Texas CTE: Health Science

Pathophysiology

Implementation. A

1 The provisions of this section shall be implemented by school districts beginning with the 2024- 2025 school year. A.1

2 School districts shall implement the employability skills student expectations listed in §127.15(d)(2) of this chapter (relating to Career and Technical Education Employability Skills) as an integral part of this course. A.2

General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: one credit in biology, one credit in chemistry, and at least one credit in a Level 2 or higher course from the health science career cluster. Recommended prerequisite: Anatomy and Physiology. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course. B

b General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: one credit in biology, one credit in chemistry, and at least one credit in a Level 2 or higher course from the health science career cluster. Recommended prerequisite: Anatomy and Physiology. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course. B

Introduction. C

1 Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions. C.1

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. C.2

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.** C.3

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 currently scientifically testable.** C.4

5 **Students are expected to know that:** C.5

- A 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; and C.5.A
- B 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 and new technologies are developed. C.5.B

6 **Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.** C.6

- A Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models. C.6.A
- B Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models. C.6.B

7 **Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. 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).** C.7

8 Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. 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, while models allow for boundary specification and provide a tool for understanding the ideas presented. 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. C.7.8

9 Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations. C.7.9

10 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.7.10

Knowledge and skills. D

1 **The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:** D.1

- A ask questions and define problems based on observations or information from text, phenomena, models, or investigations; D.1.A
- B apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems; D.1.B
- C use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards; D.1.C
- D use appropriate 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, micro pipettors, hand lenses, Celsius thermometers, hot plates, timing devices, Petri dishes, lab incubators, biochemical media and stains dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures; D.1.D
- E collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence; D.1.E
- F organize quantitative and qualitative data using lab notebooks or journals, lab reports, labeled drawings, graphic organizers, peer reviewed medical journals, summaries, oral reports, and technology-based reports; D.1.F
- G develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and D.1.G
- H distinguish between scientific hypotheses, theories, and laws. D.1.H

2 **The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:** D.2

- A identify advantages and limitations of models such as their size, scale, properties, and materials; D.2.A
- B analyze data by identifying significant statistical features, patterns, sources of error, and limitations; D.2.B
- C use mathematical calculations to assess quantitative relationships in data; and D.2.C
- D evaluate experimental and engineering designs. D.2.D

3 **The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:** D.3

A develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories; D.3.A

B communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and D.3.B

C engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence. D.3.C

4 **The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:** D.4

A analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student; D.4.A

B relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and D.4.B

C research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) or health science field in order to investigate careers. D.4.C

5 **The student analyzes the mechanisms of pathology. The student is expected to:** D.5

A describe abnormal biological and chemical processes at the cellular level; D.5.A

B examine and analyze changes resulting from mutations and neoplasms by examining cells, tissues, organs, and systems; D.5.B

C investigate factors that contribute to disease, including age, gender, environment, lifestyle, and heredity; and D.5.C

D analyze and describe how the body's compensating mechanisms attempt to maintain homeostasis when changes occur. D.5.D

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

- A differentiate and identify pathogenic organisms using microbiological techniques such as gram staining, biochemical identification, and microscopic observation; D.6.A
- B research and summarize the stages of pathogenesis, including incubation period, prodromal period, and exacerbation or remission; D.6.B
- C analyze the body's natural defense systems against infection, including barriers, the inflammatory response, and the immune response; D.6.C
- D analyze other mechanisms of disease prevention and treatment such as vaccinations, antibiotics, chemotherapy, and immunotherapy; and D.6.D
- E evaluate the effects of chemical agents, environmental pollution, and trauma on the disease process. D.6.E

7 The student examines diseases throughout the body's systems. The student is expected to: D.7

- A investigate the etiology, signs and symptoms, diagnosis, prognosis, and treatment of diseases; D.7.A
- B explore and describe advanced technologies for the diagnosis and treatment of disease; D.7.B
- C research and describe reemergence of diseases such as malaria, tuberculosis, polio, and measles; D.7.C
- D research the causes, prevention, and impact of nosocomial infections and differentiate between the causes, prevention, and impact of nosocomial infections versus community- acquired infections; D.7.D
- E research and describe antibiotic-resistant diseases such as methicillin-resistant Staphylococcus aureus; D.7.E
- F differentiate between various types of diseases and disorders, including hereditary, infectious, and auto-immune; and D.7.F
- G investigate ways diseases such as diabetes, Parkinson's, lupus, and congestive heart failure affect multiple body systems. D.7.G

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

A evaluate public health issues related to asepsis, isolation, immunization, and quarantine; D.8.A

B analyze the effects of stress and aging on the body; D.8.B

C analyze patient medical data and interpret medical laboratory test results to inform diagnosis and treatment; D.8.C

D analyze and interpret epidemiological data to determine common trends and predict outcomes in disease progression; D.8.D

E research and summarize diseases that threaten world health and propose intervention strategies; and D.8.E

F develop a prevention plan that considers how behaviors contribute to lifestyle diseases. D.8.F