

CLINICAL LABORATORY SCIENCE MAJOR, B.S.

Introduction

Clinical laboratory science (CLS), also called medical laboratory science, is the health profession that provides laboratory information and services needed for the diagnosis and treatment of disease. The field of clinical laboratory science combines many sciences, including microbiology, hematology, chemistry, molecular biology, and immunology. Clinical laboratory scientists perform a variety of laboratory tests, ensure the accuracy of the test results, explain the significance of laboratory test results, and evaluate new methods for laboratory tests. Some of the tests performed in the clinical laboratory are relatively simple. Others, such as DNA analysis and flow cell cytometry, are complex and require extensive education.

Examples of laboratory tests performed by clinical laboratory scientists include

- Detection of the abnormal cells that cause leukemia
- Analysis of cardiac enzyme activity released during a heart attack
- Identification of the type of bacteria causing an infection
- Analysis of the coagulation factors in cases of abnormal bleeding
- Detection of blood group antibodies that cause transfusion reactions
- Analysis of genetic markers for cystic fibrosis
- Typing patients for histocompatibility matches prior to transplantation

Admission to the Program

A maximum of 20 students are chosen for admission each year. Students are selected on the basis of science and mathematics prerequisite courses, grades, a written application, interviews, and letters of recommendation. Successful completion of the prerequisite courses listed under the major does not guarantee admission to the program. Because enrollment is limited, students are encouraged to begin the application process early in the fall preceding the year of enrollment. The first deadline for completed applications is the second Tuesday in January. Completed applications received after that deadline will be considered for admission if positions are available in the program.

Students are subject to the requirements in place when they are admitted to this program; consequently, the requirements described in this catalog particularly apply to students admitted during the 2023–2024 academic year.

Advising

First-year and sophomore students interested in the clinical laboratory science (CLS) major have a primary academic advisor assigned in ConnectCarolina. Students are strongly encouraged to meet regularly with their advisor and review their Tar Heel Tracker each semester. The director of the Division of Clinical Laboratory Science is available to meet with current and prospective majors by appointment (see contact information above). The Division of Clinical Laboratory Science provides academic advising for students who are enrolled in the program. Further information on the curriculum may be obtained from the division's website (<https://www.med.unc.edu/ahs/clinical/>).

Facilities

The laboratory facility for first-year clinical laboratory science courses includes individualized work areas with reagents, supplies, and laboratory instruments for students. In senior courses, students develop their skills in state-of-the-art clinical laboratory facilities.

Graduate School and Career Opportunities

Clinical laboratory science provides a basis for a broad range of future endeavors. Graduates with a B.S. degree in clinical laboratory science can elect to pursue further study in medicine, dentistry, veterinary medicine, business or management, hospital administration, computer science, education, clinical chemistry, clinical microbiology, immunology, or another laboratory science area. The Division of Clinical Laboratory Science also offers a master's degree in clinical laboratory science.

Clinical laboratory scientists are employed in hospital laboratories, commercial laboratories, physicians' office laboratories, research institutes, clinical trials, and forensic laboratories. Clinical laboratory scientists also may be employed as technical or sales representatives for corporations. Graduates of the program are very successful on national certification exams and enjoy high employment rates. See the alumni section of the website (<https://www.med.unc.edu/ahs/clinical/>) for examples of careers in clinical laboratory science.

Student Learning Outcomes

Upon completion of the Clinical Laboratory Science program, students should be able to:

- Perform and evaluate pre-analytical, analytical, and post-analytical procedures to ensure the quality of laboratory results
- Perform laboratory tests, analyze and verify results, and resolve common problems in all the major areas of the clinical laboratory
- Explain the principles and methods used in laboratory tests in all major areas of the clinical laboratory
- Explain the clinical significance of laboratory procedures in diagnosis and treatment of disease and maintenance of health
- Correlate information from different laboratory departments to verify results or resolve problems
- Evaluate patient results and suggest or select appropriate additional testing
- Determine the priority of laboratory requests and arrange the workload for optimal patient care and efficiency
- Obtain acceptable blood samples for laboratory tests using standard phlebotomy procedures
- Use quality assurance principles and practices to ensure the accuracy and reliability of laboratory information
- Perform preventive and corrective maintenance of equipment and instruments
- Use the principles of method evaluation to select new techniques and instruments
- Explain and apply the major principles and practices of laboratory administration, supervision, and budgeting
- Explain and apply principles of effective test utilization
- Comply with all standard safety regulations and monitor changes in safety regulations
- Use educational methods to present information and develop instructional materials

- Use computer systems to produce documents, research information, communicate with others, and enter and retrieve laboratory information
- Apply principles of management to the acquisition and evaluation of laboratory information systems
- Communicate effectively with laboratory personnel, other health care professionals, patients, and the public
- Demonstrate professional conduct and interpersonal skills with patients, laboratory personnel, other health care professionals, and the public
- Demonstrate ethical standards in all matters related to medical information and patient care

Requirements

In addition to the program requirements, students must

- earn a minimum final cumulative GPA of 2.000
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major core requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum cumulative GPA of 2.000 in the major core requirements. Some programs may require higher standards for major or specific courses.

For more information, please consult the degree requirements section of the catalog (<https://catalog.unc.edu/undergraduate/degree-requirements/>).

The schedule of academic work for clinical laboratory science majors includes the following General Education requirements. Students must complete all First-Year Foundation requirements, all Reflection & Integration requirements, and complete at least six Focus Capacity requirements as part of the IDEAs in Action General Education curriculum. In addition, the following prerequisite courses must be completed before entering the Clinical Laboratory Science program:

| Code | Title | Hours |
|--------------------------------|---|-------|
| Additional Requirements | | |
| BIOL 101 & 101L |  Principles of Biology and  Introductory Biology Laboratory ^{H, F} | 4 |
| | A second biology course (BIOL 202 or BIOL 103 is highly recommended) | 3-4 |
| CHEM 101 & 101L |  General Descriptive Chemistry I and  Quantitative Chemistry Laboratory I ^{H, F} | 4 |
| CHEM 102 & 102L |  General Descriptive Chemistry II and  Quantitative Chemistry Laboratory II ^{H, F} | 4 |
| CHEM 241 | Modern Analytical Methods for Separation and Characterization ^H | 3 |
| CHEM 241L | Laboratory in Separations and Analytical Characterization of Organic and Biological Compounds | 1 |
| | One of the following: | 3-4 |
| MATH 130 |  Precalculus Mathematics ^F | |
| MATH 231 |  Calculus of Functions of One Variable I ^{H, F} | |

STOR 151  Introduction to Data Analysis

Total Hours **22-24**

- H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.
- F FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

After admission (<https://catalog.unc.edu/undergraduate/departments/division-radiologic-science/>) to the CLS program, students take courses in all the major areas of clinical laboratory science including clinical chemistry, hematology, hemostasis, microbiology, transfusion medicine, and transplantation medicine. Senior students rotate through the clinical laboratories at UNC Hospitals and other laboratories in the state. They also take advanced courses in the clinical laboratory sciences. Honors contracts are available for students in the Honors program.

| Code | Title | Hours |
|--------------------------|---|-------|
| Core Requirements | | |
| CLSC 410 | Laboratory Mathematics | 1 |
| CLSC 410L | Basic and Molecular Laboratory Methods | 2 |
| CLSC 420 | Urinalysis and Body Fluids | 1 |
| CLSC 420L | Urinalysis Laboratory | 1 |
| CLSC 430 | Biochemistry | 3 |
| CLSC 440 | Hematology I | 2 |
| CLSC 440L | Hematology I Laboratory | 1 |
| CLSC 442 | Hematology II | 3 |
| CLSC 442L | Hematology II Laboratory | 1 |
| CLSC 450 | Immunology | 3 |
| CLSC 460 | Special Pathogens | 2 |
| CLSC 460L | Parasitology and Mycology Laboratory | 1 |
| CLSC 462 | Clinical Bacteriology | 3 |
| CLSC 462L | Clinical Bacteriology Laboratory | 2 |
| CLSC 470 | Clinical Chemistry | 3 |
| CLSC 470L | Clinical Chemistry Laboratory | 2 |
| CLSC 480 | Immunohematology | 3 |
| CLSC 480L | Immunohematology Laboratory | 2 |
| CLSC 540L | Clinical Hematology Laboratory | 4 |
| CLSC 542L | Clinical Hemostasis Laboratory | 2 |
| CLSC 550L | Clinical Immunology Laboratory | 1 |
| CLSC 560L | Clinical Microbiology Laboratory | 4 |
| CLSC 570L | Clinical Chemistry Laboratory Rotation | 4 |
| CLSC 580L |  Clinical Immunohematology Laboratory | 4 |
| CLSC 582L | Clinical Transplantation Medicine Laboratory | 1 |
| CLSC 620 | Clinical Laboratory Management | 2 |
| CLSC 630 |  Research Methods in Clinical Laboratory Science | 2 |

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| CLSC 670 |  Clinical Laboratory Science Educational Methods | 2 |
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|--------------------|--|-----------|
| Total Hours | | 62 |
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Sample Plan of Study

Sample plans can be used as a guide to identify the courses required to complete the major and other requirements needed for degree completion within the expected eight semesters. The actual degree plan may differ depending on the course of study selected (second major, minor, etc.). Students should meet with their academic advisor to create a degree plan that is specific and unique to their interests. The sample plans represented in this catalog are intended for first-year students entering UNC–Chapel Hill in the fall term. Some courses may not be offered every term.

In the first and sophomore years, clinical laboratory science majors satisfy General Education requirements and take a basic science curriculum comparable to that of other science students. In the sophomore year, students apply for admission (<https://catalog.unc.edu/undergraduate/departments/division-clinical-laboratory-science/>) into the final two years of the program.

The junior year includes courses that cover the principal areas of clinical laboratory science. Students also learn and practice laboratory techniques in a student laboratory. Senior students rotate through the clinical laboratories at UNC Hospitals and other laboratories in the state. They also take advanced courses in the clinical laboratory sciences.

The suggested course sequence for the required preclinical laboratory science courses at UNC–Chapel Hill is listed below. Transfer students receiving placement credit may have a slightly different sequence.

| First Year | Hours |
|--|-----------|
| Fall Semester | |
| IDST 101  College Thriving | 1 |
| CHEM 101 & 101L  General Descriptive Chemistry I and Quantitative Chemistry Laboratory I (C- or better required) ^{1, H, F} | 4 |
| ENGL 105  English Composition and Rhetoric | 3 |
| Global language level 1 | 3 |
| One of the following: | 3 |
| MATH 130  Precalculus Mathematics ^{1, F} | |
| MATH 231  Calculus of Functions of One Variable I ^{1, H, F} | |
| STOR 151  Introduction to Data Analysis | |
| Lifetime fitness | 1 |
| Hours | 15 |
| Spring Semester | |
| BIOL 101 & 101L  Principles of Biology and Introductory Biology Laboratory ^{1, H, F} | 4 |
| CHEM 102 & 102L  General Descriptive Chemistry II and Quantitative Chemistry Laboratory II ^{1, H, F} | 4 |
| Global language level 2 | 3 |
| FY-TRIPLE Triple-I | 4 |
| Hours | 15 |

Sophomore Year

Fall Semester

| | | |
|-----------------|--|---|
| CHEM 241 & 241L | Modern Analytical Methods for Separation and Characterization and Laboratory in Separations and Analytical Characterization of Organic and Biological Compounds ^H | 4 |
|-----------------|--|---|

CHEM 261 is not required but is recommended for students who have time in their schedules for additional science courses.

| | | |
|-----------------------------|--|---|
| Global language level 3 | | 3 |
| Gen Ed and elective courses | | 9 |

| | | |
|--------------|--|-----------|
| Hours | | 16 |
|--------------|--|-----------|

Spring Semester

| | | |
|--------|--|---|
| BIOL — | Biology course (BIOL 202 or BIOL 103 strongly recommended) | 4 |
|--------|--|---|

BIOL 252 is not required but is recommended for students who have time in their schedules for additional science courses.

| | | |
|-----------------------------|--|----|
| Gen Ed and elective courses | | 14 |
|-----------------------------|--|----|

| | | |
|--------------|--|-----------|
| Hours | | 18 |
|--------------|--|-----------|

Junior Year

Fall Semester

| | | |
|-----------------|---|---|
| CLSC 410 & 410L | Laboratory Mathematics and Basic and Molecular Laboratory Methods | 3 |
|-----------------|---|---|

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| CLSC 420 & 420L | Urinalysis and Body Fluids and Urinalysis Laboratory | 2 |
|-----------------|--|---|

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|----------|--------------|---|
| CLSC 430 | Biochemistry | 3 |
|----------|--------------|---|

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|-----------------|--|---|
| CLSC 440 & 440L | Hematology I and Hematology I Laboratory | 3 |
|-----------------|--|---|

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|----------|------------|---|
| CLSC 450 | Immunology | 3 |
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|--------------|--|-----------|
| Hours | | 14 |
|--------------|--|-----------|

Spring Semester

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|-----------------|--|---|
| CLSC 442 & 442L | Hematology II and Hematology II Laboratory | 4 |
|-----------------|--|---|

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|-----------------|--|---|
| CLSC 462 & 462L | Clinical Bacteriology and Clinical Bacteriology Laboratory | 5 |
|-----------------|--|---|

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|-----------------|--|---|
| CLSC 470 & 470L | Clinical Chemistry and Clinical Chemistry Laboratory | 5 |
|-----------------|--|---|

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|-----------------|--|---|
| CLSC 480 & 480L | Immunohematology and Immunohematology Laboratory | 5 |
|-----------------|--|---|

| | | |
|--------------|--|-----------|
| Hours | | 19 |
|--------------|--|-----------|

Senior Year

Clinical Education: Senior clinical education takes place in UNC Hospitals' laboratories and other clinical laboratories in North Carolina. These laboratories are highly regarded in the field of laboratory medicine, and students have the opportunity to learn the most recent techniques in clinical laboratory science.

Courses taken during fall or spring semester:

| | | |
|----------|-------------------|---|
| CLSC 460 | Special Pathogens | 2 |
|----------|-------------------|---|

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| CLSC 460L | Parasitology and Mycology Laboratory | 1 |
|-----------|--------------------------------------|---|

| | | |
|-----------|--------------------------------|---|
| CLSC 540L | Clinical Hematology Laboratory | 4 |
|-----------|--------------------------------|---|

| | | |
|-----------|--------------------------------|---|
| CLSC 542L | Clinical Hemostasis Laboratory | 2 |
|-----------|--------------------------------|---|

| | | |
|-----------|--------------------------------|---|
| CLSC 550L | Clinical Immunology Laboratory | 1 |
|-----------|--------------------------------|---|

| | | |
|-----------|----------------------------------|---|
| CLSC 560L | Clinical Microbiology Laboratory | 4 |
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|-----------|--|---|
| CLSC 570L | Clinical Chemistry Laboratory Rotation | 4 |
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|-----------|--|---|
| CLSC 580L |  Clinical Immunohematology Laboratory | 4 |
|-----------|--|---|

| | | |
|--------------------|---|------------|
| CLSC 582L | Clinical Transplantation Medicine Laboratory | 1 |
| CLSC 620 | Clinical Laboratory Management | 2 |
| CLSC 630 |  Research Methods in Clinical Laboratory Science | 2 |
| CLSC 670 |  Clinical Laboratory Science Educational Methods | 2 |
| Hours | | 29 |
| Total Hours | | 126 |

H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

F FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

¹ FY-Launch options available on designated sections.

Special Opportunities in Clinical Laboratory Science

Departmental Involvement

Student ambassadors in the Department of Health Sciences organize students' professional activities and social events. The CLS Service Society provides opportunities for students to work together to promote the CLS profession and provide services to the community.

Experiential Education

Senior clinical courses provide a range of clinical laboratory experience in chemistry, hematology, hemostasis, microbiology, transfusion medicine, immunology, histocompatibility, and molecular testing.

Certification

Upon successful completion of the clinical laboratory science curriculum, graduates receive the B.S. degree with a major in clinical laboratory science. A certificate also is awarded by the Division of Clinical Laboratory Science and the Department of Health Sciences. Graduates of the program are eligible to take the national certification examination in medical laboratory science.

Accreditation

The Clinical Laboratory Science Program is accredited by the National Accrediting Agency for Clinical Laboratory Sciences, 5600 N. River Road, Suite 720, Rosemont, IL, 60018-5119, (773) 714-8880, www.naacls.org (<http://www.naacls.org>).

Undergraduate Awards

Louise Ward Scholarships: Three scholarships are awarded to clinical laboratory science students each year based on academic excellence, potential for success as a clinical laboratory science student and practitioner, and financial need.

Additional scholarships available to clinical laboratory science students include

- The Lanning-Taylor Scholarship, awarded to a senior clinical laboratory science student.
- The Raleigh Pathology Laboratory Associates Scholarship, awarded to a junior or a senior student.
- The WakeMed Health and Hospital Annual CLS Scholarship, awarded to a junior or senior student.
- The Allene W. Alphin and Jesse C. Alphin Scholarships, awarded to two clinical laboratory science students.
- The Jeri Lasitter McConkey Scholarships, awarded to two clinical laboratory science students.

Outstanding CLS Student: Each year a clinical laboratory science senior is named as the outstanding student based on nominations from clinical and academic faculty members.

Undergraduate Research

Senior students may apply for an elective course, CLSC 695 Undergraduate Research in CLS. In this course, students work on a research project independently with guidance from CLS faculty and clinical laboratory staff members. Student research projects have resulted in presentations at professional meetings and publications.

Contact Information

Professor and Director

Tara Moon, PhD, MLS(ASCP)CM
tara_moon@med.unc.edu

Student Services Support Specialist

Carolyn Oakes
carolyn_oakes@med.unc.edu

Professor and Director

Tara Moon, PhD, MLS(ASCP)CM
tara_moon@med.unc.edu

Student Services Support Specialist

Carolyn Oakes
carolyn_oakes@med.unc.edu