

## ASA Expanded Lesson Review

The following is a compiled listing of the concepts, performance objectives, standard alignment, and essential questions by lesson.

### Lesson 1.1 – The World of Agricultural Education

#### Concepts

1. Many people work in a variety of agricultural enterprises to produce food, fiber, and fuel, which are essential to daily life.
2. Agricultural education includes learning about agriculture systems, natural resource management, science, business, communication, and leadership.
3. The National FFA Organization provides opportunities to build necessary life skills, such as leadership and personal character.
4. Supervised Agricultural Experience programs provide opportunities to explore potential career choices and develop professional career goals.

#### Performance Objectives

*It is expected that students will*

- Develop and keep an Agriscience Notebook to record and store information presented in classroom discussions and activities throughout the course.
- Interpret types of activities associated with agriculture from a case study about an agricultural entrepreneur.
- Set personal goals for premier leadership, personal growth, and career success.
- Develop a Supervised Agricultural Experience (SAE) implementation plan.

#### Standards and Benchmarks Addressed

##### ***AFNR Career Cluster – Agribusiness Systems Career Pathway Content Standards***

Lesson 1.1 will address parts of the following performance elements:

**ABS.03. Performance Element:** Utilize record keeping to accomplish AFNR business objectives while complying with laws and regulations.

##### ***AFNR Career Cluster – CSN – LifeKnowledge and Foundation Skills***

**CSN.02. Performance Element:** Personal Growth: Develop a skill set to enhance the positive evolution of the whole person.

## ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**

## ***Standards for the English Language Arts***

**Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What is agriculture?
2. What is agricultural education?
3. What are the components of agricultural education?
4. What are the different areas of study in agricultural education?
5. How is agriculture more than farming?
6. What is the definition of agribusiness?
7. What is the FFA?
8. What does the acronym FFA stand for?
9. How do I join and become involved in FFA?
10. Why is setting long-term and short-term goals important?
11. What is meant by premier leadership, personal growth, and career success?
12. How can I start a Supervised Agricultural Experience (SAE) program?
13. What are the benefits of participating in FFA and SAE?
14. What are the benefits of keeping an Agriscience Notebook?

## **Lesson 1.2 – Animal Planet**

### **Concepts**

1. Animals are used to sustain human existence by providing many essential products.
2. Animals serve many purposes in the lives of humans.
3. Career opportunities exist in animal agriculture for all levels of education in the areas of production, processing, marketing, and regulation.

## Performance Objectives

*It is expected that students will*

- Develop and present to the class a presentation about an animal industry and related careers.
- Document and record animal industries and career opportunities shared during student presentations.
- Determine and analyze their usage of various animal products over the course of one day.
- Develop a list of animal products commonly used based on previous investigations.

## Standards and Benchmarks Addressed

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 1.2 will address parts of the following performance elements:**

**AS.01. Performance Element:** Examine the components, historical development, global implications, and future trends of the animal systems industry.

### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Interdependence of organisms**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Natural resources**
- **Science and technology in local, national, and global challenges**

### ***Standards for the English Language Arts***

#### **Standard 7**

Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.

**Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## Essential Questions

1. How do animals contribute to daily life?
2. What are the industries within animal agriculture?
3. What is the difference between a companion animal and a production animal?
4. What non-consumable items are produced from animals?
5. How can I develop my interest of animals into a career?

## Lesson 2.1 – Taming Animals

### Concepts

1. Animal species were domesticated at different times throughout history using different methodologies.
2. Humans benefit from the domestication of animals.
3. Domesticated animals receive their basic needs, such as water, feed, and shelter, from humans.
4. Domestication of animals is achieved through breeding, handling, and training.

### Performance Objectives

*It is expected that students will*

- Record notes and self-reflection for presentations made in class through the use of *Presentation Notes*.
- Conduct behavioral and historical research on a variety of animals.
- Compare domestic and wild animals using the characteristics of domestication.
- Examine the development and domestication of a common animal over time.
- Design a timeline recording the history of an animal.
- Present to the class historical data collected regarding a selected animal species.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 2.1 will address parts of the following performance elements:**

**AS.01. Performance Element:** Examine the components, historical development, global implications, and future trends of the animal systems industry.

## ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**
- **Evolution and equilibrium**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Biological evolution**
- **Interdependence of organisms**
- **Behavior of organisms**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Population growth**
- **Natural resources**

**History and Nature of Science – Content Standard G:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Historical perspectives**

## ***Standards for the English Language Arts***

**Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

**Standard 7** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.

**Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

**Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## Essential Questions

1. Why are animals domesticated?
2. What allows certain animal species to be domesticated?
3. How have domesticated animal species adapted to human interactions over time?
4. Do animals benefit from domestication?
5. What is the difference between taming animals and domesticating them?
6. What are the benefits to humans by domesticating animals?

## Lesson 2.2 – Naming Animals

### Concepts

1. All living organisms are classified using kingdom, phylum, class, order, family, genus, and species.
2. Animals are classified several different ways, such as binomial nomenclature, purpose, and characteristics of anatomy and physiology.
3. There are different breeds of animals with common ancestors that have defining characteristics displayed in offspring.
4. Dichotomous keys are a classification tool that can be used to identify objects based on their physical features.

### Performance Objectives

*It is expected that students will*

- Classify objects based on their physical characteristics.
- Apply the hierarchical organizational system to a food group.
- Determine the classification of the animal in their *Producer's Management Guide*.
- Categorize animals by gender and species.
- Design a dichotomous key for five breeds of an animal species.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 2.2 will address parts of the following performance elements:**

**AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.

#### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Biological evolution**
- **Matter, energy, and organization in living systems**

**History and Nature of Science – Content Standard G:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Nature of scientific knowledge**

## ***Standards for the English Language Arts***

- Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What is taxonomy?
2. How can you classify animals?
3. How can several classification categories be used on the same object?
4. What are the hierarchical levels for taxonomic classification?
5. What is the difference between a genus and a species designation?
6. How was binomial nomenclature developed?
7. What is a breed?
8. Why were breeds developed?
9. How can a dichotomous key be used to identify animals?

## **Lesson 2.3 – Livestock across the United States**

### **Concepts**

1. Livestock production occurs in different regions of the United States.
2. Characteristics, such as climate, land price, population, industry infrastructure, feed resources, and transportation systems influence where commercial animals are produced in the United States.

## Performance Objectives

*It is expected that students will*

- Examine the inputs needed for livestock production.
- Develop a poster examining the characteristics of a livestock production region.
- Map the regions of commercial animal production.
- Explain how the resources available in different regions of the United States support and promote the production of animals.
- Document their reasoning for why certain animal species would or would not be commercially produced within the region they reside.

## Standards and Benchmarks Addressed

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 2.3 will address parts of the following performance elements:**

**AS.01. Performance Element:** Examine the components, historical development, global implications, and future trends of the animal systems industry.

**AS.08. Performance Element:** Analyze environmental factors associated with animal production.

### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Interdependence of organisms**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Natural resources**

### ***Standards for the English Language Arts***

**Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

**Standard 12** Students use spoken, written and visual language to

accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## Essential Questions

1. What are the six regions of livestock production in the United States?
2. What are the environmental characteristics that determine a region?
3. What makes one region of the United States well suited for a certain type of animal production and another region poorly suited for the same type of animal production?
4. What influences do large population centers have on agricultural animal production?
5. How do environmental characteristics influence animal production?
6. How do the varieties of crops produced affect the types of animals produced within a region?

## Lesson 3.1 – Animal Rights or Animal Wrongs?

### Concepts

1. Animal welfare and animal rights are differing belief systems pertaining to the acceptable use of animals.
2. The value humans place on live animals and the use of products derived from animals is influenced by the beliefs of an individual.
3. The use of animals for food and fiber sometimes create ethical dilemmas for producers and consumers.
4. Producers of animal products must consider the welfare of animals during the production process.
5. Profitability is maximized when animals are properly managed.

### Performance Objectives

*It is expected that students will*

- Discuss the differences in the interpretation of the meaning of the word value.
- Assess their personal values to determine their beliefs pertaining to animal use.
- Recognize issues in animal agriculture and discuss the positive and negative impacts of each issue.
- Analyze animal rights and animal welfare videos to determine the message and intent of each video.
- Develop a Producer's Code of Care document for the humane use of a species of animal under their care.

- Determine their current opinions towards the beliefs of animal rightists and animal welfarists.

## **Standards and Benchmarks Addressed**

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 3.1 will address parts of the following performance elements:**

**AS.01. Performance Element:** Examine the components, historical development, global implications, and future trends of the animal systems industry.

**AS.08. Performance Element:** Analyze environmental factors associated with animal production.

### ***National Science Education Standards***

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Interdependence of organisms**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Environmental quality**
- **Natural and human-induced hazards**

### ***Standards for the English Language Arts***

**Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

**Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What is meant by the phrase “this is an issue”?
2. How do personal beliefs and values affect an individual’s perception of animal use?
3. What is the philosophy of animal rights?
4. What is the philosophy of animal welfare?
5. How is the media used to promote the pros and cons of these philosophies?

6. What is the proper standard of care for an animal?

## Lesson 3.2 – Manipulating Manners

### Concepts

1. Animals respond instinctively to stimuli and changes in their surroundings.
2. Animals exhibit both instinctive and learned behaviors.
3. Safe handling and restraint procedures protect the animal and handler.

### Performance Objectives

*It is expected that students will*

- Investigate the behavior of pillbugs in response to stimuli.
- Conduct an inquiry lab on the behaviors of pillbugs.
- Research and determine the typical behaviors of a species of animal and become familiar with the safe handling procedures of that animal.
- Write a brief with annotated references that may be used as a preparatory guide for farm tours and field trips pertaining to animal behavior and safety.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 3.2 will address parts of the following performance elements:**

**AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.

**AS.06. Performance Element:** Outline handling procedures for the safety of animals, producers, and consumers of animal products.

#### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**
- **Evidence, models, and explanation**

**Science as Inquiry – Content Standard A:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities necessary to do scientific inquiry**
- **Understandings about scientific inquiry**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Behavior of organisms**

**History and Nature of Science – Content Standard G:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Science as a human endeavor**

## ***Principles and Standards for School Mathematics***

<b>Measurement</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to understand measurable attributes of objects and the units, systems, and processes of measurement.
<b>Data Analysis and Probability</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
<b>Connections</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.

## ***Standards for the English Language Arts***

<b>Standard 4</b>	Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
<b>Standard 5</b>	Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.
<b>Standard 6</b>	Students apply knowledge of language structure, language conventions (e.g. spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and non-print texts.
<b>Standard 7</b>	Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
<b>Standard 8</b>	Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
<b>Standard 12</b>	Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment,

persuasion, and the exchange of information).

## Essential Questions

1. Why study animal behavior?
2. How do animals respond to differences in their environment?
3. What are instinctive and learned behaviors?
4. How is conditioning used in animal agriculture?
5. How does novelty affect flighty animals?
6. What is a flight zone?
7. How can the flight zone of an animal be used to move and handle animals in a low-stress manner?
8. What are safe and calm practices to use when working with animals?

## Lesson 3.3 – Home Sweet Home

### Concepts

1. Animals require food, shelter, and water for survival.
2. Animal facilities differ based on environmental factors, species, use, and size of operations.
3. Animal facilities are designed to protect the safety and health of animals and handlers.
4. Animal facilities should include biosecurity precautions.
5. Biosecurity practices are implemented to reduce the spread of pathogens on farms.
6. Safe laboratory procedures include reading and following all instructions, wearing proper personal protective equipment, and cleaning up thoroughly when finished.

### Performance Objectives

*It is expected that students will*

- Research the basic feed, water, and shelter requirements for animals.
- Determine the average environmental conditions of the students' location.
- Calculate proportions, scale ratios, and dimensions of building plans.
- Select a type of animal facility that provides for the safe handling and efficient production of animals.
- Design and construct a model animal facility.
- Practice safe laboratory procedures.
- Conduct experiments to determine the risk levels related to spreading pathogens in a farm scenario.
- Observe and record growth of cultures.

## Standards and Benchmarks Addressed

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

Lesson 3.3 will address parts of the following performance elements:

**AS.06. Performance Element:** Outline handling procedures for the safety of animals, producers, and consumers of animal products.

**AS.07. Performance Element:** Select animal facilities and equipment that provide for the safe and efficient production, housing, and handling of animals.

**AS.08. Performance Element:** Analyze environmental factors associated with animal production.

### ***National Science Education Standards***

**Science as Inquiry – Content Standard A:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities necessary to do scientific inquiry**
- **Understandings about scientific inquiry**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Behavior of organisms**

**Science and Technology – Content Standard E:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities of technological design**
- **Understandings about science and technology**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Personal and community health**
- **Natural resources**
- **Environmental quality**
- **Natural and human-induced hazards**

### ***Principles and Standards for School Mathematics***

#### **Number and Operations**

Instructional programs from pre-kindergarten through grade 12 should enable all students to

- understand numbers, ways of representing numbers, relationships among numbers, and number systems.
- compute fluently and make reasonable estimates.

<b>Geometry</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to use visualization, spatial reasoning, and geometric modeling to solve problems.
<b>Measurement</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to <ul style="list-style-type: none"> <li>• understand measurable attributes of objects and the units, systems, and processes of measurement.</li> <li>• apply appropriate techniques, tools, and formulas to determine measurements.</li> </ul>
<b>Problem Solving</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to <ul style="list-style-type: none"> <li>• solve problems that arise in mathematics and in other contexts.</li> <li>• apply and adapt a variety of appropriate strategies to solve problems.</li> </ul>
<b>Connections</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.

## ***Standards for the English Language Arts***

<b>Standard 7</b>	Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
<b>Standard 8</b>	Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
<b>Standard 12</b>	Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What are the basic needs of animals?
2. How does environment influence the design of animal facilities?
3. What determines the size of animal facilities?
4. What are scale ratios?
5. How can scale ratio be used in facility design?
6. What are the areas needed in an animal facility?
7. What is biosecurity?

8. What are pathogens?
9. What risks do pathogens pose to farm animals?
10. What are the common risk factors to biosecurity on a farm?
11. How can biosecurity concerns be reduced at animal facilities?

## Lesson 4.1 – Units of Life

### Concepts

1. Animal cells share similarities and differences with plant cells.
2. Animal cells are comprised of many parts that have essential functions for the survival of animal tissue, such as respiration.
3. Cell organelles can only be seen using a microscope.
4. There are many different classifications of cells based on their utility.
5. Cells use water, oxygen, and glucose to produce energy and metabolic by-products of carbon dioxide and water.
6. Cells use the processes of osmosis and diffusion for the uptake of water and dissolved nutrients required for metabolism and growth.

### Performance Objectives

*It is expected that students will*

- Identify and label animal and plant cell organelles.
- Distinguish structural differences between animal and plant cells.
- Develop a pictorial representation of cell function.
- Correctly prepare slides of animal and plant cells for viewing under a microscope.
- Collect and analyze data to provide evidence of cell metabolism.
- Conduct an experiment to simulate the osmosis process of animal cells.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 4.1 will address parts of the following performance elements:**

**AS.02. Performance Element:** Manage animals based on anatomical and physiological characteristics.

#### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**
- **Form and function**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **The cell**
- **Matter, energy, and organization in living systems**

## ***Principles and Standards for School Mathematics***

<b>Number and Operations</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to <ul style="list-style-type: none"> <li>• understand numbers, ways of representing numbers, relationships among numbers, and number systems</li> <li>• compute fluently and make reasonable estimates</li> </ul>
<b>Algebra</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to <ul style="list-style-type: none"> <li>• represent and analyze mathematical situations and structures using algebraic symbols</li> <li>• use mathematical models to represent and understand quantitative relationships</li> </ul>
<b>Measurement</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to <ul style="list-style-type: none"> <li>• understand measurable attributes of objects and the units, systems, and processes of measurement</li> <li>• apply appropriate techniques, tools, and formulas to determine measurements</li> </ul>
<b>Data Analysis and Probability</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to select and use appropriate statistical methods to analyze data.
<b>Connections</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.

## ***Standards for the English Language Arts***

<b>Standard 8</b>	Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
<b>Standard 12</b>	Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## Essential Questions

1. What is a cell?
2. What are the parts of a cell?
3. How are cells classified?
4. How are animal and plant cells similar?
5. What is the function of cell organelles and how do they work together?
6. Are there different types of cells within an animal?
7. How do cells contribute to the overall function of an animal?
8. How do animal cells convert raw nutrients into energy?
9. How are cellular respiration and cellular metabolism related?
10. Why are animal cells important to understanding animal systems?
11. How does a cell absorb water and nutrients?

## Lesson 4.2 – Putting the Puzzle Together

### Concepts

1. External body parts of animals vary among different species and are important as reference tools for animal selection, health, and management.
2. A collection of organized cells create tissue responsible for various life sustaining functions.
3. The body structure of a vertebrate animal is comprised of a skeleton made of bone and cartilage with ligaments attached to muscle tissue to provide motion.
4. The collection of epithelial, connective, muscle, and nerve tissues in an organ interact to perform specific functions within the body of an animal.
5. Multiple organs work together and form physiological systems.

### Performance Objectives

*It is expected that students will*

- Identify common external animal parts and explain the purpose of each.
- Identify unique external parts specific for livestock and poultry species and explain the purpose of each part.
- Dissect a chicken wing and identify epithelial and connective tissues.
- Examine two different types of muscle tissue and describe the differences.
- Dissect a fetal pig and identify internal parts and organs that comprise systems.

### Standards and Benchmarks Addressed

## ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

Lesson 4.2 will address parts of the following performance elements:

**AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.

**AS.03. Performance Element:** Provide for the proper health care of animals.

### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**
- **Form and function**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Matter, energy, and organization in living systems**
- **Behavior of organisms**

### ***Standards for the English Language Arts***

**Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

**Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

### **Essential Questions**

1. Why are external parts necessary to know?
2. What common external parts are found on all livestock species?
3. What is a dissection?
4. What is an organ?
5. How are tissues formed in the body of an animal?
6. What are the different types of tissues in the body of an animal?
7. What is the body structure of a vertebrate?
8. What are the purposes of bone besides physical structure?
9. What is the purpose of tendons?
10. What is the purpose of ligaments?

11. How do muscle tissues differ based on their location in the body of an animal?
12. What is the largest internal organ in the body of an animal?
13. How do multiple organs work together in the body of an animal?
14. What is the relationship between external body parts and internal systems?

## Lesson 4.3 – Breathing and Beating

### Concepts

1. The respiratory and circulatory systems are closely related and essential for animal life.
2. External respiration is a process of gas exchanges between the lungs and blood.
3. The circulatory system relies on the heart to pump blood throughout the body.
4. Respiration and heart rates may be affected by external conditions, such as temperature and physical activity.

### Performance Objectives

*It is expected that students will*

- Identify and explain the function of the parts of the respiratory and circulatory systems.
- Describe the process of gas exchange in external respiration.
- Determine the presence of carbon dioxide in exhaled air.
- Design a travel brochure that highlights the flow of blood throughout the body.
- Conduct an inquiry on the affects of external conditions on respiration rate, pulse, and blood pressure.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 4.3 will address parts of the following performance elements:**

**AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.

#### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**
- **Evidence, models, and explanation**

- **Constancy, change, and measurement**
- **Evolution and equilibrium**
- **Form and function**

**Science as Inquiry – Content Standard A:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities necessary to do scientific inquiry**
- **Understandings about scientific inquiry**

**Physical Science – Content Standard B:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Chemical reactions**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Interdependence of organisms**
- **Matter, energy, and organization in living systems**

**Science and Technology – Content Standard E:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities of technological design**
- **Understandings about science and technology**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Personal and community health**

**History and Nature of Science – Content Standard G:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Science as a human endeavor**

## ***Principles and Standards for School Mathematics***

**Number and Operations** Instructional programs from pre-kindergarten through grade 12 should enable all students to compute fluently and make reasonable estimates.

**Measurement** Instructional programs from pre-kindergarten through grade 12 should enable all students to

- understand measurable attributes of objects and the units, systems, and processes of measurement.
- apply appropriate techniques, tools, and formulas to determine measurements.

**Data Analysis and Probability** Instructional programs from pre-kindergarten through grade 12 should enable all students to

- formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

- develop and evaluate inferences and predictions that are based on data.

**Communication** Instructional programs from pre-kindergarten through grade 12 should enable all students to organize and consolidate their mathematical thinking through communication.

**Connections** Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.

## ***Standards for the English Language Arts***

**Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

**Standard 5** Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.

**Standard 7** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.

**Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

**Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What is respiration?
2. What is circulation?
3. How do the respiratory and circulatory systems work together?
4. What is the difference between external and internal respiration?
5. How are gases exchanged in the lungs?
6. What is the concentration of carbon dioxide in air that is exhaled?
7. What is the path of flow of blood throughout the body?
8. What is the difference between systemic and pulmonary circulation?

9. What is the difference between an artery and a vein?
10. How do arteries and veins connecting with the lungs differ from arteries and veins connecting with other organs?
11. What is blood pressure?
12. How do respiration rates, pulse, and blood pressure respond to rest and exercise?

## Lesson 4.4 – Body Control Centers

### Concepts

1. The nervous system, which is the information control center of the body, uses the central nervous system and the peripheral nervous system to transmit messages.
2. The endocrine system secretes hormones that regulate, stimulate, or inhibit activities within the body.
3. The renal system filters wastes produced in the cells and removes them from the body.
4. Body systems work in harmony to maintain the essential processes needed to sustain life.

### Performance Objectives

*It is expected that students will*

- Study the relationships of the nervous, endocrine, renal, and urinary systems.
- Determine and use a concept map to demonstrate the connection of the systems studied to the respiratory and circulatory systems.
- Map the functions of body systems, specifically the nervous, endocrine, and renal systems.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 4.4 will address parts of the following performance elements:**

**AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.

#### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Matter, energy, and organization in living systems**

**History and Nature of Science – Content Standard G:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Science as a human endeavor**

## ***Principles and Standards for School Mathematics***

<b>Geometry</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to use visualization, spatial reasoning, and geometric modeling to solve problems.
<b>Connections</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.
<b>Representation</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to use representations to model and interpret physical, social, and mathematical phenomena.

## ***Standards for the English Language Arts***

<b>Standard 4</b>	Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
<b>Standard 5</b>	Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.
<b>Standard 8</b>	Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
<b>Standard 12</b>	Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What are the components and functions of the nervous system?
2. What roles do hormones released by the endocrine system play in the body?
3. What functions are performed by the renal system?

4. How do the nervous, endocrine, and renal systems relate to other systems and reactions within an animal?

## Lesson 5.1 – Digestion Junction

### Concepts

1. Digestive systems vary among species of animals.
2. Ruminants have a four-chambered stomach consisting of the rumen, reticulum, omasum, and abomasum, each with a specific function.
3. Digestion and absorption is accomplished through a process of mechanical, chemical, and biological decomposition of food by the organs of monogastric, ruminant, pseudo-ruminant, and avian digestive systems.
4. The diet of an animal is determined by its type of digestive system.

### Performance Objectives

*It is expected that students will*

- Define the terminology commonly used in digestive anatomy.
- Label, identify, and explain the function of various parts of animal digestive systems.
- Match livestock species with the proper digestive system.
- Build a model of a digestive system.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 5.1 will address parts of the following performance elements:**

- AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.
- AS.04. Performance Element:** Apply principles of animal nutrition to ensure the proper growth, development, reproduction, and economic production of animals.

#### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Matter, energy, and organization in living systems**

## ***Standards for the English Language Arts***

- Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- Standard 7** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
- Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

### **Essential Questions**

1. What is a digestive system?
2. What is a ruminant?
3. What is a monogastric?
4. How do methods of prehension differ among animals?
5. How do different animals digest needed nutrients?
6. What is the difference between a monogastric, ruminant, and avian digestive system?
7. What are examples of animals with a ruminant, monogastric, pseudo-ruminant and avian digestion system?
8. Why do ruminants have a four-chambered stomach?
9. Where does most digestion of food occur?

## **Lesson 5.2 – The Need for Feed**

### **Concepts**

1. The six nutrient groups all animals require include water, carbohydrates, protein, fats, vitamins, and minerals.
2. Animals require nutrients from all six nutrient groups to thrive, survive, and reproduce.
3. The specific nutritional requirements of individual animals are dependent upon species, age, and level of production.

## Performance Objectives

*It is expected that students will*

- Identify the six classes of nutrients, the function they serve in the body, and sources of each nutrient.
- Compare their personal nutritional needs with those of a production animal.
- Research and record the nutritional needs of an animal using Nutritional Requirement tables.
- Evaluate nutrient requirements of various animals at different stages of production.

## Standards and Benchmarks Addressed

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

Lesson 5.2 will address parts of the following performance elements:

**AS.04. Performance Element:** Apply principles of animal nutrition to ensure the proper growth, development, reproduction, and economic production of animals.

### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Form and function**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Matter, energy, and organization in living systems**

**Science and Technology – Content Standard E:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities of technological design**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Personal and community health**

### ***Principles and Standards for School Mathematics***

#### **Number and Operations**

Instructional programs from pre-kindergarten through grade 12 should enable all students to understand numbers, ways of representing numbers, relationships among numbers, and number systems.

<b>Measurement</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to understand measurable attributes of objects and the units, systems, and processes of measurement.
<b>Data Analysis and Probability</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
<b>Connections</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.

## ***Standards for the English Language Arts***

<b>Standard 1</b>	Students read a wide range of print and non-print texts to build an understanding of texts of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classical and contemporary works.
<b>Standard 3</b>	Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and other texts, their word identification strategies, and their understanding of textual features (e.g. sound-letter correspondence, sentence structure, context, graphics).
<b>Standard 5</b>	Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.
<b>Standard 7</b>	Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
<b>Standard 8</b>	Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
<b>Standard 12</b>	Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## Essential Questions

1. What are the six essential nutrients for all animals?
2. What do you need to stay healthy?
3. What similarities are there between your diet and the diet of an animal?
4. Do you require the same amount and type of food throughout your lifetime?
5. Do animals of different species require the same types and amounts of food throughout their lifetime?
6. What are the specific nutrient requirements of an individual animal at different stages of production?

## Lesson 5.3 – Feedstuffs

### Concepts

1. Animals derive nutrition from a variety of sources including roughages and concentrates.
2. Feedstuffs of the same type can vary in nutrient composition and nutritional value based on the location, time of harvest, growing conditions, water availability, and soil conditions of the area in which the feed is grown.
3. The nutritional value of a feed can be determined through feed analysis.
4. Feed labels are an important source of nutritional information.

### Performance Objectives

*It is expected that students will*

- Conduct an inquiry experiment to determine the energy in feedstuffs.
- Categorize feedstuffs into the nutrient group each feedstuff provides.
- Classify feedstuffs as roughages, concentrates, and supplements.
- Identify and define feed analysis terms.
- Read a feed label and interpret the information included on the label.
- Compare the information on a feed label to the information found on a food label.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 5.3 will address parts of the following performance elements:**

**AS.03. Performance Element:** Provide for the proper health care of animals.

**AS.04. Performance Element:** Apply principles of animal nutrition to ensure the proper growth, development, reproduction, and economic production of animals.

## ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Constancy, change, and measurement**

**Science as Inquiry – Content Standard A:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities necessary to do scientific inquiry**
- **Understandings about scientific inquiry**

**Physical Science – Content Standard B:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Chemical reactions**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Matter, energy, and organization in living systems**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Personal and community health**

## ***Principles and Standards for School Mathematics***

**Measurement** Instructional programs from pre-kindergarten through grade 12 should enable all students to

- understand measurable attributes of objects and the units, systems, and processes of measurement.
- apply appropriate techniques, tools, and formulas to determine measurements.

**Data Analysis and Probability** Instructional programs from pre-kindergarten through grade 12 should enable all students to

- formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
- select and use appropriate statistical methods to analyze data.
- develop and evaluate inferences and predictions that are based on data.

**Connections** Instructional programs from pre-kindergarten through grade

12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.

## ***Standards for the English Language Arts***

**Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

### **Essential Questions**

1. What is energy?
2. How is energy measured?
3. What is a calorie?
4. What is a feedstuff?
5. What is a concentrate?
6. What is a roughage?
7. How does a feed differ from a feedstuff?
8. What nutrients do different feedstuffs provide?
9. What nutritional information is found on feed labels?
10. How does a feed label compare to a food label?
11. What is nutrition?
12. Why is nutrition important to animals?
13. What is nutritional value?
14. Why is understanding nutritional value important to know of a feedstuff?
15. What is feed analysis and how is it used?
16. How can the nutrient content of a feed vary?

## **Lesson 5.4 – Nutritional Disorders**

### **Concepts**

1. Animal growth, development, and health are directly related to meeting nutrient requirements of the animal.
2. A deficiency or toxicity of one or more nutrients may result in poor growth and performance.
3. Animals at various stages of growth and development have different nutrient requirements.
4. Nutrient deficiencies in animals may result in poor performance and contribute to economic losses.

## Performance Objectives

*It is expected that students will*

- Research the nutritional disorders of a species of animal.
- Create a PowerPoint® presentation outlining nutritional disorders of a species of animal.
- Present as a team their findings of the disorders to the class.
- Develop a reference for common nutritional disorders of many animals to include in their *Producer's Management Guide*.

## Standards and Benchmarks Addressed

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

Lesson 5.4 will address parts of the following performance elements:

**AS.03. Performance Element:** Provide for the proper health care of animals.

**AS.04. Performance Element:** Apply principles of animal nutrition to ensure the proper growth, development, reproduction, and economic production of animals.

### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**
- **Form and function**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Interdependence of organisms**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Personal and community health**

### ***Standards for the English Language Arts***

**Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

- Standard 7** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
- Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## Essential Questions

1. What is a nutritional disorder?
2. How can nutritional disorders be prevented?
3. What is a deficiency?
4. What is toxicity?
5. What is the difference between a deficiency and a toxicity?
6. What determines if an animal has a nutritional deficiency?
7. What disorders are common in different species of livestock?

## Lesson 5.5 – What’s for Dinner?

### Concepts

1. Livestock rations are developed to meet the requirements of animals, maximize feed efficiency, and minimize cost of production.
2. Concentrates and roughages form the bulk of a ration.
3. Rations can be formulated using a variety of methods.
4. Supplements are used to complete a ration in order to meet the nutritional requirements of an animal.
5. Using mathematics and problem solving are important skills for animal producers when formulating rations.
6. Marketing products is essential to the success of an animal enterprise.

### Performance Objectives

*It is expected that students will*

- Read sections of a book and complete a concept of definition map as a note-taking tool.
- Describe the characteristics of a good ration.
- List the steps in balancing a ration.
- Complete conversions of feedstuffs from a dry-matter basis to an as-fed basis.
- Use the Pearson Square to balance a ration using two feedstuffs.
- Formulate a ration and create a recipe using the Pearson Square.
- Create a balanced ration for livestock by hand and by using a computer-based ration-balancing program.
- Develop a balanced ration for their Producer's Management Guide.
- Design and develop a marketing brochure for the feed they develop.

## **Standards and Benchmarks Addressed**

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 5.5 will address parts of the following performance elements:**

**AS.03. Performance Element:** Provide for the proper health care of animals.

**AS.04. Performance Element:** Apply principles of animal nutrition to ensure the proper growth, development, reproduction, and economic production of animals.

### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Evidence, models, and explanation**
- **Constancy, change, and measurement**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Matter, energy, and organization in living systems**

**Science and Technology – Content Standard E:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities of technological design**
- **Understandings about science and technology**

### ***Principles and Standards for School Mathematics***

**Number and Operations** Instructional programs from pre-kindergarten through grade 12 should enable all students to compute fluently and make reasonable estimates.

**Measurement** Instructional programs from pre-kindergarten through grade

	12 should enable all students
	<ul style="list-style-type: none"> <li>• to understand measurable attributes of objects and the units, systems, and processes of measurement.</li> <li>• to apply appropriate techniques, tools, and formulas to determine measurements.</li> </ul>
<b>Problem Solving</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students <ul style="list-style-type: none"> <li>• to solve problems that arise in mathematics and in other contexts.</li> <li>• to apply and adapt a variety of appropriate strategies to solve problems.</li> </ul>
<b>Connections</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.
<b>Representation</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to create and use representations to organize, record, and communicate mathematical ideas.

## ***Standards for the English Language Arts***

<b>Standard 3</b>	Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and other texts, their word identification strategies, and their understanding of textual features (e.g. sound-letter correspondence, sentence structure, context, graphics).
<b>Standard 7</b>	Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
<b>Standard 8</b>	Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
<b>Standard 12</b>	Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What is a ration?

2. What are the characteristics of a good ration?
3. What are the steps in balancing a ration?
4. What is dry matter?
5. How is the water content of feeds determined?
6. What are concentrates?
7. What are roughages?
8. How is the Pearson Square method used in formulating a ration?
9. What is the limitation of using the Pearson Square method?
10. What are the advantages of using ration-balancing computer program?
11. Why do producers need to find opportunities to market their products?

## Lesson 6.1 – Mom, Where Do Calves Come From?

### Concepts

1. Male and female reproductive systems differ in structure and function.
2. The female reproductive system consists of the ovary, infundibulum, fallopian tubes (oviducts), uterus, cervix, vagina, and vulva.
3. The male reproductive system consists of testes, scrotum, epididymis, vas deferens, prostate gland, Cowper's gland, seminal vesicle, urethra, and penis.

### Performance Objectives

*It is expected that students will*

- Identify and label the parts of the male and female reproductive tract.
- Describe the function of each part of the male and female reproductive tract.
- Observe a dissection of the male reproductive tract and identify the parts within the tract.
- Draw a flow chart to show the process of sperm maturation.
- Dissect a female reproductive tract and identify parts within the tract.
- Observe and compare the reproductive tracts of cows, sows, and ewes.
- Describe the path of an egg from the ovary to birth.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 6.1 will address parts of the following performance elements:**

**AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.

## ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Form and function**

**Science as Inquiry – Content Standard A:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities necessary to do scientific inquiry**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Biological evolution**
- **Matter, energy, and organization in living systems**

## ***Standards for the English Language Arts***

**Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

**Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

**Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What is a reproductive tract?
2. What are the eight major parts of the female reproductive tract?
3. What are the ten major parts of the male reproductive tract?
4. Where are the major parts of the male and female reproductive tract located in the body?
5. What are the functions of each of the parts of the female reproductive system?
6. What are the functions of each of the parts of the male reproductive system?
7. What is a sex characteristic?
8. What is a hormone?
9. What role does estrogen play in the female body?
10. What role does testosterone play in the male body?

11. What are ligaments and why are they important?

## Lesson 6.2 – Generating Generations

### Concepts

1. Straight breeding is used to produce purebred breeding stock while crossbreeding is used to produce vigorous market animals.
2. There are four breeding methods a livestock producer may choose when breeding livestock, which have advantages and disadvantages.
3. Artificial insemination and embryo transfer allow producers to improve the genetics of their animals more efficiently.
4. Cloning is possible in livestock, but not practical or widely used at the present time.
5. The potential fertility and viability of semen may be determined based on its motility, morphology, and concentration.

### Performance Objectives

*It is expected that students will*

- Distinguish between the different livestock breeding systems.
- Understand the advantages and disadvantages of breeding methods.
- Prepare slides using a variety of buffers and stains.
- Evaluate semen samples for sperm motility, morphology, and concentration.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 6.2 will address parts of the following performance elements:**

**AS.01. Performance Element:** Examine the components, historical development, global implications, and future trends of the animal systems industry.

**AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.

#### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**
- **Constancy, change, and measurement**

**Science as Inquiry – Content Standard A:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities necessary to do scientific inquiry**
- **Understandings about scientific inquiry**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Behavior of organisms**

**Science and Technology – Content Standard E:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Understandings about science and technology**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Science and technology in local, national, and global challenges**

## ***Principles and Standards for School Mathematics***

<b>Number and Operations</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to compute fluently and make reasonable estimates.
<b>Measurement</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to <ul style="list-style-type: none"><li>• understand measurable attributes of objects and the units, systems, and processes of measurement.</li><li>• apply appropriate techniques, tools, and formulas to determine measurements.</li></ul>
<b>Data Analysis and Probability</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
<b>Connections</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.
<b>Representation</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to create and use representations to organize, record, and communicate mathematical ideas.

## ***Standards for the English Language Arts***

<b>Standard 3</b>	Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and other texts, their word identification strategies, and their understanding of
-------------------	---

- textual features (e.g. sound-letter correspondence, sentence structure, context, graphics).
- Standard 5** Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.
- Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## Essential Questions

1. What is natural breeding?
2. What is crossbreeding?
3. What are the advantages and disadvantages of various breeding methods?
4. How are straight breeding and crossbreeding used in the livestock industry?
5. When should forms of inbreeding be used?
6. What are natural breeding, pasture mating, and hand breeding?
7. What is estrus synchronization?
8. What is artificial insemination?
9. What is embryo transfer?
10. What is cloning and how is it used in the livestock industry?
11. Which species most commonly utilizes each breeding method?
12. What are the proper techniques to preserve viable semen?
13. What are the indicators of quality of semen and how are they evaluated?

## Lesson 6.3 – The Pathway to Production

### Concepts

1. Reproductive processes vary by species of animal.
2. The reproductive cycle of females consists of puberty, the estrous cycle, gestation, parturition, and lactation.
3. Understanding of the estrus cycle and hormonal control is essential for reproductive success.
4. The breeding season of animals may be manipulated for economic gain.

### Performance Objectives

*It is expected that students will*

- Identify the main hormones of the estrous cycle and graph the levels of each hormone throughout the cycle.

- Research and record reproductive facts regarding the species of animal identified in the Producer’s Management Guide.
- Determine the best time to breed a horse and manage the breeding season.

## **Standards and Benchmarks Addressed**

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 6.3 will address parts of the following performance elements:**

**AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.

### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Evidence, models, and explanation**
- **Constancy, change, and measurement**
- **Form and function**

**Science as Inquiry – Content Standard A:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities necessary to do scientific inquiry**
- **Understandings about scientific inquiry**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Behavior of organisms**

**Science and Technology – Content Standard E:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities of technological design**
- **Understandings about science and technology**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Population growth**

### ***Principles and Standards for School Mathematics***

**Measurement** Instructional programs from pre-kindergarten through grade 12 should enable all students to apply appropriate techniques, tools, and formulas to determine measurements.

<b>Data Analysis and Probability</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
<b>Connections</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.
<b>Representation</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to create and use representations to organize, record, and communicate mathematical ideas.

## ***Standards for the English Language Arts***

<b>Standard 7</b>	Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
<b>Standard 8</b>	Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
<b>Standard 12</b>	Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What are the reproductive stages of animals?
2. How do hormones control the estrous cycle?
3. What are the phases of the estrous cycle?
4. Which hormone maintains pregnancy?
5. What hormone controls the release of the egg at ovulation?
6. What visual indications of estrus do animals' exhibit?
7. What is gestation?
8. What visual indications of impending parturition do animals' exhibit?
9. How can changing the breeding season be beneficial to producers?

## **Lesson 7.1 – A New Pair of Genes**

### **Concepts**

1. Fertilization of egg cells requires the joining of genetic material in the form of gametes from both male and female parents.
2. Eggs, or ova, undergo meiosis and mitosis for development of new cell tissue.
3. Mitosis has five distinct phases necessary for cell division.
4. Genetic traits, such as coat color, muscling, and horns are passed from one generation to the next by discrete units called genes.
5. Economically relevant traits can be predictably changed through genetic improvement by selective breeding.
6. Dominant and recessive genes determine the phenotypic characteristics of animals.
7. Some animals' phenotypic characteristics are expressed as sex-linked traits.

## Performance Objectives

*It is expected that students will*

- Prepare a slide to be viewed under a microscope for the purpose of examining mitosis in plant tissue.
- Examine a prepared slide of animal mitosis and make observations of the stages of mitosis.
- Compare the different stages of mitosis between plant and animal cells.
- Perform computer simulations related to genetic inheritance in order to learn about the role genetics plays in animal production.
- Conduct a probability trial to test predictions.

## Standards and Benchmarks Addressed

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 7.1 will address parts of the following performance elements:**

**AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.

**AS.05. Performance Element:** Evaluate and select animals based on scientific principles of animal production.

### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**
- **Evidence, models, and explanation**
- **Evolution and equilibrium**
- **Form and function**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **The cell**
- **Molecular basis of heredity**
- **Biological evolution**

## ***Principles and Standards for School Mathematics***

<b>Number and Operations</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to compute fluently and make reasonable estimates.
<b>Data Analysis and Probability</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to <ul style="list-style-type: none"><li>• develop and evaluate inferences and predictions that are based on data</li><li>• understand and apply basic concepts of probability</li></ul>
<b>Connections</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.

## ***Standards for the English Language Arts***

<b>Standard 8</b>	Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
<b>Standard 12</b>	Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. How are the processes of sexual reproduction in animals similar to plants?
2. Where does cell multiplication take place in an animal?
3. How is meiosis involved in animal reproduction?
4. How do meiosis and mitosis differ?
5. How can specific traits in animals be predicted in offspring?
6. What are dominant genetic traits and why are they important to understanding genetic probability?
7. What is genetics?
8. What is fertilization?
9. What is the Punnett Square method and how is it used in animal production?
10. What are the stages (phases) of mitosis?
11. What is crossbreeding?

12. What is incomplete dominance?

13. What are sex-linked traits and how are animals influenced by them?

## Lesson 7.2 – Predicting Genetic Inheritance

### Concepts

1. Genetic inheritance may be from a single gene pair, which is called a qualitative trait or through multiple gene pairs, which is called a quantitative trait.
2. Punnett Squares are used to predict the probability of inheriting qualitative traits.
3. Ratios are used to compare animals within a contemporary group.
4. Quantitative traits are a combination of heritable traits and the environment in which the animals are raised.
5. Expected Progeny Differences are utilized by producers to select animals for heritable traits.
6. Pedigrees contain important information for examining genetic history.

### Performance Objectives

*It is expected that students will*

- Use Punnett Squares to predict the probability of genetic frequencies.
- Complete a Punnett Square with a dihybrid cross.
- Calculate a contemporary group ratio.
- Compare animals based on their expected progeny differences (EPDs).
- Use EPDs in mating decisions.
- Trace genetic inheritance through a pedigree.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 7.2 will address parts of the following performance elements:**

**AS.05. Performance Element:** Evaluate and select animals based on scientific principles of animal production.

#### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Constancy, change, and measurement**
- **Evolution and equilibrium**

- Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of
- **Molecular basis of heredity**

## ***Principles and Standards for School Mathematics***

- Measurement** Instructional programs from pre-kindergarten through grade 12 should enable all students to understand measurable attributes of objects and the units, systems, and processes of measurement.
- Data Analysis and Probability** Instructional programs from pre-kindergarten through grade 12 should enable all students to understand and apply basic concepts of probability.
- Representation** Instructional programs from pre-kindergarten through grade 12 should enable all students to
- create and use representations to organize, record, and communicate mathematical ideas.
  - select, apply, and translate among mathematical representations to solve problems.

## ***Standards for the English Language Arts***

- Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- Standard 7** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
- Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What is genetic code?
2. What is genetic inheritance?
3. What is probability?
4. How are probabilities used in animal agriculture?
5. How are Punnett Squares used in animal agriculture?
6. What is the difference between qualitative and quantitative traits?

7. What is a contemporary group?
8. What is a ratio?
9. What is an index?
10. How would you utilize a ratio in genetic selection?
11. What is an Expected Progeny Difference (EPD)?
12. How would you utilize EPDs in genetic selection?
13. How would you utilize economic indexes in genetic selection?
14. What is a pedigree?
15. How can pedigrees be used in animal selection?
16. How could genomics be used for genetic selection?

## Lesson 8.1 – Popular Pathogens

### Concepts

1. Diseases are transmitted in a variety of ways.
2. Infectious disease agents can be spread by vectors and fomites.
3. Infectious diseases are caused by bacteria, viruses, fungi, protozoa, and prions.
4. Animal health management results in limiting disease and maximizing production.

### Performance Objectives

*It is expected that students will*

- Define the differences of infectious, contagious, and non-infectious diseases.
- Simulate the spread of a contagious disease and trace the route the disease takes through a population.
- Identify and sketch bacteria, mold, and protozoa from prepared slides.
- Research governmental regulatory agencies and identify primary purposes and responsibilities each agency has regarding disease prevention and control.
- Argue the role of a regulatory agency in a disease-outbreak scenario.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 8.1 will address parts of the following performance elements:**

**AS.03. Performance Element:** Provide for the proper health care of animals.

## ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Evidence, models, and explanation**
- **Constancy, change, and measurement**

**Science as Inquiry – Content Standard A:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities necessary to do scientific inquiry**
- **Understandings about scientific inquiry**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Interdependence of organisms**
- **Behavior of organisms**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Personal and community health**

## ***Principles and Standards for School Mathematics***

<b>Number and Operations</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to compute fluently and make reasonable estimates.
<b>Data Analysis and Probability</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to <ul style="list-style-type: none"><li>• formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.</li><li>• develop and evaluate inferences and predictions that are based on data.</li></ul>
<b>Problem Solving</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to solve problems that arise in mathematics and in other contexts.
<b>Reasoning and Proof</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to make and investigate mathematical conjectures.
<b>Connections</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.

## ***Standards for the English Language Arts***

- Standard 7** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
- Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## Essential Questions

1. What is a pathogen?
2. What is a disease?
3. How do you distinguish between an infectious disease, a contagious disease, and a noninfectious disease?
4. How are diseases transmitted?
5. What causes diseases?
6. What are the differences in bacteria, viruses, fungi, protozoa, and prions?
7. What are the three shapes of bacteria?
8. What is a regulatory agency?
9. How does a regulatory agency limit and control the spread of disease?
10. What is quarantine?
11. Who enforces quarantines?

## Lesson 8.2 – Diseased!

### Concepts

1. Signs of good health and poor health are used to identify illnesses.
2. The vital signs of animals vary among species.
3. Diseases are diagnosed through observation of symptoms and physical examinations.

### Performance Objectives

*It is expected that students will*

- Research and record the vital signs of an animal.

- Determine their personal vital signs.
- Compare the vital signs of an animal to a person.
- Research and record key facts and symptoms of two animal-related diseases.
- Use a template to create Diagnosing Disease cards to be used in a project and in the Producer's Management Guide.
- Diagnose diseases described in case studies using diagnostic cards.

## **Standards and Benchmarks Addressed**

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 8.2 will address parts of the following performance elements:**

**AS.03. Performance Element:** Provide for the proper health care of animals.

### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Evidence, models, and explanation**
- **Constancy, change, and measurement**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Behavior of organisms**

**Science and Technology – Content Standard E:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Understandings about science and technology**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Personal and community health**

### ***Principles and Standards for School Mathematics***

<b>Number and Operations</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to understand numbers, ways of representing numbers, relationships among numbers, and number systems.
<b>Measurement</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to understand measurable attributes of objects and the units, systems, and processes of measurement.

**Data Analysis and Probability** Instructional programs from pre-kindergarten through grade 12 should enable all students to formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

**Connections** Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.

## ***Standards for the English Language Arts***

**Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

**Standard 5** Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.

**Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

**Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What is health?
2. What is a disease?
3. What are signs of good health?
4. What are signs of poor health?
5. How are diseases diagnosed?
6. How can observing symptoms lead to a disease diagnosis?
7. What are zoonotic diseases?
8. What are vital signs?
9. Why is knowing the vital signs of an animal important?
10. Why is knowing the vital signs of a human important?
11. How do you know if a disease can be transmitted to a human from an animal?
12. What is considered a high body temperature?

## Lesson 8.3 – Bugged!

### Concepts

1. External parasites live on and in the skin of an animal at the expense of the host.
2. Internal parasites live in the organs of an animal at the expense of the host.
3. Knowledge of the life cycle of parasites can aid in their control.
4. Prevention and control of parasites is important in the production of agricultural, alternative, and companion animals.
5. There are multiple methods to determine the presence of parasite eggs in an animal, of which the laboratory is the most accurate.

### Performance Objectives

*It is expected that students will*

- Identify and diagram the life cycle of a common parasite.
- Classify parasites according to their phylum and site of infestation on the body.
- Prepare slides and observe to determine the presence of parasite eggs.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

Lesson 8.3 will address parts of the following performance elements:

**AS.03. Performance Element:** Provide for the proper health care of animals.

#### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Evidence, models, and explanation**
- **Form and function**

**Science as Inquiry – Content Standard A:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities necessary to do scientific inquiry**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Interdependence of organisms**
- **Matter, energy, and organization in living systems**
- **Behavior of organisms**

## ***Standards for the English Language Arts***

- Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- Standard 5** Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.
- Standard 7** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
- Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

### **Essential Questions**

1. What is a parasite?
2. What is a host?
3. What is the difference between an external and an internal parasite?
4. How do parasites harm animals?
5. What is the life cycle of a parasite?
6. How can you determine if an animal has internal parasites?
7. How can parasites be prevented or controlled in animals?

## **Lesson 8.4 – Pathogens Prevented**

### **Concepts**

1. Disease prevention includes vaccination, sanitation, ventilation, and nutrition and is morally and economically warranted.
2. Vaccines are available for many common diseases.
3. Record keeping is important in scheduling and administering preventative medications.

## Performance Objectives

*It is expected that students will*

- Demonstrate the proper procedures for filling a syringe for the purpose of giving shots.
- Administer intramuscular and subcutaneous shots.
- Research diseases and parasites of their animals and the preventative controls of the diseases and parasites.
- Develop a preventative care plan for their animal.
- Use publishing software to design a pamphlet for producers to use.

## Standards and Benchmarks Addressed

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 8.4 will address parts of the following performance elements:**

**AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.

**AS.03. Performance Element:** Provide for the proper health care of animals.

### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Evidence, models, and explanation**
- **Evolution and equilibrium**

**Science as Inquiry – Content Standard A:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities necessary to do scientific inquiry**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Interdependence of organisms**
- **Behavior of organisms**

**Science and Technology – Content Standard E:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities of technological design**
- **Understandings about science and technology**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Personal and community health**
- **Natural and human-induced hazards**

## ***Standards for the English Language Arts***

- Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- Standard 5** Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.
- Standard 7** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
- Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

### **Essential Questions**

1. What are vaccinations?
2. How do vaccinations increase immunity?
3. How are shots administered?
4. What is the difference between intramuscular and subcutaneous shots?
5. What is the correct vaccination schedule for the animal in my *Producer's Management Guide*?

## **Lesson 9.1 – The Products of Our Toil**

### **Concepts**

1. The primary purpose of livestock production is food and fiber.
2. Grading is used to provide a consistent and palatable product.
3. Products may be categorized as fresh or processed.
4. Consumer demand drives production and availability of fresh and processed goods.

## Performance Objectives

*It is expected that students will*

- Research an animal product and develop a presentation on that animal product.
- Work as a team to prepare and present a class lecture.
- Conduct sensory evaluation trials on meat samples and evaluate the samples.
- Taste milk samples and determine the defects, if present.
- Identify samples of cheese based on appearance and taste.
- Grade eggs based on their interior qualities using the candling and breakout methods.

## Standards and Benchmarks Addressed

### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 9.1 will address parts of the following performance elements:**

- AS.01. Performance Element:** Examine the components, historical development, global implications, and future trends of the animal systems industry.
- AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.
- AS.06. Performance Element:** Outline handling procedures for the safety of animals, producers, and consumers of animal products.

### ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**
- **Evidence, models, and explanation**
- **Constancy, change, and measurement**

**Science as Inquiry – Content Standard A:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities necessary to do scientific inquiry**
- **Understandings about scientific inquiry**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Interdependence of organisms**
- **Matter, energy, and organization in living systems**

**Science and Technology – Content Standard E:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities of technological design**
- **Understandings about science and technology**

**Science in Personal and Social Perspectives – Content Standard F:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Science and technology in local, national, and global challenges**

## ***Principles and Standards for School Mathematics***

<b>Measurement</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to understand measurable attributes of objects and the units, systems, and processes of measurement.
<b>Data Analysis and Probability</b>	Instructional programs from pre-kindergarten through grade 12 should enable all students to develop and evaluate inferences and predictions that are based on data.

## ***Standards for the English Language Arts***

<b>Standard 4</b>	Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
<b>Standard 5</b>	Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.
<b>Standard 7</b>	Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
<b>Standard 8</b>	Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
<b>Standard 12</b>	Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What is an animal product?
2. What is grading?

3. What major product do consumers receive from each type of agricultural animal?
4. What are wholesale and retail cuts?
5. What is the difference between fresh and processed products?
6. What are food safety concerns in animal products?
7. What is sensory evaluation?
8. What is palatability?
9. How do flavor, tenderness, and juiciness influence palatability?
10. What causes milk to have off-flavors?
11. What is the breakout method?
12. What is the candling method?
13. How are eggs candled?
14. What characteristics of eggs are used in assigning them a grade?

## Lesson 9.2 – In Search of the Ideal Animal

### Concepts

1. Criterion-based selection establishes priorities and provides consistency when evaluating animals.
2. Animal conformation is evaluated using priorities for each species and purpose of animal.
3. Producers use qualitative and quantitative comparison of live animals to predict value in the marketplace.
4. Offspring performance may be predicted and improved by selecting animals based on performance records.

### Performance Objectives

*It is expected that students will*

- Make decisions based on given priorities and criteria, and analyze objects as they compare ideal criteria.
- Research and identify the priorities for evaluating an animal most commonly used in that animal industry.
- Write, illustrate, and publish a children's storybook on how to select an animal.
- Determine and recommend most appropriate sires using Expected Progeny Differences.

### Standards and Benchmarks Addressed

## ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

Lesson 9.2 will address parts of the following performance elements:

**AS.02. Performance Element:** Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.

**AS.05. Performance Element:** Evaluate and select animals based on scientific principles of animal production.

## ***National Science Education Standards***

**Unifying Concepts and Processes:** As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes:

- **Systems, order, and organization**
- **Evidence, models, and explanation**
- **Constancy, change, and measurement**
- **Form and function**

**Life Science – Content Standard C:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Interdependence of organisms**
- **Behavior of organisms**

**Science and Technology – Content Standard E:** As a result of their activities in grades 9-12, all students should develop understanding of

- **Abilities of technological design**
- **Understandings about science and technology**

## ***Principles and Standards for School Mathematics***

**Number and Operations** Instructional programs from pre-kindergarten through grade 12 should enable all students to understand numbers, ways of representing numbers, relationships among numbers, and number systems.

**Measurement** Instructional programs from pre-kindergarten through grade 12 should enable all students to understand measurable attributes of objects and the units, systems, and processes of measurement.

**Data Analysis and Probability** Instructional programs from pre-kindergarten through grade 12 should enable all students to

- formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
- develop and evaluate inferences and predictions that are based on data.

**Problem Solving** Instructional programs from pre-kindergarten through grade 12 should enable all students to

- solve problems that arise in mathematics and in other contexts.
- apply and adapt a variety of appropriate strategies to solve problems.

**Connections** Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.

## ***Standards for the English Language Arts***

- Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- Standard 5** Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.
- Standard 6** Students apply knowledge of language structure, language conventions (e.g. spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and non-print texts.
- Standard 7** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
- Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What is criterion-based selection?
2. How can established priorities be used when making decisions?
3. What is conformation?
4. How do evaluating breeding and market animals differ?
5. What criteria are used in evaluating a species of animal?

6. How does data complement visual selection?
7. What are EPDs?
8. When are EPDs useful in selecting animals?

## Lesson 9.3 – Value Added

### Concepts

1. The four elements of marketing are product, price, place, and promotion.
2. Marketing of agricultural products is necessary to move goods from producer to consumer.
3. Brand name recognition, niche marketing, and value-added products increase the value of a good.
4. A solid marketing plan is necessary to increase the value and sales of a product.

### Performance Objectives

*It is expected that students will*

- Compare similar products based on their features, pricing, distribution, and promotion.
- Determine a target market and potential products based on the local community.
- Develop a plan to market a product from their project for the *Producer's Management Guide*.
- Work on a team to determine a market for a product in an appropriate local marketplace.

### Standards and Benchmarks Addressed

#### ***AFNR Career Cluster – Animal Systems Career Pathway Content Standards***

**Lesson 9.3 will address parts of the following performance elements:**

**AS.01. Performance Element:** Examine the components, historical development, global implications, and future trends of the animal systems industry.

**ABS.06. Performance Element:** Use industry-accepted marketing principles to accomplish AFNR business objectives.

#### ***Principles and Standards for School Mathematics***

**Problem Solving** Instructional programs from pre-kindergarten through grade 12 should enable all students to solve problems that arise in mathematics and in other contexts.

**Connections** Instructional programs from pre-kindergarten through grade

12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.

## ***Standards for the English Language Arts***

- Standard 4** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- Standard 5** Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.
- Standard 7** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.
- Standard 8** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- Standard 12** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

## **Essential Questions**

1. What is the difference between marketing and selling?
2. Why is marketing beneficial in agriculture?
3. What are the four P's of marketing?
4. What specialty markets exist in agriculture?
5. How are products developed and marketed?
6. How does product branding influence the marketing mix?