate various stages of blood cells maturation with the normal characteristics, functions, and reference ranges for each.****a. Compare and contrast pediatric and adult hematopoiesis with fetal hematopoiesis.****b. List the basic characteristics of cell maturation and, when given cell characteristics, determine the stage of maturation.****Identify normal stages of erythrocytes.****a. Trace the kinetics of the erythrocyte from its origin in the bone marrow and release to cell death including the pathways responsible for RBC viability and function.****b. Diagram the structure of hemoglobin.****c. Diagram and explain the synthesis and breakdown of hemoglobin.****d. Describe how hemoglobins are classified and the significance of the types.****MLT115-02****Classify the anemias by both erythrocyte morphology and etiology.****a. Explain the following erythrocyte disorders: hemoglobinopathy, related anemias other than hemoglobinopathies, and polycythemia.****b. Contrast and compare intravascular and extravascular hemolysis.****Perform hematology tests within expected parameters.****a. Describe the acceptable specimen for any type of hematology testing.****b. Perform erythrocyte sedimentation rates.****c. Perform reticulocyte counts.****d. Perform manual hematocrits.****e. Perform manual hemoglobins.****f. Perform calculations for red cell indices and interpret results.****g. Prepare acceptable stained peripheral blood smears and explain the parameters that determine the characteristics of the smear.****MLT115-03****Identify normal stages of leukocytes.****a. Diagram and explain leukopoiesis.****b. Compare and contrast normal responses and diseases in leukocytes.****c. Explain the differences among acute myelocytic leukemia (AML), chronic myelogenous leukemia (CML), myelodysplasia, acute lymphocytic leukemia (ALL), chronic lymphocytic leukemia (CLL), miscellaneous lymphoid leukemias, Hodgkin's and non-Hodgkin's lymphoma, multiple myeloma (MM), and other lymphoproliferative disorders.****Perform hematology tests within expected parameters.****a. Perform leukocyte differential and peripheral blood smear evaluations.****MLT115-04****Explain the principles of various automated hematology instruments.****a. Perform automated complete blood counts.****b. When given a testing scenario using an automated analyzer, determine if there are reasons to question the validity of the results.****c. Interpret basic histograms from automated hematology analyzers.****MLT115-05****Identify the components needed for normal coagulation (including platelets).** **a. Explain the life span, origin, and parent cell of the thrombocyte.****b. Explain the interaction between the thrombocyte and the coagulation pathways.****c. Apply knowledge of thrombocyte physiology to explain the effects of ingestion of aspirin.****d. Describe the testing for thrombocytes and the interpretation of the data.****e. Contrast and compare idiopathic thrombocytopenic purpura (ITP), thrombotic thrombocytopenic purpura (TTP), and disseminated intravascular coagulation (DIC).****f. Diagram and explain hemostasis using a figure that includes all four components.****g. Explain the significance of coagulation and fibrinolytic factor synthesis, especially the vitamin-K dependent coagulation proteins.****h. Correlate the appropriate testing for blood coagulation and hemostasis with disease.****i. Explain the following conditions and associated diseases: hypercoagulation, hypocoagulation, and combination diseases.****j. Contrast and compare heparin and warfarin (Coumadin) therapy and monitoring.****Explain the various hemostasis test methodologies.****a. Describe the acceptable specimens for thrombocyte, coagulation, and fibrinolytic testing.****b. Perform protime testing.****c. Perform APTT testing.** |

**Course Materials (Text, edition and any other publisher items)**

**Textbook: *Hematology in Practice*, Second Edition by Betty Ciesla; ISBN: 0-8036-2561-8**

###### **Resources:** [**www.medtraining.org**](http://www.medtraining.org) **(Source for online tutorials)**

###### [**www.medialabinc.net**](http://www.medialabinc.net) **(Source for online tutorials)**

[**http://www.hematologyatlas.com/principalpage.htm**](http://www.hematologyatlas.com/principalpage.htm) **(a hematology atlas)**

**Course Description: This course involves a study of blood cells (quantitative and qualitative) and includes a study of development, recognition of normal and abnormal cell morphology, alterations present in disease, studies of anemias and leukemias, studies of platelets and coagulation factors, the coagulation mechanism, and tests employed in the hematology and coagulation laboratory.**

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| **Module # and Title** | **Objectives or Competencies** | **Content, Activities, or Challenges****(Learner Interaction & Engagement)** | **Assessments, Rubrics****(feedback)** | **Publish to OER** |
| **Module 1:**  Basic Hematology Principles **Module 2**: Red Cell Disorders and Related Laboratory Procedures**Module 3:** White Cell Disorders**Module 4:**Automated Hematology Instrumentation**Module 5:** Hemostasis and Disorders of Coagulation | 1. Relate the basic principles of hematology testing.2. Correlate various stages of blood cells maturation with the normal characteristics, functions, and reference ranges for each.3. Identify normal stages of erythrocytes.1. Classify the anemias by both erythrocyte morphology and etiology.2. Perform hematology tests within expected parameters.1. Identify normal stages of leukocytes.2. Perform hematology tests within expected parameters.1. Explain the principles of various automated hematology instruments.1. Identify the components needed for normal coagulation (including platelets). 2. Explain the various hemostasis test methodologies. | **Lectures and PowerPoint Handouts:**Chapter 1 - Introduction to HematologyChapter 2 - From Hematopoiesis to the Complete Blood CountChapter 3 - Red Blood Cell Production, Function, and Relevant Red Blood Cell MorphologyChapter 4 - Hemoglobin Function and Principles of Hemolysis **Assignments/Quizzes:**Chapter 1 QuizChapter 2 QuizChapter 3 QuizChapter 4 QuizCh 1 Assignment: Quality Control/Assurance WorksheetBio-Rad QC Workbook http://www.qcnet.com/Portals/50/PDFs/QCWorkbook2008\_Jun08.pdfCh 2 Assignment: Rule of Three and Red Cell IndicesCh 3 Assignment: Red Cell MorphologyCh 4 Assignment: Hemoglobin FunctionOSHA Bloodborne Pathogens Course on Media Lab Inc<https://www.medialabinc.net/>**Videos to view:**A Life Saved -video<http://ascls.org/promote-the-profession/105-a-life-saved/68-a-life-saved>Intro to Blood Cells<http://www.mclno.org/labpartners/index.htm>“Westgard Rules”<http://www.westgard.com/>Review Ch 1 - 4**Lectures and PowerPoint Handouts:**Chapter 5: The Microcytic AnemiasChapter 6: The Macrocytic AnemiasChapter 7: Normochromic Anemias: Biochemical, Membrane, and Miscellaneous Red Blood Cell DisordersChapter 8: The Normochromic Anemias Caused by HemoglobinopathiesChapter 20: Basic Procedures in a Hematology Lab**Quizzes/Assignments:**Chapter 5 QuizChapter 6 QuizChapter 7 QuizChapter 8 QuizChapter 5 Activity: Case StudiesChapter 6 ActivityChapter 7 ActivityChapter 5 - 8 Anemia Activity**Labs:**Lab 1: Manual HematocritsLab 2: Sed RatesLab 3: Manual HemoglobinsLab 4: Reticulocyte CountLab 5: Blood Smear Preparation and StainingLab 6: RBC Morphology and InclusionsLab 7: RBC Morphology and Automated CBC CorrelationReview Ch 5 - 8, 20**Lectures and PowerPoint Handouts:**Chapter 9: Leukopoiesis and Leukopoietic FunctionChapter 10: Abnormalities of White Blood Cells: Quantitative, Qualitative, and the Lipid Storage DiseasesChapter 11: Acute LeukemiasChapter 12: Chronic Myeloproliferative DisordersChapter 13: Lymphoproliferative Disorders and Related Plasma Cell DisordersChapter 14: The Myelodysplastic Syndromes**Quizzes/Assignments:**Chapter 9 QuizChapter 10 QuizChapter 11 QuizChapter 12 QuizChapter 13 QuizChapter 14 QuizChapter 9 ActivityChapter 10 ActivityWhite Blood Cell Questions (Ch 9 - 14)**Labs:**Lab 8: WBC and Platelet Estimate and MorphologyLab 9: Counting to 100Lab 10: Manual DifferentialMedialab Diff Simulator (Normal Diffs)[www.medialabinc.net](http://www.medialabinc.net)10 Normal Differentials (on campus)Lab Practical #1(includes manual hemoglobins, manual hematocrits, sed rates, preparing and staining slides and identifying white cells under the microscope)Medialab Diff Simulator (Abnormal Diffs)[www.medialabinc.net](http://www.medialabinc.net)10 Abnormal Differentials (on campus)Review Chapter 9 - 14**Lectures and PowerPoint Handouts:**Lecture: Automated Hematology**Quizzes/Assignments:**Automated Hematology QuestionsDescribing a RBC population using RBC indices and RDW[**www.medialabinc.net**](http://www.medialabinc.net)Introduction to Flow Cytometry[**www.medialabinc.net**](http://www.medialabinc.net)**Labs:**Lab: Daily Quality Control on InstrumentReview**Lectures and PowerPoint Handouts:**Chapter 15: Overview of Hemostasis and Platelet PhysiologyChapter 16: Quantitative and Qualitative Platelet DisordersChapter 17: Defects of Plasma Clotting FactorsChapter 18: Fibrinogen, Thrombin, and the Fibrinolytic SystemChapter 19: Introduction to Thrombosis and Anticoagulant Therapy**Quizzes/Assignments:**Ch 15 QuizCh 16 QuizCh 17 QuizCh 18 QuizCh 19 QuizCh 16 ActivityCh 17 ActivityCh 18 ActivityCh 19 ActivityMedtraining: Coagulation[www.medtraining.org](http://www.medtraining.org)**Labs:**Lab 11: ProtimesLab 12: INRLab 13: aPTTReview Chapters 15 - 19Lab Practical #2(includes running 2 automated CBC’s, performing 2 manual differentials and performing 1 protime in duplicate)Review for Final Test | Quiz over lecture - each question worth .5 point for every quiz.Review Bio-Rad QC Workbook and answer the questions - short answer questions worth 1 point, math questions/graphing worth 2 - 3 points2 points per patient interpretation1 point per cell type1 point per questionGrade received on test given in points out of 50Pass Test OneQuiz over lecture - each question worth .5 point for every quizEach question worth ½ pointEach question worth ½ pointEach question worth 1 pointEach question worth 1 pointRun 5 patients (worth 5 points each), study questions worth 1 - 6 points eachRun 4 patients (worth 5 points each), study questions worth 1 - 4 points eachRun 5 patients (worth 5 points each), study questions worth 1 - 4 points eachRun 2 patients (worth 5 points each), study questions worth 1 - 6 points eachProduce 5 appropriate smears and correctly stain 2 (3 points per slide, 2 points per slide stained), study questions worth 1 - 10 points eachEvaluate 2 slides (worth 5 points each), study questions worth 1 -2 points eachEvaluate 2 slides (worth 5 points each), study questions worth 1 point eachPass Test TwoQuiz over lecture - each question worth .5 point for every quizEach question worth 1 pointEach question worth 1 pointEach question worth 1 pointEvaluate 2 slides (each worth 10 points), study questions worth 1 - 3 points eachEvaluate 2 slides (each worth 10 points), study questions worth 1 - 4 points eachPerform 2 differentials (each worth 10 points), study questions worth 2 - 8 points eachPerform 10 Diffs, each worth 5 pointsCase 1, 3, 4, 5, 10, 13, 14, 15, 20, 2590% or higher = 5 points85% - 89% = 4 points80 - 84% = 3 points79 and lower = 1 pointPerform 10 Diffs, each worth 5 pointsLab Practical worth 50 points. See rubric for gradingPerform 10 Diffs, each worth 5 points Case 2, 6, 7, 11, 12, 16, 17,  18, 19, 21 90% or higher = 5 points85% - 89% = 4 points80 - 84% = 3 points79 and lower = 1 pointPerform 10 Diffs, each worth 5 pointsPass Test ThreeEach question worth 1 pointGrade received on test given in points out of 50Grade received on test given in points out of 50Perform maintenance and QC on 2 occasions, 5 points eachPass Test FourQuiz over lecture - each question worth .5 point for every quizEach question worth 1 pointEach question worth 1 pointEach question worth 1 pointEach question worth 1 pointGrade received on test given in points out of 50Perform 3 Protimes in duplicate (worth 4 points each), study questions worth 1 - 3 points eachPerform 3 Protimes in duplicate and calculate the INR (worth 5 points each), study questions worth 1 - 2 points each Perform 3 aPTT tests in duplicate (worth 4 points each), study questions worth 1 - 4 points eachPass Test FiveLab Practical worth 50 points. See rubric for gradingPass Final Exam for Hematology | NoneNoneDigital Slides for OERNoneNone |

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