

Implementation date
Fall 2009

PROGRAM CONCENTRATION:
CAREER PATHWAY:
COURSE TITLE:

Health Care Science
Diagnostic Services
Clinical Laboratory Technician

COURSE DESCRIPTION: The goal of this course is to provide fundamental clinical laboratory technician skills to include hematology, urinalysis, chemistry, microbiology, serology/immunology, immunohematology, and phlebotomy. The Clinical Laboratory Technician course is a prerequisite for Clinical Laboratory Internship. Students will also be introduced to forensic laboratory techniques, transplantation, and paternity testing. Students will receive information about careers in clinical laboratory science. Students will continue developing components of their Health Sciences Portfolios.

Pre-requisite: Basic Diagnostic Services

BASIC DIAGNOSTIC SERVICES REVIEW

HS-CLT-1. Students will explore careers and review instrumentation techniques, safety rules, and laboratory math skills.

- a. Identify national and state safety standards.
- b. Demonstrate knowledge and applications of OSHA, CLIA, and Bloodborne Pathogen standards.
- c. Review instrumentation and lab math skills.
- d. Compare and contrast the purposes of each clinical laboratory department.
- e. Demonstrate knowledge and usage of laboratory glassware.
- f. Investigate clinical laboratory science career pathways and employment opportunities.
- g. Describe the quality control methods applicable to all areas of the clinical laboratory.
- h. Continue Portfolio development by updating resume and adding best work samples.

Academic Standards:

ELA11W3 The student uses research and technology to support writing.

ELA11RC3 The student acquires new vocabulary in each content area and uses it correctly.

ELA11LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

MM3P1 Students will solve problems (using appropriate technology).

MM3P5 Students will represent mathematics in multiple ways.

SCSh1 Students will use standard safety practices for all classroom laboratory and field investigations.

SCSH2 Students will identify and investigate problems scientifically.

SCSH3 Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

PHLEBOTOMY

HS-CLT-2. Students will identify and perform basic phlebotomy procedures.

- a. Identify the phlebotomist's role in the health care routine.
- b. Demonstrate knowledge of patient safety and patient rights.
- c. Use universal standard precautions and OSHA Standards to control the spread of infection.
- d. Identify the anatomic structure and function of body systems in relation to services performed by phlebotomists.
- e. Demonstrate specimen collection and integrity in the delivery of patient care.
- f. Identify blood collection supplies/equipment.
- g. Perform venipuncture and capillary puncture procedures.

Academic Standards:

ELA11LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

SAP4 Students will analyze the physical, chemical, and biological properties of process systems as these relate to transportation, absorption and excretion, including the cardiovascular, respiratory, digestive, excretory and immune systems.

CLINICAL PATHOLOGY DEPARTMENTS

Students will collect and analyze blood and body fluids for diagnostic purposes in the areas of hematology, clinical chemistry, urinalysis, microbiology, serology/immunology, and immunohematology.

HS-CLT-3. Students will apply knowledge and skills in performing hematology procedures to produce accurate results and diagnosis.

- a. Describe structure and function of blood and its components.
- b. Complete microhematocrit determination.
- c. Perform RBC, WBC, and platelet counts.
- d. Perform hemoglobin determination.
- e. Make blood smear and perform differential leukocyte count.
- f. Describe or perform erythrocyte sedimentation rate.

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- g. Calculate blood indices.
- h. Perform a reticulocyte count.
- i. Explain procedure for bleeding time.
- j. Identify normal and abnormal red blood cell and white blood cell morphology.
- k. Compare and contrast diseases which may be diagnosed with blood tests.

Academic Standards:

ELA11W3 The student uses research and technology to support writing.

ELA11RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

MM3D3 Students will understand the difference between experimental and observational studies by posing questions and collecting, analyzing, and interpreting data.

SAP4 Students will analyze the physical, chemical, and biological properties of process systems as these relate to transportation, absorption and excretion, including the cardiovascular, respiratory, digestive, excretory and immune systems.

HS-CLT-4. Students will apply basic clinical chemistry techniques to perform medical lab tests.

- a. Perform serial dilutions to determine concentrations of unknowns.
- b. Describe routine chemical tests to include electrolyte, liver, and cardiac panels.
- c. Describe and relate normal and abnormal values to disease states.
- d. Demonstrate basic concepts and use of a spectrophotometer.
- e. Perform organic molecule identification tests (e.g., cholesterol, hemoglobin, etc.).

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HS-CLT-5. Students will obtain, label, preserve, and process urine specimens for lab analysis results.

- a. Describe the different types of urine specimens and collection and labeling procedures and identify their diagnostic uses.
- b. Explain the role of refrigeration and preservatives in accurate urinalysis.
- c. List the physical properties of urine to include color, odor, and transparency.
- d. Describe methods used to measure the specific gravity of urine.
- e. Perform basic chemical analysis of urine and specific back-up test for positive results.
- f. Demonstrate how to prepare a urine specimen for microscopic examination of sediment.
- g. Identify and quantify microscopic elements in urine sediment to include cells, casts, crystals, bacteria, and artifacts.
- h. Identify the normal and pathological ranges of chemical and microscopic elements in urine.

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HS-CLT-6. Students will utilize clinical techniques in the identification of microbes.

- a. Perform aseptic techniques in accordance with OSHA standards.
- b. Perform plating and streaking techniques of specimens.
- c. Recognize isolation and incubation techniques.
- d. Describe types of media and their appropriate use.
- e. Perform Gram stains and identify bacterial morphology.
- f. Test for basic antibiotic resistance.
- g. Evaluate and analyze results to identify organisms.
- h. Identify isolates as pathogens or non-pathogens based on specimen sources.
- i. Model handling and disposal of biohazardous materials.

- j. Describe basic concepts of parasitology and mycology (e.g., life cycle, identification techniques, and symptoms).

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ELA11RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

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SB2 Students will derive the relationship between single-celled and multi-celled organisms and the increasing complexity of systems.

HS-CLT-7. Students will understand the processes of serology/immunology tests.

- a. Understand the concepts of antigen and viral structure in the human antibody response.
- b. Perform and interpret a serological test.
- c. Research diseases that are diagnosed by serological testing.

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HS-CLT-8. Students will understand and perform basic immunohematology laboratory procedures.

- a. Perform ABO and Rh blood typing.
- b. Describe and demonstrate the procedure for typing, screening, and crossmatching blood.
- c. Understand the criteria for selection of blood components for transfusion.

- d. Recognize American Association of Blood Banks (AABB) and FDA standards pertaining to transfusions.
- e. Identify donor blood screening, collection, and storage criteria.
- f. Solve antibody identification panel and select an appropriate blood component for a transfusion.

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CLINICAL LABORATORY SPECIALTIES

Students will become familiar with current applications and issues associated with organ transplantation, paternity testing, and forensic medicine.

HS-CLT-9. Students will examine organ transplantation and paternity testing.

- a. Describe basic facts and organizations that support organ transplantation.
- b. Discuss bioethical issues associated with organ transplantation.
- c. Demonstrate how DNA (HLA) antigens are used for paternity and transplantation testing.

Academic Standards:

ELA11RC4 The student establishes a context for information acquired by reading across subject areas.

ELA11LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

MM2P2 Students will reason and evaluate mathematical arguments.

SAP4 Students will analyze the physical, chemical, and biological properties of process systems as these relate to transportation, absorption and excretion, including the cardiovascular, respiratory, digestive, excretory and immune systems.

HS-CLT-10. Students will analyze the use of forensic medicine in criminal science.

- a. Discuss the applications of forensic medicine.
- b. Describe autopsy use in determining cause and time of death.
- c. Analyze DNA typing and explore forensic anthropology in the identification process.
- d. Explore the use of odontology in evidence identification.
- e. Perform serology (ABO, Rh, and Secretor) studies.
- f. Investigate career pathways in forensics.

Academic Standards:

ELA11RC4 The student establishes a context for information acquired by reading across subject areas.

ELA11LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

MM2P2 Students will reason and evaluate mathematical arguments.

SAP4 Students will analyze the physical, chemical, and biological properties of process systems as these relate to transportation, absorption and excretion, including the cardiovascular, respiratory, digestive, excretory and immune systems.

Reading Across the Curriculum

Reading Standard Comment

After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal learning. Students encounter a variety of informational as well as fictional texts, and they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in *context*.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across

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the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

CTAE-RC-1 Students will enhance reading in all curriculum areas by:

Reading in All Curriculum Areas

- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
- Read both informational and fictional texts in a variety of genres and modes of discourse.
- Read technical texts related to various subject areas.

Discussing Books

- Discuss messages and themes from books in all subject areas.
- Respond to a variety of texts in multiple modes of discourse.
- Relate messages and themes from one subject area to messages and themes in another area.
- Evaluate the merit of texts in every subject discipline.
- Examine author's purpose in writing.
- Recognize the features of disciplinary texts.

Building Vocabulary Knowledge

- Demonstrate an understanding of contextual vocabulary in various subjects.
- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.

Establishing Context

- Explore life experiences related to subject area content.
- Discuss in both writing and speaking how certain words are subject area related.
- Determine strategies for finding content and contextual meaning for unknown words.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge

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and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.