Anatomy and Physiology   (#2000350)

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Course Number: 2000350	**Course Path: Section:** Grades PreK to 12 Education Courses > **Grade Group:** Grades 9 to 12 and Adult Education Courses > **Subject:** Science > **SubSubject:** Biological Sciences > **Abbreviated Title:** ANAT PHYSIO
Number of Credits: One (1) credit	**Course Length:** Year (Y)
Course Type: Core Academic Course	**Course Level:** 2
Course Status: Course Approved	
Graduation Requirement: Equally Rigorous Science	

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:
Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

Course Standards

Integrate Standards for Mathematical Practice (MP) as applicable.
- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.

- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MACC.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

Name	Description
SC.912.L.14.11:	Classify and state the defining characteristics of epithelial tissue, connective tissue, muscle tissue, and nervous tissue.
SC.912.L.14.12:	Describe the anatomy and histology of bone tissue.
SC.912.L.14.13:	Distinguish between bones of the axial skeleton and the appendicular skeleton.
SC.912.L.14.14:	Identify the major bones of the axial and appendicular skeleton.
SC.912.L.14.16:	Describe the anatomy and histology, including ultrastructure, of muscle tissue.
SC.912.L.14.17:	List the steps involved in the sliding filament of muscle contraction.
SC.912.L.14.18:	Describe signal transmission across a myoneural junction.
SC.912.L.14.20:	Identify the major muscles of the human on a model or diagram. **Remarks/Examples:** Refer to MAFS.K12.MP.4: Model with mathematics.
SC.912.L.14.21:	Describe the anatomy, histology, and physiology of the central and peripheral nervous systems and name the major divisions of the nervous system.
SC.912.L.14.23:	Identify the parts of a reflex arc.
SC.912.L.14.24:	Identify the general parts of a synapse and describe the physiology of signal transmission across a synapse.
SC.912.L.14.25:	Identify the major parts of a cross section through the spinal cord.
SC.912.L.14.26:	Identify the major parts of the brain on diagrams or models. **Remarks/Examples:** Annually Assessed on Biology EOC. Florida Standards Connections: MAFS.K12.MP.4: Model with mathematics.
SC.912.L.14.28:	Identify the major functions of the spinal cord.
SC.912.L.14.29:	Define the terms endocrine and exocrine.
SC.912.L.14.30:	Compare endocrine and neural controls of physiology.
SC.912.L.14.32:	Describe the anatomy and physiology of the endocrine system.
SC.912.L.14.33:	Describe the basic anatomy and physiology of the reproductive system.
SC.912.L.14.34:	Describe the composition and physiology of blood, including that of the plasma and the formed elements.
SC.912.L.14.35:	Describe the steps in hemostasis, including the mechanism of coagulation. Include the basis for blood typing and transfusion reactions.
SC.912.L.14.36:	Describe the factors affecting blood flow through the cardiovascular system.
SC.912.L.14.38:	Describe normal heart sounds and what they mean.
SC.912.L.14.39:	Describe hypertension and some of the factors that produce it.
SC.912.L.14.41:	Describe fetal circulation and changes that occur to the circulatory system at birth.
SC.912.L.14.42:	Describe the anatomy and the physiology of the lymph system.
SC.912.L.14.44:	Describe the physiology of the respiratory system including the mechanisms of ventilation, gas exchange, gas transport and the mechanisms that control the rate of ventilation.
SC.912.L.14.46:	Describe the physiology of the digestive system, including mechanical digestion, chemical digestion, absorption and the neural and hormonal mechanisms of control.
SC.912.L.14.47:	Describe the physiology of urine formation by the kidney.
SC.912.L.14.49:	Identify the major functions associated with the sympathetic and parasympathetic nervous systems.
SC.912.L.14.50:	Describe the structure of vertebrate sensory organs. Relate structure to function in vertebrate sensory systems.
SC.912.L.14.51:	Describe the function of the vertebrate integumentary system.
SC.912.L.14.52:	Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics. **Remarks/Examples:** Annually Assessed on Biology EOC. Also assesses SC.912.L.14.6 HE.912.C.1.7 and HE.912.C.1.5.
SC.912.L.16.8:	Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer. **Remarks/Examples:** Integrate HE.912.C.1.7. Analyze how heredity and family history can impact personal health.
SC.912.L.18.1:	Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules. **Remarks/Examples:** Annually assessed on Biology EOC. Also assesses SC.912.L.18.11.
SC.912.L.18.11:	Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.
	Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. **Pose questions about the natural world,** (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. **Conduct systematic observations,** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. **Examine books and other sources of information to see what is already known,** 4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. **Plan investigations,** (Design and evaluate a scientific investigation).

	6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
	7. **Pose answers, explanations, or descriptions of events,**
	8. **Generate explanations that explicate or describe natural phenomena (inferences),**
	9. **Use appropriate evidence and reasoning to justify these explanations to others,**
	10. **Communicate results of scientific investigations, and**
	11. **Evaluate the merits of the explanations produced by others.**
SC.912.N.1.1:	**Remarks/Examples:**
	Florida Standards Connections for 6-12 Literacy in Science
	For Students in Grades 9-10
	LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
	LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.
	LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
	LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
	LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.
	For Students in Grades 11-12
	LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
	LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.
	LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
	LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
	LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.
	Florida Standards Connections for Mathematical Practices
	MAFS.K12.MP.1: Make sense of problems and persevere in solving them.
	MAFS.K12.MP.2: Reason abstractly and quantitatively.
	MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.]
	MAFS.K12.MP.4: Model with mathematics.
	MAFS.K12.MP.5: Use appropriate tools strategically.
	MAFS.K12.MP.6: Attend to precision.
	MAFS.K12.MP.7: Look for and make use of structure.
	MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.
SC.912.N.1.2:	Describe and explain what characterizes science and its methods.
	Remarks/Examples:
	Science is characterized by empirical observations, testable questions, formation of hypotheses, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.
	Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.
LAFS.1112.RST.1.1:	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
LAFS.1112.RST.1.2:	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
LAFS.1112.RST.1.3:	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LAFS.1112.RST.2.4:	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
LAFS.1112.RST.2.5:	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
LAFS.1112.RST.2.6:	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
LAFS.1112.RST.3.7:	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
LAFS.1112.RST.3.8:	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
LAFS.1112.RST.3.9:	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
LAFS.1112.RST.4.10:	By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.
	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–

LAFS.1112.SL.1.1:	12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
	   a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
	   b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
	   c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
	   d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

LAFS.1112.SL.1.2:	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
LAFS.1112.SL.1.3:	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
LAFS.1112.SL.2.4:	Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
LAFS.1112.SL.2.5:	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

LAFS.1112.WHST.1.1:	Write arguments focused on discipline-specific content.
	   a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
	   b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
	   c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
	   d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
	   e. Provide a concluding statement or section that follows from or supports the argument presented.

LAFS.1112.WHST.1.2:	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
	   a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
	   b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
	   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
	   d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
	   e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

LAFS.1112.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LAFS.1112.WHST.2.5:	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LAFS.1112.WHST.2.6:	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
LAFS.1112.WHST.3.7:	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LAFS.1112.WHST.3.8:	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
LAFS.1112.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
LAFS.1112.WHST.4.10:	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
MAFS.912.F-IF.2.4:	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ★

MAFS.912.F-IF.3.7:	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★
	
	   a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
	   b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
	   c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
	   d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
	   e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

MAFS.912.N-Q.1.1:	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★
MAFS.912.N-Q.1.3:	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★
	Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

MAFS.912.S-ID.1.1:	**Remarks/Examples:** In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.
MAFS.912.S-ID.1.2:	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★ **Remarks/Examples:** In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.
MAFS.912.S-ID.1.3:	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★ **Remarks/Examples:** In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.
MAFS.912.S-ID.1.4:	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★
MAFS.912.S-ID.2.5:	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

MAFS.912.S-ID.2.6:	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★
	  a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.
	  b. Informally assess the fit of a function by plotting and analyzing residuals.
	  c. Fit a linear function for a scatter plot that suggests a linear association.
	
	Remarks/Examples:
	Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

HE.912.C.1.3:	Evaluate how environment and personal health are interrelated. **Remarks/Examples:** Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.
HE.912.C.1.5:	Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases. **Remarks/Examples:** Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.
HE.912.C.1.7:	Analyze how heredity and family history can impact personal health. **Remarks/Examples:** Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.
ELD.K12.ELL.SC.1:	English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
ELD.K12.ELL.SI.1:	English language learners communicate for social and instructional purposes within the school setting.

Related Certifications

Science (Secondary Grades 7-12)
Biology (Grades 6-12)
Health (Elementary and Secondary Grades K-12)
Health Education (Secondary Grades 7-12)

There are more than 873 related instructional/educational resources available for this on CPALMS. Click on the following link to access them: http://www.cpalms.org/Public/PreviewCourse/Preview/13079