# Scope & Sequence

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| Course Name: Medical Microbiology **TSDS PEIMS Code:** 13020700 | | | **Course Credit:** 1.0  **Course Requirements:** This course is recommended for students in Grades 10-12.  **Prerequisites:** Biology and Chemistry.  **Recommended Prerequisites:** A course from the Health Science Career Cluster. |
| **Course Description:** The Medical Microbiology course is designed to explore the microbial world, studying topics such as pathogenic and non-pathogenic microorganisms, laboratory procedures, identifying microorganisms, drug resistant organisms, and emerging diseases. Students must meet the 40% laboratory and fieldwork requirement. This course satisfies a high school science graduation requirement. | | | |
| **NOTE:** This is a suggested scope and sequence for the course content. This content will work with any textbook or instructional materials. If locally adapted, make sure all TEKS are covered. | | | |
| **Total Number of Periods**  **Total Number of Minutes**  **Total Number of Hours** | 175 Periods  7,875 Minutes  131.25 Hours\* | \*Schedule calculations based on 175/180 calendar days. For 0.5 credit courses, schedule is calculated out of 88/90 days. Scope and sequence allows additional time for guest speakers, student presentations, field trips, remediation, extended learning activities, etc. | |
| **Unit Number, Title, and Brief Description** | **# of Class Periods\***  (assumes 45-minute periods)  Total minutes per unit | **TEKS Covered**  **130.225 (c)** **Knowledge and skills** | |
| **Unit 1: Meeting Employer Expectations in Health Science**  This unit is designed to inform future Health Science students about industry expectations for employability skills and professional standards. | 15 periods  675 minutes | (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:  (A) demonstrate verbal and non-verbal communication in a clear, concise, and effective manner; and  (B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team. | |
| **Unit 2: Laboratory and Field Investigation in Health Science**  In this unit students understand how to safely and effectively use laboratory equipment. Student will demonstrate ethical and environmentally appropriate practices during laboratory and field investigations. Students should be able analyze data with both physical equipment and with experimentation that extends beyond the classroom. | 20 periods  900 minutes | (2) The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:  (A) demonstrate safe practices during laboratory and field investigations; and  (B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials. | |
| **Unit 3: The Use of Scientific Theory in Health Science**  The scientific theory is a foundation of health science. Student in this unit will distinguish between scientific hypotheses and scientific theories and also collect and organize qualitative and quantitative data and make measurements with accuracy and precision using a variety of scientific tools. Students will also demonstrate the ability to communicate valid conclusions supported by the data through a variety of methods. Students are also expected to describe proper methods of disposing of biohazard material and to display standard precautions, including proper protective equipment during all laboratory exercises. | 15 periods  675 minutes | (3) The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:  (A) know the definition of science and understand that it has limitations, as specified in subsection (b)(4) of this section;  (B) know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories;  (C) know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science are created and new technologies emerge;  (D) distinguish between scientific hypothesis and scientific theories;  (E) plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology;  (F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures;  (G) analyze, evaluate, make inferences, and predict trends from data;  (H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;  (I) dispose of all biological material in the proper biohazard containers; and  (J) employ standard precautions, including proper protective equipment during all laboratory exercises. | |
| **Unit 4: Critical Thinking Skills in Health Science**  Students will learn to use the scientific method, critical thinking, and problem solving to make informed decisions in health science. Students will evaluate scientific models, research, and the impact of scientific research on society and the environment. Students will analyze, evaluate, and critique scientific explanations to encourage critical thinking. | 15 periods  675 minutes | (4) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:  (A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking;  (B) communicate and apply scientific information extracted from various sources such as accredited scientific journals, institutions of higher learning, current events, news reports, published journal articles, and marketing materials;  (C) draw inferences based on data related to promotional materials for products and services;  (D) evaluate the impact of scientific research on society and the environment;  (E) evaluate models according to their limitations in representing biological objects or events; and  (F) research and describe the history of science and contributions of scientists. | |
| **Unit 5: Microorganisms and Health and Wellness**  Students in this unit will understand the historical development of microbiology and how it relates to the health of an individual. The various private and governmental agencies that research and govern infectious diseases caused by microorganisms are also analyzed. | 30 periods  1,350 minutes | (5) The student describes the relationships between microorganisms and health and wellness in the human body. The student is expected to:  (A) research and describe the historical development of microbiology as it relates to health care of an individual; and  (B) research roles, functions, and responsibilities of agencies governing infectious disease control. | |
| **Unit 6: Microbiological Laboratory Skills**  In this unit students will develop the skills needed to effectively perform and analyze microorganisms in the laboratory. The basics of microorganism growth and reproduction are explained. The differences between normal and pathogenic microorganisms are discussed along with common laboratory tests conducted in medical microbiology. | 40 periods  1,800 minutes | (6) The student is expected to perform and analyze results in the microbiology laboratory. The student is expected to:  (A) classify microorganisms using a dichotomous key;  (B) explain the difference between Gram positive and Gram negative bacteria regarding the bacterial cell wall;  (C) identify chemical processes of microorganisms;  (D) recognize the factors required for microbial reproduction and growth;  (E) identify the normal flora microorganisms of the human body;  (F) distinguish between pathogens, opportunistic pathogens, hospital-acquired infections, and colonizing microorganisms;  (G) describe the colony morphology of microorganisms;  (H) interpret Gram stain results;  (I) discuss the results of laboratory procedures such as biochemical reactions that are used to identify microorganisms; and  (J) explain the role of the sensitivity report provided to the clinician by the microbiology department. | |
| **Unit 7: Microorganisms and Infectious Disease**  Students in this unit will be able to identify potentially pathogenic microorganisms along with the body’s immune response. Common bacterial infections, both hospital and community acquired, will be explored. Reemerging diseases along with drug-resistance microorganisms will be analyzed. The role of governing agencies in monitoring and establishing guidelines based on the spread of infectious diseases will be explored. | 40 periods  1,800 minutes | (7) The student examines the role of microorganisms in infectious diseases. The student is expected to:  (A) outline the infectious process, including how pathogenic microorganisms affect human body systems;  (B) categorize diseases caused by bacteria, fungi, viruses, protozoa, rickettsias, arthropods, and helminths;  (C) explain the body's immune response and defenses against infection;  (D) evaluate the effects of anti-microbial agents such as narrow and broad spectrum antibiotics;  (E) examine reemergence of diseases such as malaria, tuberculosis, and polio;  (F) identify common bacterial infections from hospital-acquired infection and community-acquired infections such as *Clostridium difficile* and *Staphylococcus aureus*;  (G) investigate drug-resistant microorganisms such as carbapenem-resistant *Enterobacteriaceae*, methicillin-resistant *Staphylococcus aureus*, vancomycin-intermediate/resistant *Staphylococci aureus*, vancomycin-resistant enterococci, and emergent antibiotic-resistant superbugs; and  (H) outline the role of the governing agencies in monitoring and establishing guidelines based on the spread of infectious diseases. | |