Chapter 130. Texas Essential Knowledge and Skills for Career and Technical Education

Subchapter H. Health Science

§130.221. Implementation of Texas Essential Knowledge and Skills for Health Science, Adopted 2015.

(a) The provisions of this subchapter shall be implemented by school districts beginning with the 2017-2018 school year.

(b) No later than August 31, 2016, the commissioner of education shall determine whether instructional materials funding has been made available to Texas public schools for materials that cover the essential knowledge and skills for career and technical education as adopted in §§130.222-130.234 of this subchapter.

(c) If the commissioner makes the determination that instructional materials funding has been made available under subsection (b) of this section, §§130.222-130.234 of this subchapter shall be implemented beginning with the 2017-2018 school year and apply to the 2017-2018 and subsequent school years.

(d) If the commissioner does not make the determination that instructional materials funding has been made available under subsection (b) of this section, the commissioner shall determine no later than August 31 of each subsequent school year whether instructional materials funding has been made available. If the commissioner determines that instructional materials funding has been made available, the commissioner shall notify the State Board of Education and school districts that §§130.222-130.234 of this subchapter shall be implemented for the following school year.

§130.222. Principles of Health Science (One Credit), Adopted 2015.

(a) General requirements. This course is recommended for students in Grades 9 and 10. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostics services, health informatics, support services, and biotechnology research and development.

(3) The Principles of Health Science course is designed to provide an overview of the therapeutic, diagnostic, health informatics, support services, and biotechnology research and development systems of the health care industry.

(4) To pursue a career in the health science industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(6) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(7) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas in a clear, concise, and effective manner;

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team; and

(C) identify employer expectations such as punctuality, attendance, time management, communication, organizational skills, and productive work habits.

(2) The student applies mathematics, science, English language arts, and social studies in health science. The student is expected to:

(A) convert units between systems of measurement;

(B) apply data from tables, charts, and graphs to provide solutions to health-related problems;

(C) interpret technical material related to the health science industry;

(D) organize, compile, and write ideas into reports and summaries;

(E) plan and prepare effective oral presentations;

(F) formulate responses using precise language to communicate ideas;

(G) describe biological and chemical processes that maintain homeostasis;

(H) identify and analyze principles of body mechanics and movement such as forces and the effects of movement, torque, tension, and elasticity on the human body;

(I) identify human needs according to Maslow's Hierarchy of Human Needs;

(J) describe the stages of development related to the life span;

(K) identify the concepts of health and wellness throughout the life span;

(L) analyze and evaluate communication skills for maintaining healthy relationships throughout the life span;

(M) research the historical significance of health care;

(N) describe the impact of health services on the economy;

(O) analyze the impact of local, state, and national government on the health science industry;

(P) identify diverse and cultural influences that have impacted contemporary aspects of health care delivery; and

(Q) research and compare practices used by various cultures and societies to solve problems related to health.

(3) The student uses verbal and nonverbal communication skills. The student is expected to:

(A) identify components of effective and non-effective communication;

(B) demonstrate effective communication skills for responding to the needs of individuals in a diverse society;

(C) evaluate the effectiveness of conflict-resolution techniques in various situations; and

(D) accurately interpret, transcribe, and communicate medical vocabulary using appropriate technology.

(4) The student implements the leadership skills necessary to function in a democratic society. The student is expected to:

(A) identify traits of a leader;

(B) demonstrate leadership skills, characteristics, and responsibilities of leaders such as goal-setting and team building; and

(C) demonstrate the ability to effectively conduct and participate in meetings.

(5) The student assesses career options and the preparation necessary for employment in the health science industry. The student is expected to:

(A) locate, evaluate, and interpret career options and employment information; and

(B) recognize the impact of career decisions, including the causes and effects of changing employment situations.

(6) The student identifies academic preparation and skills necessary for employment as defined by the health science industry. The student is expected to identify academic requirements for professional advancement such as certification, licensure, registration, continuing education, and advanced degrees.

(7) The student identifies the career pathways related to health science. The student is expected to:

(A) compare health science careers within the diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems; and

(B) identify the collaborative role of team members between systems to deliver quality health care.

(8) The student examines the role of the multidisciplinary team in providing health care. The student is expected to:

(A) explain the concept of teaming to provide quality health care; and

(B) examine the role of professional organizations in the preparation and governance of credentialing and certification.

(9) The student interprets ethical behavior standards and legal responsibilities. The student is expected to:

(A) compare published professional codes of ethics and scope of practice;

(B) explain principles of ethical behavior and confidentiality, including the consequences of breach of confidentiality;

(C) discuss ethical issues related to health care, including implications of technological advances;

(D) examine issues related to malpractice, negligence, and liability; and

(E) research laws governing the health science industry.

(10) The student recognizes the rights and choices of the individual. The student is expected to:

(A) identify situations related to autonomy;

(B) identify wellness strategies for the prevention of disease;

(C) evaluate positive and negative effects of relationships on physical and emotional health such as peers, family, and friends in promoting a healthy community;

(D) review documentation related to rights and choices; and

(E) demonstrate an understanding of diversity and cultural practices influencing contemporary aspects of health care.

(11) The student recognizes the importance of maintaining a safe environment and eliminating hazardous situations. The student is expected to:

(A) identify governing regulatory agencies such as the World Health Organization, Centers for Disease Control and Prevention, Occupational Safety and Health Administration, U.S. Food and Drug Administration, Joint Commission, and National Institute of Health;

(B) identify industry safety standards such as standard precautions, fire prevention and safety practices, and appropriate actions to emergency situations; and

(C) relate safety practices in the health science industry.

(12) The student identifies the technology used in the diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems. The student is expected to:

(A) research and identify technological equipment used in the diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems;

(B) identify potential malfunctions of technological equipment; and

(C) recognize and explain the process for reporting equipment or technology malfunctions.

§130.223. Medical Terminology (One Credit), Adopted 2015.

(a) General requirements. This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostics services, health informatics, support services, and biotechnology research and development.

(3) The Medical Terminology course is designed to introduce students to the structure of medical terms, including prefixes, suffixes, word roots, singular and plural forms, and medical abbreviations. The course allows students to achieve comprehension of medical vocabulary appropriate to medical procedures, human anatomy and physiology, and pathophysiology.

(4) To pursue a career in the health science industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health science industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students should identify the employment opportunities, technology, and safety requirements of each system. Students are expected to learn the knowledge and skills necessary to pursue a health science career through further education and employment.

(6) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(7) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(8) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas in a clear, concise, and effective manner; and

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team.

(2) The student recognizes the terminology related to the health science industry. The student is expected to:

(A) identify abbreviations, acronyms, and symbols related to the health science industry;

(B) identify the basic structure of medical words;

(C) practice word-building skills;

(D) research the origins of eponyms;

(E) recall directional terms and anatomical planes related to body structure;

(F) define and accurately spell occupationally specific terms such as those relating to the body systems, surgical and diagnostic procedures, diseases, and treatment; and

(G) use prior knowledge and experiences to understand the meaning of terms as they relate to the health science industry.

(3) The student demonstrates communication skills using the terminology applicable to the health science industry. The student is expected to:

(A) demonstrate appropriate verbal and written strategies such as correct pronunciation of medical terms and spelling in a variety of health science scenarios;

(B) employ increasingly precise language to communicate; and

(C) translate technical material related to the health science industry.

(4) The student examines available resources. The student is expected to:

(A) examine medical and dental dictionaries and multimedia resources;

(B) integrate resources to interpret technical materials; and

(C) investigate electronic media with appropriate supervision.

(5) The student interprets medical abbreviations. The student is expected to:

(A) distinguish medical abbreviations used throughout the health science industry; and

(B) translate medical abbreviations in simulated technical material such as physician progress notes, radiological reports, and laboratory reports.

(6) The student appropriately translates health science industry terms. The student is expected to:

(A) interpret, transcribe, and communicate vocabulary related to the health science industry;

(B) translate medical terms to conversational language to facilitate communication;

(C) distinguish medical terminology associated with medical specialists such as geneticists, pathologists, and oncologists;

(D) summarize observations using medical terminology; and

(E) correctly interpret contents of medical scenarios.

§130.224. Anatomy and Physiology (One Credit), Adopted 2015.

(a) General requirements. This course is recommended for students in Grades 10-12. Prerequisite: two science credits. Recommended prerequisite: a course from the Health Science Career Cluster. Students must meet the 40% laboratory and fieldwork requirement. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Anatomy and Physiology course is designed for students to conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Students in Anatomy and Physiology will study a variety of topics, including the structure and function of the human body and the interaction of body systems for maintaining homeostasis.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.

(5) Scientific inquiry is the planned and deliberate investigation of the natural world. Scientific methods of investigation are experimental, descriptive, or comparative. The method chosen should be appropriate to the question being asked.

(6) Scientific decision making is a way of answering questions about the natural world. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(7) A system is a collection of cycles, structures, and processes that interact. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(8) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(9) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(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.

(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.

(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 hypotheses 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; and

(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.

(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.

(5) The student evaluates the energy needs of the human body and the processes through which these needs are fulfilled. The student is expected to:

(A) analyze the chemical reactions that provide energy for the body;

(B) evaluate the modes, including the structure and function of the digestive system, by which energy is processed and stored within the body;

(C) analyze the effects of energy deficiencies in malabsorption disorders as they relate to body systems such as Crohn's disease and cystic fibrosis; and

(D) analyze the effects of energy excess in disorders as they relate to body systems such as cardiovascular, endocrine, muscular, skeletal, and pulmonary.

(6) The student differentiates the responses of the human body to internal and external forces. The student is expected to:

(A) explain the coordination of muscles, bones, and joints that allows movement of the body;

(B) investigate and report the uses of various diagnostic and therapeutic technologies;

(C) interpret normal and abnormal contractility conditions such as in edema, glaucoma, aneurysms, and hemorrhage;

(D) analyze and describe the effects of pressure, movement, torque, tension, and elasticity on the human body; and

(E) perform an investigation to determine causes and effects of force variance and communicate findings.

(7) The student examines the body processes that maintain homeostasis. The student is expected to:

(A) investigate and describe the integration of the chemical and physical processes, including equilibrium, temperature, pH balance, chemical reactions, passive transport, active transport, and biofeedback, that contribute to homeostasis; and

(B) determine the consequences of the failure to maintain homeostasis.

(8) The student examines the electrical conduction processes and interactions. The student is expected to:

(A) illustrate conduction systems such as nerve transmission or muscle stimulation;

(B) investigate the therapeutic uses and effects of external sources of electricity on the body system; and

(C) evaluate the application of advanced technologies such as electroencephalogram, electrocardiogram, bionics, transcutaneous electrical nerve stimulation, and cardioversion.

(9) The student explores the body's transport systems. The student is expected to:

(A) analyze the physical, chemical, and biological properties of transport systems, including circulatory, respiratory, and excretory;

(B) determine the factors that alter the normal functions of transport systems; and

(C) contrast the interactions among the transport systems.

(10) The student investigates environmental factors that affect the human body. The student is expected to:

(A) identify the effects of environmental factors such as climate, pollution, radioactivity, chemicals, electromagnetic fields, pathogens, carcinogens, and drugs on body systems; and

(B) explore measures to minimize harmful environmental factors on body systems.

(11) The student investigates the structure and function of the human body. The student is expected to:

(A) analyze the relationships between the anatomical structures and physiological functions of systems, including the integumentary, nervous, skeletal, muscular, cardiovascular, respiratory, digestive, urinary, immune, endocrine, and reproductive systems;

(B) evaluate the cause and effect of disease, trauma, and congenital defects on the structure and function of cells, tissues, organs, and systems;

(C) research technological advances and limitations in the treatment of system disorders; and

(D) examine characteristics of the aging process on body systems.

(12) The student describes the process of reproduction and growth and development. The student is expected to:

(A) explain embryological development of cells, tissues, organs, and systems;

(B) identify the functions of the male and female reproductive systems; and

(C) summarize the human growth and development cycle.

(13) The student recognizes emerging technological advances in science. The student is expected to:

(A) recognize advances in stem cell research such as cord blood use; and

(B) recognize advances in bioengineering and transplant technology.

§130.225. Medical Microbiology (One Credit), Adopted 2015.

(a) General requirements. This course is recommended for students in Grades 10-12. Prerequisites: Biology and Chemistry. Recommended prerequisite: a course from the Health Science Career Cluster. Students must meet the 40% laboratory and fieldwork requirement. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) 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.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.

(5) Scientific inquiry is the planned and deliberate investigation of the natural world. Scientific methods of investigation are experimental, descriptive, or comparative. The method chosen should be appropriate to the question being asked.

(6) Scientific decision making is a way of answering questions about the natural world. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(7) A system is a collection of cycles, structures, and processes that interact. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(8) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(9) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(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.

(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.

(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.

(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.

(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.

(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 the 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.

(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 the human body system;

(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.

§130.226. World Health Research (One Credit), Adopted 2015.

(a) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: Biology and Chemistry. Recommended prerequisite: a course in the Health Science Career Cluster. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The World Health Research course is designed to examine major world health problems and emerging technologies as solutions to these medical concerns. It is designed to improve students' understanding of the cultural, infrastructural, political, educational, and technological constraints and inspire ideas for appropriate technological solutions to global medical care issues.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(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.

(2) The student explores and discusses current major human health problems in the world. The student is expected to:

(A) describe the pathophysiology of the three leading causes of death in developing and developed countries;

(B) discuss history of diseases and the evolution of medical technology over time;

(C) contrast health problems in developing and developed countries;

(D) describe the function of the World Health Organization;

(E) define and calculate incidence, morbidity, and mortality; and

(F) identify and describe the challenges in global health that can have the greatest impact on health in developing nations.

(3) The student explains who pays for health care in the world today. The student is expected to:

(A) compare the availability of health care in developing and developed countries;

(B) discuss and contrast the four basic health care system models, including the Beveridge Model, Bismarck Model, National Health Insurance Model, and the Out-of-Pocket Model;

(C) explain how countries such as the United Kingdom, Japan, Germany, Taiwan, Switzerland, and the United States of America pay for health care;

(D) describe how health care expenditures have changed over time; and

(E) identify the major contributors to the rising health science industry costs.

(4) The student describes the engineering technologies developed to address clinical needs. The student is expected to:

(A) describe technologies that support the prevention and treatment of infectious diseases;

(B) explain the implication of vaccines on the immune system;

(C) investigate technologies used for the early detection of cancer;

(D) investigate technologies used for the treatment of several different types of cancers;

(E) explain the cardiovascular system and the technologies used in the diagnosis and treatment of heart disease; and

(F) describe and discuss technologies developed to support vital organ failure.

(5) The student explores how human clinical trials are designed, conducted, and evaluated. The student is expected to:

(A) identify types of clinical trials;

(B) define and calculate a sample size; and

(C) analyze quantitative methods used to describe clinical trials.

(6) The student recognizes the ethics involved in clinical research. The student is expected to:

(A) define informed consent;

(B) explain who can give informed consent;

(C) identify issues in research that influence the development of ethical principles and legal requirements currently governing research with human subjects; and

(D) explain the ethical guidelines for the conduct of research involving human subjects.

(7) The student explains how medical technologies are managed. The student is expected to:

(A) describe how health science research is funded;

(B) explain the role of the U.S. Food and Drug Administration in approving new drugs and medical devices; and

(C) analyze factors that affect the dissemination of new medical technologies.

(8) The student applies research principles to create a project that addresses a major health problem. The student is expected to:

(A) construct charts and graphs in facilitating data analysis and in communicating experimental results clearly and effectively using technology; and

(B) present the project to classmates, health professionals, parents, or instructors.

§130.227. Pathophysiology (One Credit), Adopted 2015.

(a) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: Biology and Chemistry. Recommended prerequisite: a course from the Health Science Career Cluster. Students must meet the 40% laboratory and fieldwork. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Pathophysiology course is designed for students to conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Students in Pathophysiology will study disease processes and how humans are affected. Emphasis is placed on prevention and treatment of disease. Students will differentiate between normal and abnormal physiology.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.

(5) Scientific inquiry is the planned and deliberate investigation of the natural world. Scientific methods of investigation are experimental, descriptive, or comparative. The method chosen should be appropriate to the question being asked.

(6) Scientific decision making is a way of answering questions about the natural world. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(7) A system is a collection of cycles, structures, and processes that interact. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(8) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(9) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(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.

(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.

(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 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 and differentiate 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; and

(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.

(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.

(5) The student analyzes the mechanisms of pathology. The student is expected to:

(A) identify biological and chemical processes at the cellular level;

(B) detect changes resulting from mutations and neoplasms by examining cells, tissues, organs, and systems;

(C) identify factors that contribute to disease such as age, gender, environment, lifestyle, and heredity;

(D) examine the body's compensating mechanisms occurring under various conditions; and

(E) analyze how the body attempts to maintain homeostasis when changes occur.

(6) The student examines the process of pathogenesis. The student is expected to:

(A) identify pathogenic organisms using microbiological techniques;

(B) differentiate the stages of pathogenesis, including incubation period, prodromal period, and exacerbation or remission;

(C) analyze the body's natural defense systems against infection such as barriers, the inflammatory response, and the immune response;

(D) evaluate the effects of chemical agents, environmental pollution, and trauma on the disease process; and

(E) research stages in the progression of disease.

(7) The student examines a variety of human diseases. The student is expected to:

(A) describe the nature of diseases, including the etiology, signs and symptoms, diagnosis, prognosis, and treatment options for diseases;

(B) explore advanced technologies for the diagnosis and treatment of disease;

(C) examine reemergence of diseases such as malaria, tuberculosis, and polio;

(D) differentiate between hospital-acquired infections and community-acquired infections;

(E) examine antibiotic-resistant diseases such as methicillin resistant *Staphylococcus aureus*;

(F) differentiate between congenital disorders and childhood diseases; and

(G) investigate ways diseases affect multiple body systems.

(8) The student integrates the effects of disease prevention and control. The student is expected to:

(A) evaluate public health issues related to asepsis, isolation, immunization, and quarantine;

(B) analyze the effects of stress and aging on the body;

(C) evaluate treatment options for diseases;

(D) investigate diseases that threaten world health and propose intervention strategies; and

(E) develop a plan for personal health and wellness.

§130.228. Health Informatics (One Credit), Adopted 2015.

(a) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: Business Management I and Medical Terminology. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Health Informatics course is designed to provide knowledge of one of the fastest growing areas in both academic and professional fields. The large gap between state of the art computer technologies and the state of affairs in health care information technology has generated demand for information and health professionals who can effectively design, develop, and use technologies such as electronic medical records, patient monitoring systems, and digital libraries, while managing the vast amount of data generated by these systems.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(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;

(B) demonstrate adaptability skills such as problem solving and creative thinking;

(C) develop a career plan;

(D) employ teamwork;

(E) create a job-specific resume; and

(F) appraise the characteristics desired by employers such as work ethics and professionalism.

(2) The student interprets fundamental knowledge of concepts of health information systems technology and the tools for collecting, storing, and retrieving health care data. The student is expected to:

(A) discuss and define the common information systems;

(B) differentiate between the six types of information systems;

(C) explain how each of the six information systems support the administrative, financial, clinical, and research needs of a health care enterprise;

(D) describe the components of an information system; and

(E) implement the concepts of health informatics by creating a culminating project.

(3) The student employs the various types of databases in relation to health informatics. The student is expected to:

(A) define the function of a database management system;

(B) identify the purpose of data modeling;

(C) define the customary steps in the data modeling process;

(D) differentiate between entities, attributes, and relationships in a data model; and

(E) explain various types of organizational databases.

(4) The student distinguishes between data and information. The student is expected to:

(A) discuss the importance of data security, accuracy, integrity, and validity; and

(B) demonstrate an understanding of data information concepts for health information systems and electronic health records.

(5) The student examines the evolution of the health information system. The student is expected to:

(A) evaluate the growing role of the electronic health record;

(B) review the progress of the development of the electronic health record; and

(C) explain functional requirements for electronic health records.

(6) The student examines the process of medical diagnostic and coding concepts as well as current procedural practices. The student is expected to:

(A) examine Health Insurance Portability and Accountability Act (HIPAA) guidelines for confidentiality, privacy, and security of a patient's information within the medical record;

(B) differentiate between insurance fraud and insurance abuse;

(C) discuss the linkage between current procedural technology (CPT) codes, International Classification of Diseases, 10th revision, clinical modification (ICD-10-CM) codes, and medical necessity for reimbursement for charges billed;

(D) search ICD-10-CM code system for correct diagnosis code using patient information;

(E) identify the two types of codes in the health care common procedure coding system (HCPCS); and

(F) explain how medical coding affects the payment process.

(7) The student identifies agencies involved in the health insurance claims process. The student is expected to:

(A) define Medicaid and Medicare;

(B) discuss health care benefit programs such as TRICARE and CHAMPVA;

(C) explain how to manage a worker's compensation case;

(D) complete a current health insurance claim form such as the Centers for Medicare and Medicaid Service (CMS-1500) form; and

(E) identify three ways to transmit electronic claims.

§130.229. Mathematics for Medical Professionals (One Credit), Adopted 2015.

(a) General requirements. This course is recommended for student in Grades 11 and 12. Prerequisites: Geometry and Algebra II. This course satisfies a high school mathematics graduation requirement. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Mathematics for Medical Professionals course is designed to serve as the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on fluency and solid understanding in medical mathematics, students will extend and apply mathematical skills necessary for health science professions. Course content consists primarily of high school level mathematics concepts and their applications to health science professions.

(4) The mathematical process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas in a clear, concise, and effective manner;

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team; and

(C) demonstrate adaptability skills such as problem solving and creative thinking.

(2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in health science professions;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems in health science professions;

(D) communicate mathematical ideas, reasoning, and their implications to the health science field using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas in health science professions;

(F) analyze mathematical relationships to connect and communicate mathematical ideas in health science professions; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication as it applies to health science professions.

(3) The student generates deeper mathematical understandings through problems involving numerical data that arise in health science professions. The student extends existing knowledge and skills to analyze real-world clinical situations. The student is expected to:

(A) add, subtract, multiply, and divide rational numbers fluently in problem-solving situations related to health science professions;

(B) keep track of and manage inventory using the First In, Last Out (FILO) concept;

(C) solve health science related problems involving ratios, rates, and percent accurately and precisely, including lab analysis, body fluid analysis, vital signs, medication dosages and administration, growth charts, body surface area, parenteral solutions and data collection related to homeostasis;

(D) learn to read and use military time fluently for health science situations, including medication administration, scheduling, and documentation;

(E) apply appropriate estimation techniques used in health science professions to estimate percent and then confirm those estimates with calculations; and

(F) read and determine accurate numerical value of Roman numerals as used in the health science professions, including cranial nerves.

(4) The student applies the process standards in mathematics to create and analyze mathematical models of health science situations to make informed decisions related to improved health care outcomes by appropriate, proficient, and efficient use of tools, including technology. The student judges the validity of a prediction and uses mathematical models to represent, analyze, and solve dynamic health care problems. The student is expected to:

(A) collect data to create a scatterplot and apply various functions to model the data in an effort to interpret results and make predictions in health science situations such as interpreting growth charts, interpreting disease and mortality rates, and diagnosing and determining treatment modalities;

(B) create, represent, and analyze appropriate mathematical functions such as linear, quadratic, exponential, logarithmic, and sinusoidal functions used to model, interpret and predict situations that occur in health science professions such as supply and demand, inventory control, and cost analysis within clinical situations;

(C) determine or analyze an appropriate sinusoidal model for health science situations that can be modeled with periodic functions, including those related to electrocardiograms (EKG), repolarization of the heart, and medication dosage and administration;

(D) write and solve systems of equations, especially those representing mixtures, which apply to health science situations, including intravenous (IV) solutions and medication dosages;

(E) use properties of logarithmic and exponential functions to solve equations related to health science situations such as determining the pH of a solution, the concentration of hydrogen ions (H+) given the pH, calculating the absorbance and transmittance, and determining exponential growth and decay; and

(F) calculate accurate and precise unit rates used in health science situations.

(5) The student applies mathematical process standards to obtain accurate and precise measurements. The student is expected to:

(A) define each of the health science professions that require a unique set of measurement or calculation standards and explain or identify the importance of each measurement system (apothecary, metric, household systems);

(B) explain the necessity of obtaining accurate measurements in the health science professions;

(C) use dimensional analysis with precision and accuracy in performing unit conversions from one measurement system to another, including the use of proportions and unit rates in pharmacology;

(D) classify the specific system to which a given unit belongs and explain its similarity or differences to units in other measurement systems;

(E) select and use appropriate measurement tools used in health science professions such as rulers, tape measures, thermometers, syringes, scales, and sphygmomanometer gauges to obtain accurate and precise measurements; and

(F) select and use appropriate measurement techniques used in health science professions to obtain accurate and precise measurements, including determining measures for medication, nutrition, fluids, and homeostasis.

(6) The student applies mathematical process standards to analyze statistical information used in health science professions. The student is expected to:

(A) obtain and analyze lab reports to evaluate if values lie outside normal parameters;

(B) obtain and analyze vital signs by comparing to normal parameters;

(C) calculate and apply measures of central tendency in application problems in the health science field;

(D) demonstrate an understanding of the significance of the normal distribution;

(E) demonstrate an understanding of and apply the Empirical Rule to find probabilities from normal distributions;

(F) calculate and use the z-score to calculate standard deviation of a normal distribution using a formula;

(G) calculate the percentile rank for a given score using a formula;

(H) describe characteristics of well-designed and well-conducted experiments, observational studies, and surveys in the health science field, including the ethical issues associated with each;

(I) distinguish between populations and samples;

(J) explain placebo and placebo effect; and

(K) define epidemiology and its extension of statistical procedures to public health issues.

(7) The student applies mathematical process standards to solve geometric problems arising in health science professions. The student is expected to:

(A) calculate volumes of various liquids and solids encountered in health science professions, including irregularly shaped solids, using formulas and geometric reasoning;

(B) calculate surface area of various surfaces encountered in health science professions, including body surface area, using formulas and geometric reasoning;

(C) calculate appropriate angles encountered in health science professions such as medication administration, body positioning, and physical therapy using geometric reasoning; and

(D) calculate and analyze range of motion using a goniometer.

§130.230. Pharmacology (One Credit), Adopted 2015.

(a) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: Biology and Chemistry. Recommended prerequisite: a course from the Health Science Career Cluster. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Pharmacology course is designed to study how natural and synthetic chemical agents such as drugs affect biological systems. Knowledge of the properties of therapeutic agents is vital in providing quality health care. It is an ever-changing, growing body of information that continually demands greater amounts of time and education from health care workers.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(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;

(B) demonstrate adaptability skills such as problem solving and creative thinking;

(C) develop a career plan;

(D) employ teamwork;

(E) create a job-specific resume; and

(F) appraise the characteristics desired by employers.

(2) The student identifies individuals associated with manufacturing, dispensing, and administrating pharmaceuticals as a valued member of a health care team. The student is expected to:

(A) define pharmacology and its major subdivisions, including pharmacodynamics, pharmacokinetics, and pharmacotherapeutics;

(B) explain the difference between therapeutic effects, side effects, and toxic effects;

(C) identify a drug receptor in the human body;

(D) trace the interaction and antagonist receptor;

(E) explain the relationship between drug dosage, drug response, and time;

(F) explain drug safety and therapeutic index;

(G) describe three names by which drugs are known; and

(H) list two common drug reference books.

(3) The student identifies individuals associated with manufacturing, dispensing, and administrating pharmaceuticals as a valued member of a health care team. The student is expected to:

(A) identify career pathways related to pharmacology;

(B) define the role of the pharmacy team;

(C) research and describe emerging pharmacy career opportunities;

(D) analyze the impact of pharmaceuticals on the costs of health care; and

(E) evaluate the impact of pharmaceuticals on the costs of society.

(4) The student explains the ethical and legal responsibilities of pharmacists and pharmacy technicians. The student is expected to:

(A) describe the legal terms and consequences associated with prescription errors;

(B) analyze the six routes of medication administration;

(C) differentiate between negligence, product liability, contributory negligence, and regulatory law;

(D) evaluate the effect of medication errors related to the pharmacy and the industry;

(E) discuss the elements of a lawsuit; and

(F) define professional liability.

(5) The student uses a comprehensive medical vocabulary in order to communicate effectively with other health care professionals. The student is expected to:

(A) identify the various routes of drug medication;

(B) differentiate among the various classes of drugs;

(C) properly use common terms associated with pharmacology; and

(D) analyze unfamiliar terms using the knowledge of word roots, suffixes, and prefixes.

(6) The student demonstrates mathematical knowledge and skills to solve problems with systems of measurement used in the pharmacy. The student is expected to:

(A) analyze medication calculations, including metric, apothecary, and household systems;

(B) convert a measurement expressed in one standard unit within a system to a measurement expressed in another unit within the same system; and

(C) convert a measurement expressed in one system to a unit of the same measurement in a different system.

(7) The student recognizes the effectiveness of a pharmaceutical agent, its form, and its route of administration. The student is expected to:

(A) differentiate between solid, semi-solid, and liquid dosage forms;

(B) name forms in which drugs are manufactured, including their subcategories;

(C) list examples of drugs in each dosage form; and

(D) define medical terms associated with drug forms.

(8) The student must be able to select appropriate equipment and instruments and use technology for specific tasks. The student is expected to:

(A) identify technology components used in the pharmacy;

(B) describe how technology applications approve efficiency in the pharmacy; and

(C) analyze the use of technology in the pharmacy.

(9) The student is expected to practice safety in dispensing and administering pharmaceutical agents and prevent personal and client illness or injury. The student is expected to:

(A) employ safety standards;

(B) interpret rules associated with pharmacy standards;

(C) examine unsafe practices;

(D) observe safe procedures in the administration of client care; and

(E) demonstrate these safe procedures in the clinical setting.

§130.231. Health Science Theory (One Credit), Adopted 2015.

(a) General requirements. This course is recommended for students in Grades 10-12. Prerequisites: Principles of Health Science and Biology. Districts are encouraged to offer this course in a consecutive block with Health Science Clinical to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Health Science Theory course is designed to provide for the development of advanced knowledge and skills related to a wide variety of health careers. Students will employ hands-on experiences for continued knowledge and skill development.

(4) To pursue a career in the health science industry, students should recognize, learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health science industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students should identify the employment opportunities, technology, and safety requirements of each system. Students are expected to apply the knowledge and skills necessary to pursue a health science career through further education and employment.

(6) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(7) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(8) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas in a clear, concise, and effective manner; and

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team.

(2) The student applies mathematics, science, English language arts, and social studies in health science. The student is expected to:

(A) solve mathematical calculations appropriate to situations in a health-related environment;

(B) communicate using medical terminology;

(C) express ideas in writing and develop skills in documentation;

(D) interpret complex technical material related to the health science industry;

(E) summarize biological and chemical processes that maintain homeostasis;

(F) explain the changes in structure and function due to trauma and disease; and

(G) research the global impact of disease prevention and cost containment.

(3) The student displays verbal and non-verbal communication skills. The student is expected to:

(A) demonstrate therapeutic communication appropriate to the situation;

(B) execute verbal and nonverbal skills when communicating with persons with sensory and language barriers in a simulated setting; and

(C) use electronic communication devices with appropriate supervision in the classroom setting such as facsimile, scanner, electronic mail, and telephone.

(4) The student analyzes and evaluates communication skills for maintaining healthy relationships throughout the life span. The student is expected to:

(A) evaluate how healthy relationships influence career goals;

(B) demonstrate communication skills in building and maintaining healthy relationships;

(C) demonstrate strategies for communicating needs, wants, and emotions; and

(D) evaluate the effectiveness of conflict resolution techniques in various simulated situations.

(5) The student relates appropriate information to the proper authority in a simulated classroom setting. The student is expected to:

(A) identify and retrieve reportable information; and

(B) report simulated information according to facility policy.

(6) The student identifies documents integrated into the permanent record of the health informatics system. The student is expected to:

(A) research document formats; and

(B) compile and record data according to industry-based standards.

(7) The student describes academic requirements necessary for employment in the health science industry. The student is expected to:

(A) research specific health science careers; and

(B) examine employment procedures for a specific health science career.

(8) The student identifies problems and participates in the decision-making process. The student is expected to:

(A) analyze systematic procedures for problem solving;

(B) evaluate the impact of decisions; and

(C) suggest modifications based on decision outcomes.

(9) The student implements the knowledge and skills of a health science professional in the classroom setting. The student is expected to:

(A) comply with specific industry standards related to safety and substance abuse;

(B) model industry expectations of professional conduct such as attendance, punctuality, personal appearance, hygiene, and time management;

(C) articulate comprehension of assignment;

(D) employ medical vocabulary specific to the health care setting;

(E) perform admission, discharge, and transfer functions in a simulated setting;

(F) demonstrate skills related to activities of daily living in rehabilitative care such as range of motion, positioning, and ambulation according to the health science industry standards, regulatory agency standards, and professional guidelines;

(G) role play techniques used in stressful situations such as trauma and chronic and terminal illness;

(H) demonstrate first aid, vital signs, cardiopulmonary resuscitation, and automated external defibrillator skills in a laboratory setting; and

(I) perform skills specific to a health science professional such as medical assistant, dental assistant, emergency medical technician-basic, phlebotomy technician, and pharmacy technician.

(10) The student evaluates ethical behavioral standards and legal responsibilities. The student is expected to:

(A) research and describe the role of professional associations and regulatory agencies;

(B) examine legal and ethical behavior standards such as Patient Bill of Rights, Advanced Directives, and the Health Insurance Portability and Accountability Act; and

(C) investigate the legal and ethical ramifications of unacceptable behavior.

(11) The student exhibits the leadership skills necessary to function in a democratic society. The student is expected to:

(A) identify leadership skills of health science professionals;

(B) participate in group dynamics; and

(C) integrate consensus-building techniques.

(12) The student maintains a safe environment. The student is expected to:

(A) conform to governmental regulations and guidelines from entities such as the World Health Organization, Centers for Disease Control and Prevention, Occupational Safety and Health Administration, U.S. Food and Drug Administration, Joint Commission, and National Institute of Health;

(B) explain protocol related to hazardous materials and situations;

(C) observe and report unsafe conditions; and

(D) support recycling and waste management for cost containment and environmental protection.

(13) The student assesses wellness strategies for the prevention of disease. The student is expected to:

(A) research wellness strategies for the prevention of disease;

(B) evaluate positive and negative effects of relationships on physical and emotional health;

(C) explain the benefits of positive relationships among community health professionals in promoting a healthy community;

(D) research and analyze the effects of access to quality health care; and

(E) research alternative health practices and therapies.

§130.232. Health Science Clinical (One Credit), Adopted 2015.

(a) General requirements. This course is recommended for students in Grades 10-12. Prerequisites: Biology and Principles of Health Science. Corequisite: Health Science Theory. This course must be taken concurrently with Health Science Theory and may not be taken as a stand-alone course. Districts are encouraged to offer this course in a consecutive block with Health Science Theory to allow students

sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Health Science Clinical course is designed to provide for the development of advanced knowledge and skills related to a wide variety of health careers. Students will employ hands-on experiences for continued knowledge and skill development.

(4) To pursue a career in the health science industry, students should recognize, learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health science industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students should identify the employment opportunities, technology, and safety requirements of each system. Students are expected to apply the knowledge and skills necessary to pursue a health science career through further education and employment.

(6) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(7) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(8) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas in a clear, concise, and effective manner; and

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team.

(2) The student applies mathematics, science, English language arts, and social studies in health science. The student is expected to:

(A) solve mathematical calculations appropriate to situations in a health-related environment;

(B) communicate using medical terminology;

(C) express ideas in writing and develop skills in documentation;

(D) interpret complex technical material related to the health science industry;

(E) summarize biological and chemical processes that maintain homeostasis;

(F) explain the changes in structure and function due to trauma and disease; and

(G) research the global impact of disease prevention and cost containment.

(3) The student displays verbal and non-verbal communication skills. The student is expected to:

(A) demonstrate therapeutic communication appropriate to the situation;

(B) execute verbal and nonverbal skills when communicating with persons with sensory loss and language barriers; and

(C) use electronic communication devices with appropriate supervision such as facsimile, scanner, electronic mail, and telephone.

(4) The student analyzes and evaluates communication skills for maintaining healthy relationships throughout the life span. The student is expected to:

(A) evaluate how a healthy relationship influences career goals;

(B) demonstrate communication skills in building and maintaining healthy relationships;

(C) demonstrate strategies for communicating needs, wants, and emotions; and

(D) evaluate the effectiveness of conflict resolution techniques in various practical situations.

(5) The student relates appropriate information in the practical setting to the proper authority. The student is expected to:

(A) identify and retrieve reportable information; and

(B) report information according to facility policy in the practical setting.

(6) The student identifies documents integrated into the permanent record of the health informatics system. The student is expected to:

(A) research and describe document formats; and

(B) compile and record data according to industry based standards.

(7) The student describes academic requirements necessary for employment in the health science industry. The student is expected to:

(A) research specific health science careers; and

(B) review employment procedures for a specific health science career.

(8) The student identifies problems and participates in the decision-making process. The student is expected to:

(A) analyze systematic procedures for problem solving;

(B) evaluate the impact of decisions; and

(C) suggest modifications based on decision outcomes.

(9) The student implements the knowledge and skills of a health science professional in the clinical setting. The student is expected to:

(A) comply with specific industry standards related to safety and substance abuse;

(B) model industry expectations of professional conduct such as attendance, punctuality, personal appearance, hygiene, and time management;

(C) articulate comprehension of assignment;

(D) employ medical vocabulary specific to the health care setting;

(E) perform admission, discharge, and transfer functions in a simulated setting;

(F) demonstrate skills related to activities of daily living in rehabilitative care such as range of motion, positioning, and ambulation according to the health science industry standards, regulatory agency standards, and professional guidelines;

(G) role play techniques used in stressful situations such as trauma, chronic, and terminal illness;

(H) demonstrate first aid, vital signs, cardiopulmonary resuscitation, and automated external defibrillator skills in a laboratory setting; and

(I) perform skills specific to a health science professional such as medical assistant, dental assistant, emergency medical technician-basic, phlebotomy technician, and pharmacy technician.

(10) The student evaluates ethical behavioral standards and legal responsibilities. The student is expected to:

(A) research and describe the role of professional associations and regulatory agencies;

(B) examine legal and ethical behavior standards such as Patient Bill of Rights, Advanced Directives, and the Health Insurance Portability and Accountability Act;

(C) investigate the legal and ethical ramifications of unacceptable behavior; and

(D) perform within the designated scope of practice.

(11) The student exhibits the leadership skills necessary to function in a democratic society. The student is expected to:

(A) identify leadership skills of health science professionals;

(B) participate in group dynamics; and

(C) integrate consensus-building techniques.

(12) The student maintains a safe environment. The student is expected to:

(A) conform to governmental regulations and guidelines from entities such as the World Health Organization, Centers for Disease Control and Prevention, Occupational Safety and Health Administration, U.S. Food and Drug Administration, Joint Commission, and National Institute of Health;

(B) explain protocol related to hazardous materials and situations such as material safety data sheets;

(C) observe and report unsafe conditions; and

(D) practice recycling and waste management for cost containment and environmental protection.

(13) The student assesses wellness strategies for the prevention of disease. The student is expected to:

(A) research wellness strategies for the prevention of disease;

(B) evaluate positive and negative effects of relationships on physical and emotional health;

(C) explain the benefits of positive relationships among community health professionals in promoting a healthy community;

(D) research and analyze access to quality health care; and

(E) research alternative health practices and therapies.

§130.233. Practicum in Health Science I (Two Credits), Adopted 2015.

(a) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: Principles of Health Science, Health Science Theory, and Biology. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Practicum in Health Science I course is designed to give students practical application of previously studied knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience.

(4) To pursue a career in the health care industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health care industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students recognize the employment opportunities, technology, and safety requirements of each system. Students are expected to apply the knowledge and skills necessary to pursue a health science certification or licensure through further education and employment.

(6) Professional integrity in the health care industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(7) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(8) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(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.

(2) The student applies mathematics, science, English language arts, and social sciences in health science. The student is expected to:

(A) interpret data from various sources in formulating conclusions;

(B) compile information from a variety of sources to create a technical report;

(C) plan, prepare, and deliver a presentation;

(D) examine the environmental factors that affect homeostasis;

(E) relate anatomical structure to physiological functions; and

(F) distinguish atypical anatomy and physiology in the human body systems.

(3) The student uses verbal and non-verbal communication skills. The student is expected to:

(A) accurately report information according to facility policies and procedures;

(B) demonstrate therapeutic communication skills to provide quality care; and

(C) employ therapeutic measures to minimize communication barriers.

(4) The student implements the knowledge and skills of a health care professional necessary to acquire and retain employment. The student is expected to:

(A) demonstrate proficiency in medical terminology and skills related to the health care of an individual;

(B) develop new problem-solving strategies based on previous knowledge and skills; and

(C) evaluate performance for continuous improvement and advancement in health care.

(5) The student employs ethical behavior standards and legal responsibilities. The student is expected to:

(A) identify individual ethical and legal behavior standards according to professional regulatory agencies; and

(B) research case studies related to unethical behavior in the health care industry.

(6) The student employs a safe environment to prevent hazardous situations. The student is expected to:

(A) integrate regulatory standards such as standard precautions and safe patient handling;

(B) evaluate hazardous materials according to the material safety data sheets; and

(C) apply principles of infection control and body mechanics in all aspects of the health care industry.

(7) The student explores the knowledge and skill levels necessary for advancing in the health science professions. The student is expected to:

(A) identify knowledge and skills that are transferable among health science professions; and

(B) research career pathways pertaining to the health care industry.

(8) The student implements skills in monitoring individual health status during therapeutic or diagnostic procedures. The student is expected to:

(A) identify care indicators of health status; and

(B) record health status according to facility protocol.

(9) The student recognizes the importance of participation in extended learning experiences. The student is expected to:

(A) participate in extended learning experiences such as community service, career and technical student organizations, and professional organizations; and

(B) create a plan of action targeting the career and technical student organization's community service goal.