



# Washington Township School District



*The mission of the Washington Township Public Schools is to provide a safe, positive, and progressive educational environment that provides opportunity for all students to attain the knowledge and skills specified in the NJ Learning Standards at all grade levels, so as to ensure their full participation in an ever-changing world as responsible, self-directed and civic-minded citizens.*

<b>Course Title:</b>	<b>Veterinary Science</b>				
<b>Grade Level(s):</b>	<b>Grades 11-12</b>				
<b>Duration:</b>	<i>Full Year:</i>	<b>X</b>	<i>Semester:</i>		<i>Marking Period:</i>
<b>Course Description:</b>	This course is designed for students who have a serious interest in pursuing a career in veterinary science or zoology. It is offered as an additional science elective to enable an in-depth study of animal anatomy and physiology. Careers related to animal science will be topics included within the coursework. The course should be taken after or concurrently with a Physics course and is not intended to be elected in lieu of a Physics selection. Completion of this course does not meet the college requirement of a laboratory based science.				
<b>Grading Procedures:</b>	<b>Tests: 40%</b> <b>Quizzes: 10%</b> <b>Projects: 20%</b> <b>Laboratory Exercises: 20%</b> <b>Independent Work: 10%</b>				
<b>Primary Resources:</b>	<b>Textbook: Introduction to Veterinary Science, Third Edition by James B. Lawhead and Meecee Baker</b> <b>Resources: Next Generation Science Standards at <a href="http://www.nextgenscience.org/">www.nextgenscience.org/</a> and New Jersey Student Learning Standards</b>				

## Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21<sup>st</sup> century skills for College and Career Readiness in a global society

<b>Designed by:</b>	Mary Howard
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**Under the Direction of:**

Dr. Patricia Hughes

**Written:** August 2017

**Revised:** \_\_\_\_\_

**BOE Approval:** September 2017

## Unit Title: Introduction Veterinary Science

### Unit Description:

This unit focuses on the role of veterinary science in various aspects of animal health and wellbeing and the agricultural industry. Additionally, students will be introduced to scientific literature, its importance in the scientific study of veterinary science, and its application to the animal science and agricultural industries. The use of case studies will be explored. Continued study of current literature and case studies will continue throughout the remainder of the curriculum.

**Unit Duration:** 2 Weeks and Ongoing

### Desired Results

#### Standard(s):

- Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants (HS-ETS1-1)
- Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. (HS-ETS1-4.)
- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)

#### Indicators:

##### ETS1.A: Defining and Delimiting Engineering Problems

Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.

Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

##### ETS1.B: Developing Possible Solutions

Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.

##### LS1.A: Structure and Function

Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

#### Understandings:

*Students will understand that...*

- Veterinary science is vital to the study and protection of animal production practices, herd health and monitoring spread of disease.
- Human health is protected by veterinary science working closely with many medical professionals by the careful monitoring of livestock health as well as its unique training in epidemiology and emerging zoonotic diseases worldwide.
- Any organism, including animals, can be organized from the simplest structure to the most

#### Essential Questions:

- What is Veterinary Science?
- What are the major areas of study in veterinary and animal science?
- How do anatomists organize the human body?
- What is the basic structure of living things?
- What prior knowledge is necessary to understand how living things operate?
- How do organisms maintain the chemical and physical balance necessary to live?
- What is lab safety?
- How do students keep themselves and their peers safe in the classroom and work environment?

complex; that is, from atom, to molecule, to cell and so on.

- The physiology of an organism is based on chemistry and physics that occur at the cellular or tissue level.
- While performing veterinary procedures or maintaining a safe work environment, working as a team increases the likelihood of success.
- All students have a responsibility for keeping a safe classroom, work environment and protecting the health of both themselves and their peers.
- In order to keep up to date on current advances in areas of scientific study, veterinary and animal scientists must read and understand primary resources and scientific articles.

- What are the common safety concerns in veterinary practice?
- Why is it important to understand scientific literature?
- What is the purpose and value of scientific literature in the study of veterinary science?
- How do I read a scientific article efficiently?

## Assessment Evidence

### Performance Tasks:

*Students will be able to...*

- Describe the study of veterinary and animal science
- Give examples of the different areas of veterinary and animal science
- Describe anatomical position and label body using anatomical terms
- Identify the levels of biological organization and explain their relationships
- Recognize common root words, prefixes, suffixes, and combining vowels
- Understand the function and uses of root words, prefixes, suffixes, and combining vowels
- Divide simple and compound words into their respective parts
- List three planes and identify body cut into planes
- Give examples of complementarity of structure and function
- Understand models are important in helping scientists understand living organisms and how they function
- Identify potential safety hazards encountered in veterinary practice
- Avoid injury while working in a veterinary practice
- Maintain a safe school and work environment
- Effectively read a scientific article
- Understand the purpose and value of a scientific article

### Other Evidence:

- Cornell Notes/Note Cards on unit reading materials
- Quiz: Veterinary Terminology
- Quiz: Classroom Safety
- Daily Assessments (informal)
  - Bell Work
  - Supplemental Reading
  - Whiteboard Activities
  - Writing Prompts
- Performance Assessments
  - Class Discussion
  - Online Activities
  - Research Journal
- Group Work
  - Case Study Project
  - Research

### Benchmarks:

Unit Assessment

Writing Assessment: Scientific Article Review

## Learning Activities:

### Introductory Veterinary Science:

- Lecture Topics:
  - Introduction to Veterinary Science
  - Veterinary Terminology
    - Building Blocks of Words
    - Directional Terms
    - Body Planes
    - Abbreviations
  - Laboratory Safety
    - Safety in the Classroom and MSDS
    - Safety Regulation and OSHA
    - Safety in Veterinary Practice
- Textbook:
  - Introduction to Veterinary Science, Chapter 20, pages 342 to 350
- Laboratory Activities:
  - Language of Veterinary Science Lab
  - Safety Lab
- Other Activities:
  - Veterinary Science Jeopardy
  - MSDS
- Videos:
  - Vets on Call (<https://communities.naae.org/community/instruction/vetscience>)
  -
- Case Studies:
  - A Day in the Life: Safety in Numbers; Textbook, page 143

### Introduction to Current Topics in Veterinary Science

- Lecture Topics:
  - Use of Literature in Science
  - How to Read a Scientific Article
  - Internet Searches (IMC Activity)
- Other Activities:
  - Modeling Current Event Assignments
  - Finding Articles of Interest
- Videos:
  - How to Read a Scientific Article
- Case Studies:
  - How I Figured It Out by Reading: The Berry Twins Story
- Common Reading Project Activities
- Current Event Assignment

## Resources:

- Textbook: Introduction to Veterinary Science by James Lawhead and Meecee Baker
- Common Reading Project: Zoo Story by Thomas French. The book was selected based on the quality of the writing and its insightful and detailed look at the complex life of a zoo and the interaction between animals and humans. This project will be implemented over several units during the first semester of this course.
- Current Event: The field of veterinary science, as with any science, changes rapidly with the ongoing development of new technology. Research institutions around the country continue to provide significant new discoveries to this field and promote changes and additional research in the many fields of medical research; staying current on these advances is important. In each unit, students will use scientific databases and perform Internet research on current events. Students will summarize what they have learned in various formats and share it with their peers. Topics will be current and unit dependent.
- Online Resources: PEER, Veterinary Science Lessons; Texas A&M University at <https://peer.tamu.edu/VBB/ScienceTeacherResources.asp>; Agricultural Education Curriculum; Georgia Agricultural Education at <http://www.gaaged.org/curriculum2/topic.aspx?TID=16>; Animal Physiology at <https://www.cteonline.org/curriculum/outline/animal-science-cte-online-model/gg5dxj>; Reading and Synthesizing Scientific Literature at <https://digscholarship.unco.edu/cgi/viewcontent.cgi?article=1004&context=infolit>
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops, Office 365 Suite Apps,

- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)

**Unit Learning Goal and Scale**  
*(Level 2.0 reflects a minimal level of proficiency)*

**Standard(s):**

Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

<b>4.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>• In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught</li> <li>• Discuss the implications of veterinary and animal science in the current health and welfare of various animal populations by citing examples of current discoveries or advancement in this field of study</li> <li>• Illustrate a current veterinary science activity, issue or event and highlight its importance in chemical, biological and/or pharmacological research, human health or animal welfare</li> </ul>
<b>3.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Identify past and current discoveries and developments in the veterinary science and animal science industries, such as agriculture, diagnostics, medical devices, pharmaceuticals and research and development</li> <li>• Discuss the importance of current research and scientific writing to the advancement of veterinary science</li> </ul>
<b>2.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Recognize or recall specific vocabulary, including: veterinary science, veterinary medicine, agriculture, food, wild animals, domestic, exotic, wildlife, production animals, bioethics</li> <li>• Explain veterinary and animal science and identify some of its current applications</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

## Unit Modifications for Special Population Students

<p><b>Advanced Learners</b></p>	<ul style="list-style-type: none"> <li>Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.</li> <li>Structure the learning around explaining or solving a medical or anatomy field related issue.</li> </ul>
<p><b>Struggling Learners</b></p>	<ul style="list-style-type: none"> <li>Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).</li> <li>Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.</li> <li>Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).</li> </ul>
<p><b>English Language Learners</b> (See <a href="http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf">http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf</a>)</p>	<ul style="list-style-type: none"> <li>Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).</li> </ul>
<p><b>Learners with an IEP</b></p>	<p>Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:</p> <ul style="list-style-type: none"> <li>Variation of time: adapting the time allotted for learning, task completion, or testing</li> <li>Variation of input: adapting the way instruction is delivered</li> <li>Variation of output: adapting how a student can respond to instruction</li> <li>Variation of size: adapting the number of items the student is expected to complete</li> <li>Modifying the content, process or product</li> </ul> <p>Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed <a href="#">here</a>. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here <a href="http://www.udlguidelines.cast.org">www.udlguidelines.cast.org</a></p>
<p><b>Learners with a 504</b></p>	<p>Refer to page four in the <a href="#">Parent and Educator Guide to Section 504</a> to assist in the development of appropriate plans.</p>



**Indicators:**

- **Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems**
  - **Physical Science: HS-PS2-3, HS-PS3-3**
- **Common Core State Standards Connections: ELA /Literacy**
  - **RST .11-12.7 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.**
  - **RST .11-12.8 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.**
  - **RST .11-12.9 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.**
- **Common Core State Standards Connections: Mathematics**
  - **MP.2 Reason abstractly and quantitatively.**
  - **MP.4 Model with mathematics.**

## Integration of 21<sup>st</sup> Century Skills

**Indicators:**

- **Science and Engineering Practices:**
  - Analyzing and interpreting data
  - Asking questions and defining problems
  - Constructing explanations and designing solutions
  - Developing and Using Models
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information
  - Planning and carrying out investigations
  - Using mathematics and computational thinking
- **Crosscutting Concepts**
  - Patterns
  - Cause and Effect
  - Scale, proportion, and quantity
  - Systems and system models
  - Energy and matter: Flows, cycle, and conservation
  - Structure and function
  - Stability
- **Connections to Engineering, Technology and Applications of Science**
  - New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

## Unit Title: Careers and Decision Making in Veterinary Science

### Unit Description:

Veterinary and animal science is the broad branch of biology that studies animals and the branch of medicine that is concerned with animal health and welfare. Veterinary and animal scientists make decisions regarding animal care, nutrition, welfare and animal companionship. In addition, these industries are involved with the business of breeding and producing domestic livestock species. Other fields of study include exotic animals, environmental restoration and regulation, disease transmission and sustainable food and agricultural practices. This unit provides students information on the many possible applications and career tracks available in the veterinary and animal science industries.

The basic concepts of this unit will be initially introduced with entry level materials and revisited in subsequent units as appropriate.

**Unit Duration:** 1 Week Introduction and Ongoing

### Desired Results

#### Standard(s):

- **Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants (HS-ETS1-1)**

#### Indicators:

##### ETS1.A: Defining and Delimiting Engineering Problems

Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.

Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

#### Understandings:

*Students will understand that ...*

- Veterinary science is the branch of medicine concerned with the health of animals and the treatment of injuries or diseases that affect them.
- Animal science also called animal bioscience is the study of the biology of animals that are under the control of humans.
- Animal scientists work in a variety of settings, including corporate labs, government agencies/labs, and academic (college and university) research facilities.
- Agencies that regulate the development and approval of animal science products and research include the FDA the USDA and the EPA.
- Many jobs are available in the veterinary and animal science fields and can be found in the following areas: research and development, manufacturing and production, clinical research, quality control, information systems, marketing and sales, regulatory affairs, and administration/legal affairs.

#### Essential Questions:

- What are the major categories of employment position within the veterinary and animal science industries?
- What are the educational requirements for the primary positions the veterinary and animal science industries?
- What skills would be necessary for the various positions?
- What are the governmental agencies that regulate the veterinary and animal science industries?
- How are careers in the academic, government and private sectors similar?
- How are careers in the academic, government and private sector different?

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• Veterinary and animal science careers usually require an education beyond a high school degree, including; certificate programs, 2-year and 4-year degree programs, graduate and post-baccalaureate study.</li></ul> |  |
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## Assessment Evidence

### Performance Tasks:

*Students will be able to ...*

- Explore different careers and career pathways in the animal science and agricultural industries
- Identify various career pathways for veterinary professionals in clinical, academic, and public health settings
- State examples of careers and job responsibilities associated with veterinary and animal science
- Recognize and/or define the following terminology related to careers and career pathways in veterinary and animal science; pure science, applied science, private practitioner, veterinary specialist, intern, diplomate, veterinary technician, treatment protocol, management team, NIH, CDC, R&D (research and development), FDA, USDA, inspector
- Describe the educational requirements and responsibilities for various positions within the veterinary and animal science industries
- Compare and contrast careers within academic, government, and private sectors
- Demonstrate understanding of the career development planning process and the process of life-long learning
- Create a presentation on a specific job in the field of veterinary science and its contribution to solving societal issues and problems

### Other Evidence:

- Cornell Notes/Note Cards on unit reading materials
- Daily Assessments (informal)
  - Bell Work
  - Supplemental Reading
  - Whiteboard Activities
  - Writing Prompts
- Performance Assessments
  - Class Discussion
  - Online Activities
  - Research Journal
- Group Work
  - Career Project
  - Research

### Benchmarks:

Unit Assessment

Employment Portfolio

Career Research Project Presentation

## Learning Plan

### Learning Activities:

- Lecture Topics:
  - Skills and Careers in Veterinary Science
  - Decision Making in Veterinary Science
- Textbook:
  - Introduction to Veterinary Science, Chapter 20, pages 342 to 350
  - Introduction to Veterinary Science, Chapter 21, pages 351 to 362
- Laboratory Exercises:
- Other Activities:
  - Class Discussion: Veterinary Science and Animal Science Careers
  - Veterinary Careers Activities
    - Career Assessment Activity
    - Career Trek (classroom game activity)
  - Veterinary and Animal Science Career Research E-Project
  - Find That Job!
    - Online Activity: Finding 'Hot Jobs'
    - Job Skills 101; Interviews, Resumes and More
- Case Study: A Day in the Life, Textbook pg. 352
- Ongoing Activities:
  - Review 'Veterinary Science Careers' sidebars that accompany each textbook chapter

**Resources:**

- Textbook: Biotechnology; Science for the New Millennium by Elyn Daugherty Chapter1
- Online Resources: Animal Science at <https://www.cteonline.org/curriculum/outline/animal-science-cte-online-model/qq5dxj>; Veterinary Science at <http://www.gaaged.org/curriculum2/topic.aspx?TID=16>; Agricultural Literacy Project at <https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=64>; Animal Smart Careers at <http://animalsmart.org/animal-science/careers>.
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops,
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information) in conjunction with, but not limited to the following topics: veterinary science, animal science and careers in veterinary and animal science.

**Unit Learning Goal and Scale**  
(Level 2.0 reflects a minimal level of proficiency)

**Standard(s):**

Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.

<b>4.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught</li> <li>Design a specific pathway within the veterinary and animal science industries, based on what skills, education and areas of research is needed to solve a specified major global challenge</li> </ul>
<b>3.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants</li> <li>Identify several veterinary and animal science industry careers that could address a specific global challenge or societal need</li> </ul>
<b>2.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>Recognize or recall specific vocabulary (for example, constraint, criteria, engineering, global challenge, measurable, need qualitative, quantitative, requirement, risk mitigation, societal, solution)</li> <li>Identify a major global challenge that is addressed by the veterinary and animal science industry</li> <li>Summarize societal needs and wants related to the challenge or problem</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

**Standard(s):**

Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

<b>4.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught</li> <li>Develop a portfolio documenting education, experiences, and acquired skills for specific careers in the veterinary and animal science industries</li> <li>Demonstrate understanding of the career development planning process and the process of life-long learning</li> </ul>
<b>3.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>Compare and contrast careers within veterinary and animal science industries and address how they work together to solve global issues</li> <li>Research and create a presentation on a specific career in the veterinary or animal science industry</li> </ul>
<b>2.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>Recognize or recall specific vocabulary (for example, academic sector, associate degree, bachelor's degree, veterinary technician, veterinary assistant, veterinary specialist, diagnostics, government, journal, lab assistant, PhD, private sector, professional behavior, quality control, regulatory affairs, research associate, research and development, private practice, mixed animal practice)</li> <li>Describe the educational requirements and responsibilities for various positions within the veterinary and animal science industry</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

## Unit Modifications for Special Population Students

<p><b>Advanced Learners</b></p>	<ul style="list-style-type: none"> <li>Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.</li> <li>Structure the learning around explaining or solving a medical or anatomy field related issue.</li> </ul>
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<p><b>English Language Learners</b> (See <a href="http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf">http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf</a>)</p>	<ul style="list-style-type: none"> <li>Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).</li> </ul>
<p><b>Learners with an IEP</b></p>	<p>Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:</p> <ul style="list-style-type: none"> <li>Variation of time: adapting the time allotted for learning, task completion, or testing</li> <li>Variation of input: adapting the way instruction is delivered</li> <li>Variation of output: adapting how a student can respond to instruction</li> <li>Variation of size: adapting the number of items the student is expected to complete</li> <li>Modifying the content, process or product</li> </ul> <p>Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed <a href="#">here</a>. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here <a href="http://www.udlguidelines.cast.org">www.udlguidelines.cast.org</a></p>
<p><b>Learners with a 504</b></p>	<p>Refer to page four in the <a href="#">Parent and Educator Guide to Section 504</a> to assist in the development of appropriate plans.</p>

## Interdisciplinary Connections

**Indicators:**

- **Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems**
  - Physical Science: HS-PS2-3, HS-PS3-3
- **Common Core State Standards Connections: ELA /Literacy**
  - RST .11-12.7 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.
  - RST .11-12.8 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.
  - RST .11-12.9 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.
- **Common Core State Standards Connections: Mathematics**
  - MP.2 Reason abstractly and quantitatively.
  - MP.4 Model with mathematics.

## Integration of 21<sup>st</sup> Century Skills

**Indicators:**

- **Science and Engineering Practices:**
  - Analyzing and interpreting data
  - Asking questions and defining problems
  - Constructing explanations and designing solutions
  - Developing and Using Models
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information
  - Planning and carrying out investigations
  - Using mathematics and computational thinking
- **Crosscutting Concepts**
  - Patterns
  - Cause and Effect
  - Scale, proportion, and quantity
  - Systems and system models
  - Energy and matter: Flows, cycle, and conservation
  - Structure and function
  - Stability
- **Connections to Engineering, Technology and Applications of Science**
  - New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.



## Unit Title: Basic Cell Biology

### Unit Description:

The cell is the basic structure of animal life. However, the cell contains other structures and molecules. Cells conduct many functions and are also able to reproduce. Animals not only have millions of cells that comprise the body but also many different cell types. The combination of these cell types makes an animal function. This unit will review and discuss the structure of cells and how they work.

**Unit Duration:** 3 weeks

### Desired Results

#### Standard(s):

- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (HS-LS1-2)
- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells (HS-LS1-1)
- Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. (HS-LS1-4)

#### Indicators:

##### LS1.A: Structure and Function

Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

##### LS1.A: Structure and Function

Systems of specialized cells within organisms help them perform the essential functions of life. All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells

##### LS1.B: Growth and Development of Organisms

In multicellular organisms, individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.

#### Understandings:

*Students will understand that...*

- Systems of specialized cells within organisms help them perform the essential functions of life.
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and

#### Essential Questions:

- What is a cell?
- How do organelles contribute to cellular function?
- What is the role of the membrane?
- What are the different types of animal cells and what are their functions?
- What are enzymes?
- How do enzymes impact chemical reactions?
- What are chemical reactions and how are they important to cells?
- What are nucleic acids and proteins?
- What is the relationship between nucleic acids and proteins?
- What is transcription?
- What is translation?
- What are chromosomes?

information flows— within and between systems at different scales.

- Feedback mechanisms maintain a living system's internal conditions within certain limits, and they mediate behaviors, allowing the system to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.
- Feedback (negative or positive) can stabilize or destabilize a system.
- Models (e.g., physical, mathematical, and computer models) can be used to simulate systems and interactions.

- What is mitosis?
- What is meiosis?
- How do cells and organisms reproduce?
- What is genetic variation?
- What is inheritance?
- What are the different inheritance patterns?

## Assessment Evidence

### Performance Tasks:

- Explain the molecular makeup of cells
- Identify the basic structures of the cell and their corresponding functions
- Review the basic function of the cell
- Describe the process of protein synthesis
- Discuss mitosis and its clinical significance in diseases such as cancer
- Detail meiosis in mammalian reproduction
- Connect cellular parts and function to clinical veterinary practice

### Other Evidence:

- Cornell Notes/Note Cards on unit reading materials
- Daily Assessments (informal)
  - Bell Work
  - Supplemental Reading
  - Whiteboard Activities
  - Writing Prompts
- Quiz: Biochemistry Basics
- Quiz: Macromolecules
- Quiz: Membrane Transport
- Quiz: DNA, RNA, Protein Basics
- Laboratory Activities:
  - Macromolecules
  - Diffusion
  - Replication and Inheritance
- Performance Assessments
  - Class Discussion
  - Online Activities
  - OneNote Class Notebook
- Group Work
  - Career Project
  - Research

### Benchmarks:

Unit Test: Basic Cell Biology

Laboratory Report/Journal: Macromolecules and Diffusion Labs

Writing Assessment: Animals and Selective Breeding

## **Learning Activities:**

### **Basic Cell Biology:**

- Lecture Topics:
  - Cell Makeup
  - Cell Structure
  - Cell Function
  - DNA, RNA and Protein Synthesis
  - Mitosis and Cancer
  - Mammalian Reproduction
- Textbook:
  - Introduction to Veterinary Science, Chapter 1, pages 2 to 16
  - Campbell Biology; Chapters 2, 3, 4, 5, 8 and 10
- Other Activities:
  - Macromolecule Lab
  - Diffusion Lab
- Videos:
  - Cell Organelles
  - Mitosis vs. Meiosis
  - Chromosomal Basis of Inheritance
  - DNA to RNA to Protein
- Case Studies:
  - A Day in the Life
  - Osmosis: Life or Death
  - Patches: The dog, his cancer, his skull and a 3D printer.
- Common Reading Project Activities
- Current Event Assignment

### **Resources:**

- Textbook: Introduction to Veterinary Science by James Lawhead and Meecee Baker and Campbell Biology: Concepts and Connections; Pearson, 8<sup>th</sup> Edition
- Common Reading Project: Zoo Story by Thomas French. The book was selected based on the quality of the writing and its insightful and detailed look at the complex life of a zoo and the interaction between animals and humans. This project will be implemented over several units during the first semester of this course.
- Current Event: The field of veterinary is changing rapidly. Everyday significant new discoveries are bringing new products to market; staying current on these advances is important. In each unit, students will use scientific databases and perform Internet research on current events. Students will summarize what they have learned in various formats and share it with their peers. Topics will be current and unit dependent.
- Online Resources: PEER, Veterinary Science Lessons; Texas A&M University at <https://peer.tamu.edu/VBB/ScienceTeacherResources.asp>,
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops,
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information) in conjunction with, but not limited to the following topics: cell biology, cell structure and function, protein synthesis, mitosis, meiosis, replication, selective breeding, cancer and cancer research

Unit Learning Goal and Scale  
(Level 2.0 reflects a minimal level of proficiency)

Standard(s): Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.	
4.0	Students will be able to: <ul style="list-style-type: none"> <li>Determine the result when this structural organization is interrupted by various conditions</li> </ul>
3.0	Students will be able to: <ul style="list-style-type: none"> <li>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms</li> </ul>
2.0	Students will be able to: <ul style="list-style-type: none"> <li>Recognize and recall vocabulary: function, hierarchical organization, react, interact, multicellular, organelle, organisms, regulate, tissue</li> <li>Describe how various systems provide specific functions within multicellular organisms</li> </ul>
1.0	With help, partial success at level 2.0 content and level 3.0 content:
0.0	Even with help, no success

Standard(s): Systems of specialized cells within organisms help them perform the essential functions of life.	
4.0	Students will be able to: <ul style="list-style-type: none"> <li>Identify differences and similarities between cells based on their essential functions</li> </ul>
3.0	Students will be able to: <ul style="list-style-type: none"> <li>Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells</li> </ul>
2.0	Students will be able to: <ul style="list-style-type: none"> <li>Recognize and recall vocabulary: lipid, hydrophobic, hydrophilic, glucose, glycogen, enzymes, exocytosis, metabolism, anabolism, catabolism, homeostasis, diffusion, osmosis, active transport, endocytosis</li> <li>Describe the relationship between organelles, cells, tissues, and systems</li> </ul>
1.0	With help, partial success at level 2.0 content and level 3.0 content:
0.0	Even with help, no success

## Unit Modifications for Special Population Students

<p><b>Advanced Learners</b></p>	<ul style="list-style-type: none"> <li>Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.</li> <li>Structure the learning around explaining or solving a medical or anatomy field related issue.</li> </ul>
<p><b>Struggling Learners</b></p>	<ul style="list-style-type: none"> <li>Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).</li> <li>Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.</li> <li>Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).</li> </ul>
<p><b>English Language Learners</b> (See <a href="http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf">http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf</a>)</p>	<ul style="list-style-type: none"> <li>Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).</li> </ul>
<p>Learners with an IEP</p>	<p>Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:</p> <ul style="list-style-type: none"> <li>Variation of time: adapting the time allotted for learning, task completion, or testing</li> <li>Variation of input: adapting the way instruction is delivered</li> <li>Variation of output: adapting how a student can respond to instruction</li> <li>Variation of size: adapting the number of items the student is expected to complete</li> <li>Modifying the content, process or product</li> </ul> <p>Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed <a href="#">here</a>. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here <a href="http://www.udlguidelines.cast.org">www.udlguidelines.cast.org</a></p>
<p><b>Learners with a 504</b></p>	<p>Refer to page four in the <a href="#">Parent and Educator Guide to Section 504</a> to assist in the development of appropriate plans.</p>

**Indicators:**

- **Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems**
  - Physical Science: HS-PS2-3, HS-PS3-3
- **Common Core State Standards Connections: ELA /Literacy**
  - RST .11-12.7 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.
  - RST .11-12.8 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.
  - RST .11-12.9 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.
- **Common Core State Standards Connections: Mathematics**
  - MP.2 Reason abstractly and quantitatively.
  - MP.4 Model with mathematics.

## Integration of 21<sup>st</sup> Century Skills

**Indicators:**

- **Science and Engineering Practices:**
  - Constructing explanations and designing solutions
  - Asking questions and defining problems
  - Developing and using models
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information
  - Planning and carrying out investigations
  - Analyzing and Interpreting Data
- **Crosscutting Concepts**
  - Structure and Function
  - Patterns
  - Cause and Effect
  - Scale, Proportion, and Quantity
  - Systems and system models
  - Stability
- **Connections to Engineering, Technology and Applications of Science**
  - New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.
  - Technological advances have influenced the progress of science and science has influenced advances in technology.
  - Science and engineering are influenced by society and society is influenced by science and engineering.

## Unit Title: Comparative Anatomy and Physiology

### Unit Description:

Comparative anatomy and physiology is the study of the similarities and differences in the anatomy of different species. This unit comprises the bulk of the veterinary science curriculum. Basic anatomy and physiology will be introduced in a survey format followed by comparison of animal species in each organ system. Organ systems to be reviewed include: musculoskeletal, circulatory, respiratory, renal, digestive, reproductive, nervous, endocrine and immune. Basic tissue types and physiology will also be reviewed.

**Unit Duration:** 20 weeks

### Desired Results

#### Standard(s):

- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)
- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)
- Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)

#### Indicators:

##### LS1.A: Structure and Function

Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

##### LS1.A: Structure and Function

Systems of specialized cells within organisms help them perform the essential functions of life. All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells

##### LS1.A: Structure and Function

Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

#### Understandings:

*Students will understand that...*

- Any organism, including animals, can be organized from the simplest structure to the most complex; that is, from atom, to molecule, to cell and so on.
- Homeostasis is an organism's ability to maintain a stable internal environment.
- Pathologies of cells and tissues are imbalances in homeostasis that result in disease or death.
- Histology is the classification of tissues in the human body
- Tissues are composed of and identified by the cells that make them.

#### Essential Questions:

- What is the basic structure of living things?
- How do organisms maintain the chemical and physical balance necessary to live?
- What happens when there is an imbalance in the organism? What is the purpose of tissue?
- What are tissues made of?
- How are tissues of the body classified?
- What is the role of the integumentary system?
- How is skin structured?
- What is the purpose of skin?
- How does skin function?
- What are the major elements of the skeletal system?
- What are the major functions of the skeletal system?
- How are bones classified?

- The physiology of an organism is based on chemistry and physics that occur at the cellular or tissue level.
- The major function of skin is protection but also has far reaching effects on the whole body.
- The skeletal system has five primary functions.
- Bones are classified according to shape, structure and feature surface markings.
- Bone is composed of matrix and several types of cells.
- Compact bone contains parallel osteons and spongy bone contains trabeculae.
- Bone growth and development depend on balance between bone formation and bone reabsorption.
- Calcium plays a critical role in bone physiology.
- A fracture is a crack or break in a bone.
- Joints are categorized according to their range of motion or anatomical organization.
- Blood has several important functions and unique physical characteristics.
- Plasma, the fluid portion of blood, contains significant quantities of plasma proteins.
- Red blood cells contain hemoglobin that can be recycled in the body.
- The various types of white blood cells contribute to the body's defenses.
- Platelets function in the clotting process.
- The heart is a four-chambered organ that pumps oxygen-poor blood to the lungs and oxygen-rich blood to the rest of the body.
- The conducting system distributes electrical impulses through the heart, and an electrocardiogram records the associated electrical events.
- Events during a complete heartbeat constitute a cardiac cycle.
- Arteries, arterioles, capillaries, venules, and veins differ in size, structure, and functional properties.
- The respiratory system, organized into an upper respiratory and a lower respiratory system, has several basic functions.
- Located outside the thoracic cavity, the upper respiratory system consists of the nose, nasal cavity, paranasal sinuses, and pharynx.
- Enclosed by a pleural membrane, the lungs are paired organs containing alveoli, which permit gaseous exchange.
- External respiration and internal respiration allow gaseous exchange within the body.
- Pulmonary ventilation involves pressure changes, muscle movement, and respiratory rates and volumes.
- Most oxygen is transported bound to hemoglobin and carbon dioxide is transported in three ways; as carbonic acid, bound to hemoglobin, or dissolved in plasma.
- The respiratory system provides oxygen to, and eliminates carbon dioxide from, other organ systems.

- What are the major cells of bone?
- What is the difference between compact and spongy bone?
- How does bone form?
- How does bone tissue grow or enlarge?
- What role does calcium play in bone physiology?
- What is a fracture?
- What is the axial and appendicular skeleton?
- What are the bones that make up each?
- What are the major classifications of joints?
- What are the functions and characteristics of blood?
- What is blood and what is it composed of?
- What are red blood cells and how do they function?
- What are the functions and components of white blood cells?
- What are the functions of platelets?
- What is the anatomy of the heart?
- How does the heart pump oxygen-rich and oxygen-poor blood throughout the body?
- What is the electrical conducting system of the heart?
- What is the cardiac cycle?
- What the relative sizes, structure and functional properties of arteries, arterioles, venules and veins?
- How is the cardiovascular system regulated?
- How is the respiratory system organized?
- What are the functions of the respiratory system?
- What is the respiratory mucosa?
- What are the anatomical components of the upper respiratory system?
- What are the anatomical components of the lower respiratory system?
- How is air conveyed to and from the lungs?
- How is gaseous exchange to and from the lungs achieved?
- How is oxygen transported in the body?
- How is carbon dioxide transported in the body?
- How is the respiratory system integrated with other organ systems?
- What are the anatomical components of the renal system?
- What is the primary function of the renal system?
- How is urine formed in the kidneys?
- What is the clinical significance of a urinalysis?
- What are the organs of the digestive system and how do they function?
- What are the accessory organs of the digestive system and what role do they play in the process of digestion?
- What is the function of the mesentery and where is it found?
- What is the components and function of the oral cavity?
- What is the function and physiology of the stomach?
- What is the function and physiology of the small intestine?
- What is the function and physiology of the large intestine?
- What is the process of mechanical and chemical digestion?



- The renal system, including the kidneys and bladder, allow for waste products of body functions to be eliminated in the form of urine.
- Evaluation of urine can provide valuable insight into the status of the renal system and the total health of the animal.
- The digestive system, consisting of the digestive tract and accessory organs, has overlapping food utilization functions.
- The oral cavity contains the tongue, salivary glands, and teeth, each with specific functions.
- The stomach is a J-shaped organ that receives the bolus from the esophagus and aids in chemical and mechanical digestion.
- The small intestine digests and absorbs nutrients, and associated glandular organs assist with the digestive process.
- The large intestine is divided into three parts with regional specialization.
- Digestion is the mechanical and chemical alteration of food that allows the absorption and use of nutrients.
- The basic process of digestion is the same for all animals, however, a variety of dentition and digestive tracts exists among differing species.
- The male reproductive system and the associated hormones allow production and delivery of sperm cells.
- The female reproductive system and the associated hormones aid in the production of eggs.
- The joining of the egg and sperm results in pregnancy and hopefully successful parturition.
- The nervous system has anatomical and functional divisions.
- Neurons are nerve cells specialized for intercellular communication.
- The CNS and PNS neuroglia support and protect neurons.
- An action potential is an electrical event.
- Neurotransmitters and neuromodulators have various functions.
- Individual neurons process information by integrating excitatory and inhibitory stimuli.
- The brain and spinal cord make up the central nervous system.
- The cranial nerves and spinal nerves constitute the peripheral nervous system.
- Reflexes are rapid, automatic responses to stimuli.
- Sensory receptors connect our internal and external environments with the nervous system.
- Homeostasis is preserved through intercellular communication.
- The endocrine system regulates physiological processes through the binding of hormones to receptors.
- Foreign molecules that stimulate an immune response are called antigens.
- Immunity to antigens can be passive or active.

- How are nutrients absorbed and utilized in the body?
- What are the anatomical divisions of the nervous system and how does each of these divisions function?
- What are the specialized cells of the nervous system?
- What is the CNS? What are the functions and components of this anatomical division of the nervous system?
- What is the PNS? What are the functions and components of this anatomical division of the nervous system?
- What is an action potential?
- How does axon diameter and myelin affect action potential propagation speed?
- What communication occurs at a synapse?
- What are neurotransmitters and neuromodulators?
- What is the functional anatomy of the brain and spinal cord?
- What is a reflex arc?
- What is the functional anatomy of the brain?
- What are the 12 pairs of cranial nerves?
- What is the difference between the sympathetic and parasympathetic nervous systems?
- What is an antigen?
- What type of molecules are antigens?
- What is the difference between passive and active immunity?
- What is the significance of primary and secondary immune response?
- How is animal health linked to immune system response?

- The primary immune response occurs in the first days after invasion of the antigen, whereas, the secondary immune response prevents a second episode of the same disease.
- The immune system response is strengthened by good overall animal health.

### Assessment Evidence

#### Performance Tasks:

*Students will be able to...*

- Describe anatomical position and label animal models using anatomical terms
- Give examples of complementarity of structure and function
- Describe the elements of a homeostatic control system
- Define tissue, describe microscopic anatomy of four types, locate and describe function of four types
- Differentiate between types of epithelial tissue and connective tissue; describe, locate and give functions of each
- Recognize three types of muscle tissue
- Recognize nervous tissue
- Describe the functions of the musculoskeletal system
- Detail the structure of bone
- Name joint types and their accompanying roles in movement
- List the two major sections of the skeleton, name the corresponding bones, and compare species differentiation
- Explain how bone grows and remodels
- Relate bone and muscle groups to movement
- Connect academic material pertaining to musculoskeletal system to clinical practice
- List blood components and explain the functions of blood
- Identify the basic structures of the mammalian heart
- Trace the flow of blood through the heart and body while detailing the parts of blood vessels and their structural significance
- Use knowledge of heart function and control to explain the clinical significance of the electrocardiogram; heart sounds, including heart murmurs; and blood pressure
- Identify the basic components of the respiratory tract
- List and discuss the function and control of breathing
- Identify and name the basic structures in the renal system
- Name and explain the functions of the renal system
- Identify structures within the kidney and detail the formation and regulation of urine
- Evaluate urine and blood as a measure of the health of the animal and the urinary system

#### Other Evidence:

- Cornell Notes/Note Cards on unit reading materials
- Daily Assessments (informal)
  - Bell Work
  - Supplemental Reading
  - Whiteboard Activities
  - Writing Prompts
- Quiz: Anatomical Landmarks
- Quiz: Skeleton Labeling
- Quiz: Heart Labeling Diagram
- Quiz: Respiratory Tract Labeling Diagram
- Quiz: Renal System Labeling Diagram
- Quiz: Animal Teeth Comparison
- Quiz: Hormones of the Reproductive System
- Quiz: Nervous system Labeling Diagram
- Quiz: Cranial Nerves
- Quiz: Endocrine System Labeling Diagram
- Quiz: Immune System Cells
- Laboratory Activities:
  - Microscope Basics and Tissue Identification
  - Animal Skeleton Comparison
  - Blood and Circulation
  - Spirometry
  - Urinalysis
  - Reproduction
  - Brain Function
  - Animal Behavior
- Performance Assessments
  - Class Discussion
  - Online Activities
  - Research Journal
- Group Work
  - Skeleton Comparison Project
  - Digestive Tracts Across Species Project
  - Genetics and Breeding Project
  - Research

- Identify the basic structures of the digestive system
- Explain digestion including: exocrine secretions and function, digestive tract function, and digestive tract absorption
- Compare and contrast the specialization of dentition and digestive tracts found in various domestic species of animals
- Define symbiosis and describe its significance in the ruminant
- Identify male anatomy and relate associated hormonal functions
- Discuss female anatomy and the estrous cycle
- List the steps in establishing pregnancy and identify the stages of parturition
- Describe the neuron, the nerve impulse, and the synapse, and explain the components of a reflex arc
- Identify the major structures of the brain and name associated neurons
- Discuss the anatomy and function of the spinal cord
- Compare and contrast the functions of the sensory somatic system to the autonomic nervous system and differentiate between the two branches of the autonomic system
- Describe the endocrine system
- Name the major endocrine glands, list the hormones secreted by each gland, and describe the functions of these hormones
- Define the term antigen and explain its significance in immunity
- Distinguish between passive and active immunity
- Differentiate between humoral and cellular immunity and their relationships in immunity
- Explain primary and secondary immune responses

**Benchmarks:**

Individual System Assessments: Musculoskeletal, Circulatory, Respiratory, Renal, Digestive, Reproductive, Nervous/Endocrine, Immune

Writing Assessment: Flow of Blood through Mammalian Heart, Oxygen Transport through Mammalian System, Reflex Arc

Laboratory Practical: Tissue Identification

Project: Skeleton Comparison Project, Comparative Physiology Final Project

## Learning Activities:

### Comparative Anatomy and Physiology:

- Lecture Topics:
  - Tissue Types and Functions
  - Musculoskeletal System
  - Circulatory System
  - Respiratory System
  - Renal System
  - Digestive System
  - Reproductive System
  - Nervous and Endocrine System
  - Immune System
- Textbook:
  - Introduction to Veterinary Science, Chapter 2 to 11, pages 18 -200
  - As a reference; Fundamentals of Anatomy and Physiology 11<sup>th</sup> ed. by Martini, Nath and Bartholomew
- Laboratory Activities:
  - Microscope Basics
  - Tissue Identification Lab
  - Bone Lab
  - Blood and Circulation Lab
  - Spirometry Lab
  - Urinalysis Lab
  - Ruminating on the Digestive System Lab
  - Brain Function Lab
  - Animal Behavior Lab
- Other Activities:
  - Structure and Function Activity
  - Medical Imaging
  - EKG Interpretation Activity
  - Symbiosis and Ruminants
  - Genetics and Breeding Project
  - Adaption Island Activity
  - Comparative Anatomy Final Project
- Videos:
  - Veterinary Presentation on Orthopedics
  - Veterinary Presentation on Arthritis
  - Veterinary Presentation of the Heart
  - Veterinary Presentation on Nutrition and Obesity
  - Veterinary Presentation on Dental Health
  - Veterinary Presentation on Neutering
  - Veterinary Presentation on Behavior
- Case Studies:
  - A Day in the Life; Tissue Diseases, Textbook, page 19
  - A Day in the Life: Radiographs and Orthopedic Surgery; Textbook, page 34
  - A Day in the Life: Sonic the Hedgehog; Textbook, page 54
  - A Day in the Life: Feline Respiratory Emergency, Textbook, page 79
  - A Day in the Life: Bladder Stones; Textbook, page 90 to 91
  - A Day in the Life: Rocks, Socks and Underwear; Textbook, page 108
  - A Day in the Life: Cow Reproduction; Textbook, page 131 to 132
  - A Day in the Life: Seizures; Textbook, page 152
  - A Day in the Life: Between a Rock and a Hard Place; Textbook, page 170
  - A Day in the Life: Saving Lives and Stomping Out Disease; Textbook, page 185
- Common Reading Project Activities
- Current Event Assignment

**Resources:**

- Textbook: Introduction to Veterinary Science by James Lawhead and Meecee Baker and Fundamentals of Anatomy and Physiology 11<sup>th</sup> ed. by Martini, Nath and Bartholomew
- Common Reading Project: Zoo Story by Thomas French. The book was selected based on the quality of the writing and its insightful and detailed look at the complex life of a zoo and the interaction between animals and humans. This project will be implemented over several units during the first semester of this course.
- Current Event: The field of veterinary is changing rapidly. Everyday significant new discoveries are bringing new products to market; staying current on these advances is important. In each unit, students will use scientific databases and perform Internet research on current events. Students will summarize what they have learned in various formats and share it with their peers. Topics will be current and unit dependent.
- Online Resources: Veterinary and Science Partnership Lessons at <https://peer.tamu.edu/VBB/ScienceTeacherResources.asp>; Veterinary Science at <http://www.gaaged.org/curriculum2/topic.aspx?TID=16>, Animal Science at <https://www.cteonline.org/curriculum/outline/animal-science-model/qq5dxj>, Ruminating on the Digestive System at <https://www.calacademy.org/educators/lesson-plans/ruminating-on-the-digestive-system>, Animal Physiology at <https://www.cteonline.org/curriculum/outline/animal-science-cte-online-model/qq5dxj>,
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops,
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)
- Skeleton and Bone specimens and artifacts
- Various classroom models of the muscles, heart and ECG tracings, lungs and alveoli, the digestive system, the reproductive system and pregnancy, basic neurons, brain/brain structures, eye and ear
- Vernier: Experiment 12 Analyzing the Heart with EKG; Experiment 7 Blood Pressure as a Vital Sign; Experiment 19 Lung Volumes and Capacities, Neuromuscular Reflex Lab,

**Unit Learning Goal and Scale**  
(Level 2.0 reflects a minimal level of proficiency)

**Standard(s):**

Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

<b>4.0</b>	<p><b>Students will be able to:</b> In addition to 3.0 performance:</p> <ul style="list-style-type: none"> <li>Infer how changes in a negative feedback loop can cause diseases in animal models (examples: diabetes, arthritis)</li> </ul>
<b>3.0</b>	<p><b>Students will be able to:</b> In addition to 2.0 performance:</p> <ul style="list-style-type: none"> <li>Describe negative feedback loops and identify when the body uses them</li> <li>Describe positive feedback loops and identify when the body uses them</li> </ul>
<b>2.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>Recall specific vocabulary: anatomy, appendicular, axial, cardiovascular, digestion, excretion, homeostasis, metabolism, negative feedback, organelle, organism, pericardial, peritoneal, physiology, pleural, reproduction, respiration, thoracic, visceral</li> <li>Recognize that the body has control systems</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

**Standard(s):**

Systems of specialized cells within organisms help them perform the essential functions of life.

<b>4.0</b>	<p><b>Students will be able to:</b> In addition to 3.0 performance:</p> <ul style="list-style-type: none"> <li>Associate specific structures which dictate the function of a tissue</li> </ul>
<b>3.0</b>	<p><b>Students will be able to:</b> In addition to 2.0 performance:</p> <ul style="list-style-type: none"> <li>Differentiate between: types of epithelial tissue and connective tissue</li> <li>Classify and Identify: microscopic anatomy of epithelial and connective tissue</li> <li>Classify and Identify: location and functions of epithelial and connective tissue</li> <li>Examine the similarity and differences between epithelial and connective tissue</li> </ul>
<b>2.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>Recall specific vocabulary including: adipose tissue, cartilage, chondrocyte, connective tissue, epithelial tissue, fibroblast, fibrous tissue, macrophage, muscle tissue, nervous tissue, neuroglia, neuron, osteocyte, osteon.</li> <li>Realize that the body is made of different tissues</li> <li>Describe the major functions of each type of connective tissue</li> <li>Describe the major functions of each type of epithelial tissue</li> <li>Describe the major functions of each type of muscle tissue</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

<b>Standard(s):</b> Systems of specialized cells within organisms help them perform the essential functions of life.	
<b>4.0</b>	<b>Students will be able to:</b> In addition to 3.0 performance: <ul style="list-style-type: none"> <li>• Model how the microscopic structure of bone allows it to resist both torque and pressure stresses</li> </ul>
<b>3.0</b>	<b>Students will be able to:</b> In addition to 2.0 performance: <ul style="list-style-type: none"> <li>• Explain the micro and macroscopic structure on bone tissue</li> <li>• Explain the steps of bone remodeling</li> <li>• Explain the steps of bone healing</li> </ul>
<b>2.0</b>	<b>Students will be able to:</b> <ul style="list-style-type: none"> <li>• Recall specific vocabulary including: sutural bones, irregular bones, short bones, flat bones, long bones, sesamoid bones, bone markings, diaphysis, epiphysis, metaphysis, compact bone, medullary cavity, spongy bone, cortex, hydroxyapatite, osteocytes, lamellae, canaliculi, osteoblasts, ossification, osteogenesis, osteoid osteoprogenitor, osteoclasts, osteolysis, osteon, central canal, perforating canals, trabeculae, red bone marrow, yellow bone marrow, periosteum, endosteum, primary ossification center, secondary ossification center, articular cartilage, epiphyseal cartilage, epiphyseal line, ossification center, spicules, remodeling,</li> <li>• Recognize that bone is constructed of both organic and inorganic materials</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

<b>Standard(s):</b> Systems of specialized cells within organisms help them perform the essential functions of life.	
<b>4.0</b>	<b>Students will be able to:</b> In addition to 3.0 performance: <ul style="list-style-type: none"> <li>• Translate specific electrical events of the heart cycle from an ECG, relating them to specific anatomical features of the heart tissue that allow for the continual pumping of blood throughout the body</li> </ul>
<b>3.0</b>	<b>Students will be able to:</b> In addition to 2.0 performance: <ul style="list-style-type: none"> <li>• Discuss the functions of the major components of the heart</li> <li>• Trace the pathway of the blood through the heart</li> <li>• Describe coronary circulation and identify the vessels involved</li> <li>• Compare the pulmonary and systemic circuits of the cardiovascular system</li> </ul>
<b>2.0</b>	<b>Students will be able to:</b> <ul style="list-style-type: none"> <li>• Recall specific vocabulary including: arteriole, atrium, cardiac conduction system, cardiac cycle, cardiac output, diastole, electrocardiogram, endocardium, epicardium, functional syncytium, myocardium, pacemaker, pericardium, peripheral resistance, pulmonary circuit, sphygmomanometer, systemic circuit, systole, vasoconstriction, vasodilation, ventricle, venule, viscosity</li> <li>• Name the organs of the cardiovascular system and discuss their functions</li> <li>• Name and describe the locations of the major parts of the heart</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

<b>Standard(s):</b> Systems of specialized cells within organisms help them perform the essential functions of life.	
<b>4.0</b>	<b>Students will be able to:</b> In addition to 3.0 performance: <ul style="list-style-type: none"> <li>• Create a map or diagram explaining how oxygen is carried to the tissues of the body and how cellular wastes (carbon dioxide) leaves the body</li> </ul>
<b>3.0</b>	<b>Students will be able to:</b> In addition to 2.0 performance: <ul style="list-style-type: none"> <li>• Describe the respiratory membrane and its function</li> <li>• Describe the changes to thoracic cavity volume that allow air to come in and out of the body</li> <li>• Describe the structures of blood that allow it to carry oxygen and carbon dioxide</li> <li>• Explain the difference between the conduction and respiratory zones on the respiratory system</li> </ul>
<b>2.0</b>	<b>Students will be able to:</b> <ul style="list-style-type: none"> <li>• Recall specific vocabulary including: alveolus, bronchial tree, carbaminohemoglobin, carbonic anhydrase, cellular respiration, citric acid cycle, expiration, glottis, hemoglobin, hyperventilation, inspiration, oxyhemoglobin, partial pressure, pleural cavity, respiratory center, respiratory membrane, respiratory volume, surface tension, surfactant</li> <li>• List the general functions of the respiratory system</li> <li>• Name and describe the locations of the organs of the respiratory system</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

<b>Standard(s):</b> Systems of specialized cells within organisms help them perform the essential functions of life.	
<b>4.0</b>	<b>Students will be able to:</b> In addition to 3.0 performance: <ul style="list-style-type: none"> <li>• Evaluate urine and blood as a measure of the health of an animal and the urinary system</li> </ul>
<b>3.0</b>	<b>Students will be able to:</b> In addition to 2.0 performance: <ul style="list-style-type: none"> <li>• Identify and name the basic structures in the renal system</li> <li>• Name and explain the functions of the renal system</li> <li>• Identify structures within the kidney and detail the formation and regulation of urine</li> </ul>
<b>2.0</b>	<b>Students will be able to:</b> <ul style="list-style-type: none"> <li>• Recall specific vocabulary including: dorsal, ventral, urinary incontinence, spayed, gout, mastitis, intravenous, isotonic, urinalysis, specific gravity, free catch urine, azotemia, uremia, acute, chronic, subcutaneous</li> <li>• List the general functions of the renal system</li> <li>• Name and describe the locations of the organs of the renal system</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>



<b>Standard(s):</b> Systems of specialized cells within organisms help them perform the essential functions of life.	
<b>4.0</b>	<b>Students will be able to:</b> In addition to 3.0 performance: <ul style="list-style-type: none"> <li>• Demonstrate the pathway for the digestion and absorption of carbohydrates, proteins and lipids from ingestion until the nutrients reach the blood stream</li> <li>• Compare, contrast and explain the specialization of dentition and digestive tracts in various domestic species</li> </ul>
<b>3.0</b>	<b>Students will be able to:</b> In addition to 2.0 performance: <ul style="list-style-type: none"> <li>• Explain the breakdown of carbohydrates to glucose</li> <li>• Explain the breakdown of proteins to amino acids</li> <li>• Explain the breakdown of lipids to micelles</li> <li>• Identify the three pathways for adsorption of molecules</li> <li>• Describe how food is mechanically broken down</li> <li>• List and describe the function of the main digestive enzymes</li> </ul>
<b>2.0</b>	<b>Students will be able to:</b> <ul style="list-style-type: none"> <li>• Recall specific vocabulary including: absorption, accessory organ, alimentary canal, bile, chyme, circular muscle, deciduous, feces, gastric juice, intestinal juice, intrinsic, longitudinal muscle, mesentery, mucous membrane, pancreatic juice, peristalsis, serous layer, sphincter muscle, villus.</li> <li>• Recognize the organs and accessory structures of the digestive system</li> <li>• Explain the basics of digestion and absorption</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

<b>Standard(s):</b> Systems of specialized cells within organisms help them perform the essential functions of life.	
<b>4.0</b>	<b>Students will be able to:</b> In addition to 3.0 performance: <ul style="list-style-type: none"> <li>• Explain the steps in establishing pregnancy and stages of parturition</li> </ul>
<b>3.0</b>	<b>Students will be able to:</b> In addition to 2.0 performance: <ul style="list-style-type: none"> <li>• Discuss the functions of the reproductive system</li> <li>• Identify male anatomy and relate associated hormonal function</li> <li>• Discuss female anatomy and the estrous cycle</li> </ul>
<b>2.0</b>	<b>Students will be able to:</b> <ul style="list-style-type: none"> <li>• Recall specific vocabulary including: spay, castration, prolapsed uterus, epidural, estrous cycle, puberty, polyestrous, estrus, seasonal polyestrous, pheromone, parturition, gestation, involution, weaned, obstetric, whelping, cesarean section</li> <li>• Name the organs of the male and female reproductive system and discuss their functions</li> <li>• Name and describe the locations of the major parts of the reproductive system</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

<b>Standard(s):</b> Systems of specialized cells within organisms help them perform the essential functions of life.	
<b>4.0</b>	<b>Students will be able to:</b> In addition to 3.0 performance: <ul style="list-style-type: none"> <li>• Model the steps of neuron communication, showing how the specific structures of the neuron allow the process to happen</li> </ul>
<b>3.0</b>	<b>Students will be able to:</b> In addition to 2.0 performance: <ul style="list-style-type: none"> <li>• List the steps of creating a nerve impulse</li> <li>• Describe how a nerve cell generates and propagates a nerve impulse</li> <li>• Explain the specific role the Nissl bodies, axon, terminal bulbs, dendrites, neurotransmitters, synaptic cleft</li> <li>• Identify and explain the role of the following: serotonin, dopamine, acetylcholine</li> </ul>
<b>2.0</b>	<b>Students will be able to:</b> <ul style="list-style-type: none"> <li>• Recall specific vocabulary including: action potential, adrenergic, autonomic nervous system, axon, central nervous system, cholinergic, convergence, dendrite, divergence, facilitation, myelin, neurilemma, neuroglia, neuron, neurotransmitter, peripheral nervous system, postganglionic, preganglionic, receptor, reflex, summation, sympathetic, synapses, threshold</li> <li>• Identify the general structure of a neuron</li> <li>• Realize that a nerve impulse is transmitted from one neuron to another</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

<b>Standard(s):</b> Systems of specialized cells within organisms help them perform the essential functions of life.	
<b>4.0</b>	<b>Students will be able to:</b> In addition to 3.0 performance: <ul style="list-style-type: none"> <li>• Discuss and explain the relationships between humoral and cellular immunity. Give an animal species example including primary and secondary responses of the immune system in these relationships</li> <li>• Discuss the clinical significance of immunity in an animal species</li> </ul>
<b>3.0</b>	<b>Students will be able to:</b> In addition to 2.0 performance: <ul style="list-style-type: none"> <li>• Define the term antigen and explain its significance in immunity</li> <li>• Distinguish between passive and active immunity</li> <li>• Differentiate between humoral and cellular immunity</li> </ul>
<b>2.0</b>	<b>Students will be able to:</b> <ul style="list-style-type: none"> <li>• Recall specific vocabulary including: abscess, banded, tetanus, antigen, lymph, phagocytized, edema, humoral immunity, primary response, secondary response, pus, active immunity, passive immunity, colostrum, intranasally, kennel cough, pruritis, atopy, anaphylaxis</li> <li>• Name the organs of the immune system and discuss their functions</li> <li>• Name and describe the locations of the major parts and components of the immune system</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

## Unit Modifications for Special Population Students

<p><b>Advanced Learners</b></p>	<ul style="list-style-type: none"> <li>Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.</li> <li>Structure the learning around explaining or solving a medical or anatomy field related issue.</li> </ul>
<p><b>Struggling Learners</b></p>	<ul style="list-style-type: none"> <li>Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).</li> <li>Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.</li> <li>Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).</li> </ul>
<p><b>English Language Learners</b> (See <a href="http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf">http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf</a>)</p>	<ul style="list-style-type: none"> <li>Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).</li> </ul>
<p><b>Learners with an IEP</b></p>	<p>Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:</p> <ul style="list-style-type: none"> <li>Variation of time: adapting the time allotted for learning, task completion, or testing</li> <li>Variation of input: adapting the way instruction is delivered</li> <li>Variation of output: adapting how a student can respond to instruction</li> <li>Variation of size: adapting the number of items the student is expected to complete</li> <li>Modifying the content, process or product</li> </ul> <p>Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed <a href="#">here</a>. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here <a href="http://www.udlguidelines.cast.org">www.udlguidelines.cast.org</a></p>
<p><b>Learners with a 504</b></p>	<p>Refer to page four in the <a href="#">Parent and Educator Guide to Section 504</a> to assist in the development of appropriate plans.</p>

## Interdisciplinary Connections

### Indicators:

- **Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems**
  - **Physical Science: HS-PS2-3, HS-PS3-3**
- **Common Core State Standards Connections: ELA /Literacy**
  - **RST .11-12.7 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.**
  - **RST .11-12.8 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.**
  - **RST .11-12.9 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.**
- **Common Core State Standards Connections: Mathematics**
  - **MP.2 Reason abstractly and quantitatively.**
  - **MP.4 Model with mathematics.**

## Integration of 21<sup>st</sup> Century Skills

### Indicators:

- **Science and Engineering Practices:**
  - Analyzing and interpreting data
  - Asking questions and defining problems
  - Constructing explanations and designing solutions
  - Developing and Using Models
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information
  - Planning and carrying out investigations
  - Using mathematics and computational thinking
- **Crosscutting Concepts**
  - Patterns
  - Cause and effect
  - Scale, proportion, and quantity
  - Systems and system models
  - Energy and matter: Flows, cycle, and conservation
  - Structure and function
  - Stability and change
- **Connections to Engineering, Technology and Applications of Science**
  - New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.
  - Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

## Unit Title: Veterinary Nutrition

### Unit Description:

Animal nutrition focuses on the dietary needs of animals and includes the study of the composition and characteristics of the material consumed by the animal. In this unit we will review the basic structure of lipids, carbohydrates, and proteins and their contribution to the animal diet. In addition, we will review how different molecules are digested and why these nutrients are important to the animal diet and overall health.

Diet management plans will be introduced, explored and studied as an important contributor to the overall successful health of an animal species.

**Unit Duration:** 4 weeks

### Desired Results

#### Standard(s):

- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (HS-LS1-2)
- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells (HS-LS1-1)
- Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants (HS-ETS1-1)

#### Indicators:

##### LS1.A: Structure and Function

Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

##### LS1.A: Structure and Function

Systems of specialized cells within organisms help them perform the essential functions of life. All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.

##### ETS1.A: Defining and Delimiting Engineering Problems

Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.

Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

#### Understandings:

*Students will understand that...*

- Carbohydrates, protein, fats, vitamins, minerals, and water comprise the six nutrients of animal diets.
- Components of diets work together to allow the body to function effectively and efficiently.
- Deficiency in any of the six major dietary components, especially water, will result in low performance or death.

#### Essential Questions:

- What are the six nutrients in an animal diet?
- How do the nutrient components of a diet work together?
- What is an appropriate daily ration?
- Why is it important for animals to maintain a healthy diet?
- Why is it important to correctly read pet food labels?
- Why do different species eat different diets?
- Why are diet management plans important in a veterinarians clinical practice?

- To maintain a healthy animal, all six nutrients must be present in the correct amount in the daily ration.
- Importance of correctly interpreting pet labels
- Understanding the differences in species diets and nutritional needs is important to overall animal health.
- Understanding the differences in species digestive tracts gives veterinarians the ability to successfully develop species-specific rations.

## Assessment Evidence

### Performance Tasks:

- List six major components of animal diets and discuss their structure
- Explain the significance of the individual diet components in nutrition
- Discuss the clinical significance of diet management in animals
- Explain the general principles in animal nutrition
- Describe the important features found on pet food labels and compare and contrast the nutritional requirements for dogs and cats
- Discuss the horse's ability to digest fiber and its role in equine nutrition
- Detail the ruminant's ability to digest fiber and its role in ruminant nutrition

### Other Evidence:

- Cornell Notes/Note Cards on unit reading materials
- Quiz: Diet Components
- Quiz: Food Math Basics
- Daily Assessments (informal)
  - Bell Work
  - Supplemental Reading
  - Whiteboard Activities
  - Writing Prompts
- Performance Assessments
  - Class Discussion
  - Online Activities
  - Research Journal
- Group Work
  - Diet Management Plan
  - Research

### Benchmarks:

Unit Assessment

Diet Management Plan

Diet Management Plan Presentation

## Learning Plan

### Learning Activities:

#### **Basic Animal Nutrition and Species Comparison of Diets:**

- Lecture Topics:
  - Basic Animal Nutrition
    - Nutrients
    - Diet Components
    - Diet Management and Plans
    - Exercise and Nutrition
  - Species Comparison
    - Animal Nutrition
    - Pet Food Labels
    - Supplements
    - Equine Nutrition and Fiber Digestion
    - Ruminant Nutrition and Fiber Digestion
    - Nutrition in Clinical Practice
- Textbook:
  - Introduction to Veterinary Science, Chapter 12, pages 202 to 217
  - Introduction to Veterinary Science, Chapter 13, pages 218 to 234
- Laboratory Activities:
  - Feed Nutrient Value Lab
  - Diet Analysis Lab
- Other Activities:
  - How Much Water Do You Eat?
  - A Day in the Life of a Cow
  - Supplements, Good or Bad?
  - Chew, Bite and Chomp
  - Let's Eat
  - Energy, Rations and Feedstuffs
- Videos:
  - Veterinary Presentation on Nutrition and Obesity
  - Veterinary Presentation on Animal Nutrition
- Case Studies:
  - A Day in the Life: Diet Management, Textbook, page 203 to 204
  - A Day in the Life: Obesity in Animals, Textbook, page 219
- Common Reading Project Activities
- Current Event Assignment

### Resources:

- Textbook: Introduction to Veterinary Science by James Lawhead and Meecee Baker
- Common Reading Project: Zoo Story by Thomas French. The book was selected based on the quality of the writing and its insightful and detailed look at the complex life of a zoo and the interaction between animals and humans. This project will be implemented over several units during the first semester of this course.
- Current Event: The field of veterinary is changing rapidly. Everyday significant new discoveries are bringing new products to market; staying current on these advances is important. In each unit, students will use scientific databases and perform Internet research on current events. Students will summarize what they have learned in various formats and share it with their peers. Topics will be current and unit dependent.
- Online Resources: Animal Nutrition at <https://www.cteonline.org/curriculum/outline/animal-science-cte-online-model/qq5dxj>, Veterinary Science at <http://www.gaaged.org/curriculum2/topic.aspx?TID=16>, How Much Water Do You Eat at <https://www.calacademy.org/educators/lesson-plans/how-much-water-do-you-eat>, Nutrition and Growth at <https://peer.tamu.edu/VBB/ScienceTeacherResources.asp>, Nutrition and Growth at <https://peer.tamu.edu/VBB/AgTeacherResources.asp>
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops,
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)

**Unit Learning Goal and Scale**  
(Level 2.0 reflects a minimal level of proficiency)

**Standard(s):**

Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

<b>4.0</b>	<p><b>Students will be able to:</b> In addition to 3.0 performance:</p> <ul style="list-style-type: none"> <li>• Design a diet management plan for a specific animal species. Discuss the importance and reasons for each component inclusion in your diet plan</li> <li>• Explain how dietary mismanagement can lead to animal welfare issues. Give an example and propose a solution to the dietary problem</li> </ul>
<b>3.0</b>	<p><b>Students will be able to:</b> In addition to 2.0 performance:</p> <ul style="list-style-type: none"> <li>• Understand nutritional need changes under specific physiological changes like pregnancy, lactation and aging</li> <li>• Explain the types of feed available for several animal species</li> <li>• Explain how fermentation in ruminants and other animals affects overall dietary health</li> </ul>
<b>2.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Recall specific vocabulary including: free choice diet, resting energy rate, maintenance energy requirement, grazing, concentrates, supplements, float, forage, total mixed ratio</li> <li>• Define maintenance energy requirement and resting energy requirement</li> <li>• Calculate the daily energy needs of an animal species</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

**Standard(s):**

Systems of specialized cells within organisms help them perform the essential functions of life.

<b>4.0</b>	<p><b>Students will be able to:</b> In addition to 3.0 performance:</p> <ul style="list-style-type: none"> <li>• Explain why diet is important to overall animal health</li> <li>• Explain the difference in species diets and why is it important to understand these differences. Discuss several animal species as examples</li> </ul>
<b>3.0</b>	<p><b>Students will be able to:</b> In addition to 2.0 performance:</p> <ul style="list-style-type: none"> <li>• Discuss the significance and importance of each of the major components of an animal diet</li> <li>• Compare and contrast the ingredients on pet food labels</li> </ul>
<b>2.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Recall specific vocabulary including: necropsy, postmortem, constipation, flatulence, calorie, hydrolysis, dehydration, free radicals, hemolysis, dry matter, free choice diet, resting energy rate, maintenance energy requirement, grazing, concentrates, float, forage, cribbing, bolt, total mixed ration</li> <li>• Name the six major components of animal diets</li> <li>• Discuss the structure of the six major components of animal diets</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>



## Unit Modifications for Special Population Students

<b>Advanced Learners</b>	<ul style="list-style-type: none"> <li>Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.</li> <li>Structure the learning around explaining or solving a medical or anatomy field related issue.</li> </ul>
<b>Struggling Learners</b>	<ul style="list-style-type: none"> <li>Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).</li> <li>Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.</li> <li>Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).</li> </ul>
<b>English Language Learners</b> (See <a href="http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf">http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf</a> )	<ul style="list-style-type: none"> <li>Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).</li> </ul>
<b>Learners with an IEP</b>	<p>Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:</p> <ul style="list-style-type: none"> <li>Variation of time: adapting the time allotted for learning, task completion, or testing</li> <li>Variation of input: adapting the way instruction is delivered</li> <li>Variation of output: adapting how a student can respond to instruction</li> <li>Variation of size: adapting the number of items the student is expected to complete</li> <li>Modifying the content, process or product</li> </ul> <p>Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed <a href="#">here</a>. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here <a href="http://www.udlguidelines.cast.org">www.udlguidelines.cast.org</a></p>
<b>Learners with a 504</b>	<p>Refer to page four in the <a href="#">Parent and Educator Guide to Section 504</a> to assist in the development of appropriate plans.</p>

## Interdisciplinary Connections

**Indicators:**

- **Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems**
  - **Physical Science: HS-PS2-3, HS-PS3-3**
- **Common Core State Standards Connections: ELA /Literacy**
  - **RST .11-12.7 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.**
  - **RST .11-12.8 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.**
  - **RST .11-12.9 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.**
- **Common Core State Standards Connections: Mathematics**
  - **MP.2 Reason abstractly and quantitatively.**
  - **MP.4 Model with mathematics.**

## Integration of 21<sup>st</sup> Century Skills

**Indicators:**

- **Science and Engineering Practices:**
  - Analyzing and interpreting data
  - Asking questions and defining problems
  - Constructing explanations and designing solutions
  - Developing and Using Models
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information
  - Planning and carrying out investigations
  - Using mathematics and computational thinking
- **Crosscutting Concepts**
  - Patterns
  - Cause and Effect
  - Scale, proportion, and quantity
  - Systems and system models
  - Energy and matter: Flows, cycle, and conservation
  - Structure and function
  - Stability
- **Connections to Engineering, Technology and Applications of Science**
  - New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

## Unit Title: Veterinary Diseases

### Unit Description:

Any impairment of the normal state of an animal that interrupts vital function is a disease. Diseases of animals is a major concern primarily because of the economic losses they cause and the possible transmission of the causative agents to humans. This unit will discuss various topics in the area of veterinary diseases. These topics include: causes and effects of disease, disease and infectious agents, parasites, viruses, vaccines and vaccination protocols, biosecurity and prevention of disease, zoonoses and the clinical application of disease management in the practice of veterinary medicine.

**Unit Duration:** 4 weeks

### Desired Results

#### Standard(s):

- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (HS-LS1-2)
- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells (HS-LS1-1)
- Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants (HS-ETS1-1)

#### Indicators:

##### LS1.A: Structure and Function

Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

##### LS1.A: Structure and Function

Systems of specialized cells within organisms help them perform the essential functions of life. All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.

##### ETS1.A: Defining and Delimiting Engineering Problems

Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.

Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

#### Understandings:

*Students will understand that...*

- Koch's postulates lay the foundation for the study of infectious diseases.
- Infectious agents should be detectable in sick animals but not healthy animals.
- It should be possible to isolate and culture infectious agents.
- Organisms taken from culture and introduced into a healthy animal should cause the same disease as the organism they were cultured from.

#### Essential Questions:

- What are Koch's postulates?
- What is disease and how is it spread?
- How are diseases classified?
- What is biosecurity?
- How are diseases prevented from spreading?
- What is a vaccine?
- What is a vaccination protocol?
- Why are vaccines important in fighting the spread of infectious diseases?
- What are zoonotic diseases?

<ul style="list-style-type: none"> <li>• Disease prevention begins with biosecurity practices.</li> <li>• A comprehensive vaccination program tailored for each client's needs helps prevent the spread of disease.</li> <li>• Disease prevention is cost effective for both the large-scale producer and the pet owner.</li> <li>• Classifying disease into such categories as parasitic, infectious, metabolic, and toxic helps practitioners, owners and students make sense of a vast field of study.</li> <li>• Some diseases can be confusing and may be classified in multiple categories or cause conditions that could be classified in other categories.</li> <li>• A disease classification system gives veterinarians a tool in the study of their discipline.</li> <li>• Outbreaks of zoonotic diseases cause international concern.</li> <li>• Veterinarians and physicians are trained to identify more commonly occurring zoonotic diseases.</li> <li>• Students of veterinary science should familiarize themselves with the causes, symptoms, treatments, and prevention of zoonotic diseases.</li> </ul>	<ul style="list-style-type: none"> <li>• Why is it important for veterinarians and physicians to work together in the fight against zoonotic diseases?</li> <li>• Why are zoonotic diseases an international concern?</li> </ul>
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**Assessment Evidence**

<p><b>Performance Tasks:</b></p> <ul style="list-style-type: none"> <li>• Describe Koch's Postulates</li> <li>• List the important distinguishing features and give examples of major disease agents, and discuss the resulting diseases</li> <li>• Name the basic components of disease prevention</li> <li>• Describe the types of vaccines available and their roles in disease prevention</li> <li>• Classify disease, match them with the domestic species in which they occur, and discuss their clinical significance</li> <li>• List and describe several diseases common in domestic animals that are contagious to humans</li> </ul>	<p><b>Other Evidence:</b></p> <ul style="list-style-type: none"> <li>• Cornell Notes/Note Cards on unit reading materials</li> <li>• Quiz: Symbiosis</li> <li>• Quiz: Types of Infectious Agents</li> <li>• Daily Assessments (informal) <ul style="list-style-type: none"> <li>○ Bell Work</li> <li>○ Supplemental Reading</li> <li>○ Whiteboard Activities</li> <li>○ Writing Prompts</li> </ul> </li> <li>• Performance Assessments <ul style="list-style-type: none"> <li>○ Class Discussion</li> <li>○ Online Activities</li> <li>○ Research Journal</li> </ul> </li> <li>• Group Work <ul style="list-style-type: none"> <li>○ What is that Disease? Project</li> <li>○ Research</li> </ul> </li> </ul>
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<p><b>Benchmarks:</b></p> <p>Unit Assessment</p> <p>What is that Disease? Project</p> <p>Disease Project Presentation</p> <p>Writing Assessment: Opinion Essay, Thumbs Up or Thumbs Down on Vaccinations</p>
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## Learning Plan

### Learning Activities:

#### Diseases:

- Lecture Topics:
  - Principles of Infectious Disease
    - Koch's Postulates
    - Disease Agents
    - Viruses
    - Parasite Host Relationships
    - Non-Infectious Disease
  - Disease Prevention
    - Methods of Disease Prevention
    - Vaccines
    - Clinical Applications of Vaccination
  - Zoonoses
    - Introduction to Zoonotic Diseases
    - Common Zoonotic Disease
  - Disease in Clinical Practice
    - Disease Diagnosis
    - Common Clinical Practices
- Textbook:
  - Introduction to Veterinary Science, Chapter 14, pages 236 to 262
  - Introduction to Veterinary Science, Chapter 15, pages 263 to 272
  - Introduction to Veterinary Science, Chapter 16, pages 273 to 288
  - Introduction to Veterinary Science, Chapter 17, pages 289 to 300
  - Introduction to Veterinary Science, Chapter 18, pages 301 to 317
- Laboratory Activities:
  - Scientific Inquiry, Problem Solving through Rabies Lab
  - Biosecurity: Stop That Infection Lab
  - Metabolic Disorders in Animals Lab
- Other Activities:
  - Parasite Life Cycles
  - Parasite Flashcards
  - Zoonotic Parasites Worksheet
  - Infections Diseases Spread Activity
- Videos:
  - Veterinary Presentation on Vaccinations
  - Veterinary Presentation on Parasites
- Case Studies:
  - A Day in the Life: Botulism; Textbook, page 237
  - A Day in the Life: Vaccines; Textbook, page 264-265
  - A Day in the Life: All I Want is a Full Night's Sleep; Textbook, page 274 to 275
  - A Day in the Life: What Are Friends For? Textbook, page 290 to 291
  - A Day in the Life: Disease Diagnosis; Textbook, page 302
- Common Reading Project Activities
- Current Event Assignment

#### **Resources:**

- Textbook: Introduction to Veterinary Science by James Lawhead and Meecee Baker
- Common Reading Project: Zoo Story by Thomas French. The book was selected based on the quality of the writing and its insightful and detailed look at the complex life of a zoo and the interaction between animals and humans. This project will be implemented over several units during the first semester of this course.
- Current Event: The field of veterinary is changing rapidly. Everyday significant new discoveries are bringing new products to market; staying current on these advances is important. In each unit, students will use scientific databases and perform Internet research on current events. Students will summarize what they have learned in various formats and share it with their peers. Topics will be current and unit dependent.

- Online Resources: Parasites at <https://peer.tamu.edu/VBB/AgTeacherResources.asp>; Vaccination at <https://peer.tamu.edu/VBB/AgTeacherResources.asp>; Vaccination and Infectious Diseases at <https://peer.tamu.edu/VBB/ScienceTeacherResources.asp>; Veterinary Science at <http://www.gaaged.org/curriculum2/topic.aspx?TID=16>; Cause and Effects of Diseases and Illnesses of Animals at <https://www.cteonline.org/curriculum/outline/animal-science-cte-online-model/qq5dxj>
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops,
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)

**Unit Learning Goal and Scale**  
(Level 2.0 reflects a minimal level of proficiency)

**Standard(s):**

Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

<b>4.0</b>	<p><b>Students will be able to:</b> In addition to 3.0 performance:</p> <ul style="list-style-type: none"> <li>Classify a disease, match the disease with the domestic species in which they occur, and discuss its clinical significance</li> <li>Propose a management plan and treatment protocol to stop the spread of an infectious zoonotic disease</li> </ul>
<b>3.0</b>	<p><b>Students will be able to:</b> In addition to 2.0 performance:</p> <ul style="list-style-type: none"> <li>List the important distinguishing feature and give examples of major disease agents and discuss the resulting diseases</li> <li>Cite some current research or current event that demonstrates and explains a zoonotic disease or disease agent</li> </ul>
<b>2.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>Recall specific vocabulary including: Koch's postulates, vector, eukaryotic, prokaryotic, systemic, antimicrobial, bacteriostatic, antiseptics, disinfectants</li> <li>Define vector and/or infectious agent</li> <li>Describe Koch's postulates</li> <li>Name the basic components of disease prevention</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

**Standard(s):**

Systems of specialized cells within organisms help them perform the essential functions of life.

<b>4.0</b>	<p><b>Students will be able to:</b> In addition to 3.0 performance:</p> <ul style="list-style-type: none"> <li>Describe the types of vaccines available and their role in disease prevention</li> <li>Explain a vaccination protocol using a specific animal model. Discuss its importance in overall animal health and wellness</li> </ul>
<b>3.0</b>	<p><b>Students will be able to:</b> In addition to 2.0 performance:</p> <ul style="list-style-type: none"> <li>Describe the types of vaccines available and their role in disease prevention</li> <li>Discuss the pros and cons of vaccination in animals and humans</li> </ul>
<b>2.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>Recall specific vocabulary including: antioxidant, biosecurity, antigen, lymph edema, immunity, modified live vaccines, killed vaccines, titer, seroconversion, ELISA test</li> <li>Define the terms vaccine, vaccination and infectious agent</li> <li>Define the term antigen and explain its significance in immunity</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>

0.0	Even with help, no success
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**'Unit Modifications for Special Population Students**

<b>Advanced Learners</b>	<ul style="list-style-type: none"> <li>Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.</li> <li>Structure the learning around explaining or solving a medical or anatomy field related issue.</li> </ul>
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<b>Learners with a 504</b>	<p>Refer to page four in the <a href="#">Parent and Educator Guide to Section 504</a> to assist in the development of appropriate plans.</p>



## Interdisciplinary Connections

### Indicators:

- **Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems**
  - **Physical Science: HS-PS2-3, HS-PS3-3**
- **Common Core State Standards Connections: ELA /Literacy**
  - **RST .11-12.7 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.**
  - **RST .11-12.8 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.**
  - **RST .11-12.9 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.**
- **Common Core State Standards Connections: Mathematics**
  - **MP.2 Reason abstractly and quantitatively.**
  - **MP.4 Model with mathematics.**

## Integration of 21<sup>st</sup> Century Skills

### Indicators:

- **Science and Engineering Practices:**
  - Analyzing and interpreting data
  - Asking questions and defining problems
  - Constructing explanations and designing solutions
  - Developing and Using Models
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information
  - Planning and carrying out investigations
  - Using mathematics and computational thinking
- **Crosscutting Concepts**
  - Patterns
  - Cause and Effect
  - Scale, proportion, and quantity
  - Systems and system models
  - Energy and matter: Flows, cycle, and conservation
  - Structure and function
  - Stability
- **Connections to Engineering, Technology and Applications of Science**
  - New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

## Unit Title: Special Topics in Veterinary Science

### Unit Description:

The field of veterinary and animal science is changing rapidly. Everyday significant new discoveries are bringing new research, management techniques, animal care and wellness modalities and new agricultural products to market. This unit focuses on some of the most recent advances and special areas of study in the field of veterinary medicine and animal science. Students will also explore future trends in the rapidly expanding world of animals and related environmental issues.

**Unit Duration:** 4 weeks

### Desired Results

#### Standard(s):

- **Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. (HS-LS3-2)**
- **Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (HS-LS3-3.)**
- **Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants (HS-ETS1-1)**
- **Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. (HS-ETS1-2.)**
- **Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics. (HS-ETS1-3.)**

#### Indicators:

##### **LS3.B: Variation of Traits**

Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus, the variation and distribution of traits observed depends on both genetic and environmental factors.

##### **ET S1. A: Defining and Delimiting Engineering Problems**

Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.

##### **ET S1. B: Developing Possible Solutions**

When evaluating solutions, it is important to consider a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.

##### **ET S1.C: Optimizing the Design Solution**

Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed.

#### **Understandings:**

*Students will understand that...*

- Diagnosing disease in animals requires a systematic approach.
- Information can be acquired in each step from the history, physical examination, and subsequent diagnostic tests.
- Combining all the available information, the veterinarian works toward developing accurate diagnosis and creating a successful treatment plan.

#### **Essential Questions:**

- How do veterinarians diagnose disease?
- What information do surgeons collect to make correct diagnoses?
- What factors contribute to the success of a surgeon?
- What are some of the techniques that surgeons use?
- How are basic wounds treated?
- What is animal research?

- Successful surgery is a result of both extensive study and practical experience.
- Surgeons must follow comprehensive techniques.
- Surgeons must learn to match the tool to the surgical need.
- Surgery creates a wound and postsurgical care must include removing proud flesh, debridement, and draining of an abscess.
- Understanding the process of wound healing by first and second intentions gives surgeons the technical background to appropriately repair wounds.
- Using animals for scientific research evokes strong emotions among those on both sides of the issue.
- People who favor the use of animals in scientific research cite the many benefits.
- Benefits of animal research include testing of drugs, vaccines, treatments, medical devices and procedures.
- Veterinary and animal science conducts research that has improved the health and quality of life for animals.
- Those who oppose the use of any animals for research are concerned that laboratory animals are exposed to too much suffering and that there are better alternatives than using animal research.
- In order to keep up to date on current advances in areas of scientific study, veterinary and animal scientists must read and understand primary resources and scientific articles.

- How does animal research provide benefits?
- What is the controversy surrounding animal research?
- How do both sides of the animal research argument convey their ideas?
- What are ways in which the environment and animals interact?
- What are some of the current global issues involving animals and the environment?
- What are endangered species?
- How are endangered species managed?
- What is the goal of global wildlife management?
- What are current trends in the field of veterinary medicine and animal science?

### Assessment Evidence

#### Performance Tasks:

- List the major methods used to research and diagnose disease and cite examples of disease diagnosis with each testing method
- Discuss current research and new applications in the field of veterinary medicine
- Discuss the clinical significance of diagnosis
- Explain the clinical significance of the basic principles of successful surgery
- Explain the clinical significance of healing of lacerations by first and second intention
- Explain the clinical significance of common considerations in veterinary surgeries
- Explain why animals are used in scientific research and education
- Observe what people have learned from animal research by seeing the contributions of scientists who study animals
- Explain how different species of animals have been used in important research studies
- Understand that there are laws that govern how laboratory animals are used and cared for
- Research the controversy surrounding the use of animals in research

#### Other Evidence:

- Cornell Notes/Note Cards on unit reading materials
- Daily Assessments (informal)
  - Bell Work
  - Supplemental Reading
  - Whiteboard Activities
  - Writing Prompts
- Performance Assessments
  - Class Discussion
  - Online Activities
  - Research Journal
- Group Work
  - Research Debate
  - Final Project
  - Research

- Write a persuasive essay on the use of animals in research

**Benchmarks:**

Unit Assessment

Animal Research Debate

Veterinary Science and Me Project

Veterinary Science and Me Project Presentation

## Learning Plan

### Learning Activities:

#### Special Topics in Veterinary Science:

- Lecture Topics:
  - Clinical
    - Surgery
    - Physical Exam
    - Treatments
  - Animal Research and Animal Welfare
    - Animal Research
    - Clinical Trials
  - Animals and the Environment
    - Animal Management Practices
  - Exotic Animals and Endangered Species
- Textbook:
  - Introduction to Veterinary Science, Chapter 18, pages 303 to 318
  - Introduction to Veterinary Science, Chapter 19, pages 321 to 340
- Laboratory Activities:
  - Physical Exam Lab
  - Animals and their Environment Lab
- Other Activities:
  - TPR Activity
  - The Importance of Being a Mouse Story
  - Animal Research Survey
  - Animal Research Writing Activity
  - Sustainable Grazing
  - Endangered Species
- Videos:
  - Viewing of various online clinical cases (selected to student interest)
  - Topic specific videos (selected to student interest)
- Case Studies:
  - A Day in the Life: A Chance to Cut; Textbook, page 321 to 322
  - Case Studies Selected to support student interest and final project topic selection
- Common Reading Project Activities
- Current Event Assignment

### Resources:

- Textbook: Introduction to Veterinary Science by James Lawhead and Meecee Baker
- Common Reading Project: Zoo Story by Thomas French. The book was selected based on the quality of the writing and its insightful and detailed look at the complex life of a zoo and the interaction between animals and humans. This project will be implemented over several units during the first semester of this course.
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- Online Resources: Veterinary Science at <https://www.calacademy.org/educators/lesson-plans/sustainable-grazing>; Sustainable Grazing at <https://www.calacademy.org/educators/lesson-plans/sustainable-grazing>; Frontiers in Veterinary Medicine at <https://www.frontiersin.org/journals/veterinary-science>
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops,
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)

**Unit Learning Goal and Scale**  
(Level 2.0 reflects a minimal level of proficiency)

**Standard(s):** Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus, the variation and distribution of traits observed depends on both genetic and environmental factors

<b>4.0</b>	<p><b>Students will be able to:</b> In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught</p> <ul style="list-style-type: none"> <li>• Explain the laws that govern how laboratory animals are used and cared for</li> <li>• Research a controversy surrounding the use of animals in research</li> <li>• Write a persuasive paper on animal usage</li> <li>• Debate the pros and cons of animal research</li> </ul>
<b>3.0</b>	<p><b>Students will be able to:</b> In addition to 2.0 performance:</p> <ul style="list-style-type: none"> <li>• Explain why scientific research evokes strong emotions and cite examples that support this idea</li> <li>• Analyze information about using animals in research</li> <li>• Discuss the pros and cons of using animals in research</li> </ul>
<b>2.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Recognize or recall specific vocabulary including: scientific research, animal research, controversy, pro, con, debate, persuasive, drugs, vaccines, treatments, medical devices, modalities</li> <li>• Explain why animals are used in scientific research and education</li> <li>• List several ways in which animal research has benefited the community</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

**Standard(s):**

Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

<b>4.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>• In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught</li> <li>• Discuss the implications of veterinary and animal science in the current health and welfare of various animal populations by citing examples of current discoveries or advancement in this field of study</li> <li>• Illustrate a current veterinary science activity, issue or event and highlight its importance in chemical, biological and/or pharmacological research, human health or animal welfare</li> <li>•</li> </ul>
<b>3.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Identify past and current discoveries and developments in the veterinary science and animal science industries, such as agriculture, diagnostics, medical devices, pharmaceuticals and research and development</li> <li>• Discuss the importance of current research and scientific writing to the advancement of veterinary science</li> </ul>
<b>2.0</b>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Recognize or recall specific vocabulary, including: veterinary science, veterinary medicine, agriculture, food, wild animals, domestic, exotic, wildlife, production animals, bioethics</li> <li>• Explain veterinary and animal science and identify some of its current applications</li> </ul>
<b>1.0</b>	<b>With help, partial success at level 2.0 content and level 3.0 content:</b>
<b>0.0</b>	<b>Even with help, no success</b>

## Unit Modifications for Special Population Students

<b>Advanced Learners</b>	<ul style="list-style-type: none"> <li>Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.</li> <li>Structure the learning around explaining or solving a medical or anatomy field related issue.</li> </ul>
<b>Struggling Learners</b>	<ul style="list-style-type: none"> <li>Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).</li> <li>Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.</li> <li>Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).</li> </ul>
<b>English Language Learners</b> (See <a href="http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf">http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf</a> )	<ul style="list-style-type: none"> <li>Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).</li> </ul>
<b>Learners with an IEP</b>	<p>Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:</p> <ul style="list-style-type: none"> <li>Variation of time: adapting the time allotted for learning, task completion, or testing</li> <li>Variation of input: adapting the way instruction is delivered</li> <li>Variation of output: adapting how a student can respond to instruction</li> <li>Variation of size: adapting the number of items the student is expected to complete</li> <li>Modifying the content, process or product</li> </ul> <p>Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed <a href="#">here</a>. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here <a href="http://www.udlguidelines.cast.org">www.udlguidelines.cast.org</a></p>
<b>Learners with a 504</b>	<p>Refer to page four in the <a href="#">Parent and Educator Guide to Section 504</a> to assist in the development of appropriate plans.</p>

## Interdisciplinary Connections



**Indicators:**

- **Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems**
  - **Physical Science: HS-PS2-3, HS-PS3-3**
- **Common Core State Standards Connections: ELA /Literacy**
  - **RST .11-12.7 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.**
  - **RST .11-12.8 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.**
  - **RST .11-12.9 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.**
- **Common Core State Standards Connections: Mathematics**
  - **MP.2 Reason abstractly and quantitatively.**
  - **MP.4 Model with mathematics.**

## Integration of 21<sup>st</sup> Century Skills

**Indicators:**

- **Science and Engineering Practices:**
  - Analyzing and interpreting data
  - Asking questions and defining problems
  - Constructing explanations and designing solutions
  - Developing and Using Models
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information
  - Planning and carrying out investigations
  - Using mathematics and computational thinking
- **Crosscutting Concepts**
  - Patterns
  - Cause and Effect
  - Scale, proportion, and quantity
  - Systems and system models
  - Energy and matter: Flows, cycle, and conservation
  - Structure and function
  - Stability
- **Connections to Engineering, Technology and Applications of Science**
  - New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.