

# Advanced Animal Genetics

**Media Type:** Video  
**Duration:** 38 minutes

**Goal:** To gain an understanding of the structures and processes related to genetics and how they impact the livestock industry.

**Description:** This presentation explores the fundamental principles of heredity and variation. Terms such as cell, chromosomes, DNA and RNA are defined and described to aid in the understanding of the genetic processes. Detailed graphics and illustrations of topics, such as meiosis and mitosis development, will increase student comprehension of the more advanced genetic concepts. The history of inheritance is also discussed, as well as the use of technology to improve genetic outcomes and to benefit livestock industry. Collaborator: Andy Herring, Ph.D., Texas A&M University.

**Objectives:**

1. To understand the structural make up of DNA and RNA .
2. To identify and comprehend the processes related to cell division.
3. To explore the importance of animal genetics and the role it plays in the livestock industry.



Agriculture, Food & Natural Resources Career Cluster (AG)

Cluster	Standard
	Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster™.
	Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster™ and the role of agriculture, food and natural resources (AFNR) in society and the economy.
	Examine and summarize the importance of health, safety and environmental management systems in AFNR businesses.
	Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.
Animal Systems Career Pathway (AG-ANI)	Analyze historic and current trends impacting the animal systems industry.
	Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.
	Classify, evaluate and select animals based on anatomical and physiological characteristics.
	Apply principles of effective animal health care.

College & Career Readiness Anchor Standards for Reading

Reading Standards for Literacy in Science & Technical Subjects		
Key Ideas & Details	Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.	
	<table border="1"> <tr> <td>9-10.1</td> <td>Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</td> </tr> </table>	9-10.1
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## College & Career Readiness Anchor Standards for Reading

Reading Standards for Literacy in Science & Technical Subjects					
Craft & Structure	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.				
	<table border="1"> <tr> <td>9-10.4</td> <td>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.</td> </tr> <tr> <td>11-12.4</td> <td>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.</td> </tr> </table>	9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.	11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
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Integration of Knowledge & Ideas	Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.				
	<table border="1"> <tr> <td>9-10.7</td> <td>Translate quantitative or technical information expressed in words in a text into visual form and translate information expressed visually or mathematically into words.</td> </tr> <tr> <td>11-12.7</td> <td>Integrate and evaluate multiple sources of information presented in diverse formats and media in order to address a question or solve a problem.</td> </tr> </table>	9-10.7	Translate quantitative or technical information expressed in words in a text into visual form and translate information expressed visually or mathematically into words.	11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media in order to address a question or solve a problem.
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## College & Career Readiness Anchor Standards for Writing

Writing Standards for Literacy in History/Social Studies & Technical Subjects							
Text Types & Purposes	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.						
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Production & Distribution of Writing	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.						
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Research to Build & Present Knowledge	Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.						
	Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.						
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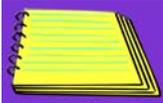


College & Career Readiness Anchor Standards for Speaking and Listening

## Speaking & Listening Standards

Comprehension & Collaboration	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.	
	Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.	
	9-10.1	Initiate and participate effectively in a range of collaborative discussions with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
	9-10.2	Integrate multiple sources of information presented in diverse media or formats evaluating the credibility and accuracy of each source.
Presentation of Knowledge & Ideas	Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.	
	Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.	
	Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.	
	9-10.4	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
	9-10.5	Make strategic use of digital media in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
	9-10.6	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

# Advanced Animal Genetics



## Lesson Plan

**Class 1:** Distribute the *Advanced Animal Genetics Vocabulary Handout* and *Worksheet* to be filled out during the presentation. Show the *Advanced Animal Genetics - Part 1*, *Advanced Animal Genetics - Part 2*, *Advanced Animal Genetics - Part 3*, *Advanced Animal Genetics - Part 4*, *Advanced Animal Genetics - Part 5* and *Advanced Animal Genetics - Part 6* segments. Complete the *Animal Cell Diagram Activity*. Assign the *DNA Model Project* as homework.



Video  
16 min.

**Class 2:** Show the *Advanced Animal Genetics - Part 7*, *Advanced Animal Genetics - Part 8*, *Advanced Animal Genetics - Part 9*, *Advanced Animal Genetics - Part 10*, *Advanced Animal Genetics - Part 11* and *Advanced Animal Genetics - Part 12* segments. Complete the *Comparisons of Mitosis & Meiosis* and *Comparison of DNA & RNA Activities*. Complete the *Heritable Traits Project*.



Video  
12 min.

**Class 3:** Show the *Advanced Animal Genetics - Part 13*, *Advanced Animal Genetics - Part 14*, *Advanced Animal Genetics - Part 15*, *Advanced Animal Genetics - Part 16*, *Advanced Animal Genetics - Part 17* and *Advanced Animal Genetics - Part 18* segments. Complete the *Genetics Lab Activity* and play the *Vocabulary Game*.



Video  
10 min.

**Class 4:** Finish the *Vocabulary Game Tournament* if needed. Complete the *Advanced Animal Genetics Crossword*. Administer the *Advanced Animal Genetics Assessment*. Allow students to finish the *DNA Model Project*.



## Lesson Links

### Association for the Advancement of Animal Breeding and Genetics

- <http://aaabg.org>

### Genetics

- <http://bowlingsite.mcf.com/genetics/genetics.html>



## Career & Technical Student Organizations

### FFA

- Livestock Judging



## Career Connections

Using the *Career Connections Activity*, allow students to explore the various careers associated with this lesson. See the *Activity* for more details. *If student licenses have been purchased:* Students will select the interviews to watch based on your directions. *If only a teacher license is purchased:* Show students all the career interviews and instruct them to only complete the interview form for the required number of interviews.

- iCEV50539, Kristi Greer, Office Manager, Global Genetics & Biologicals
- iCEV50724, Scott Sprague, Biologist, Research Branch, Arizona Game & Fish Department
- iCEV50847, Thomas Pressley, Ph.D., Professor, Department of Cell Physiology & Molecular Biophysics, Texas Tech University
- iCEV50037, Michael Heaton, Ph.D., Molecular Genomics Livestock Researcher, U.S. Meat Animal Research Center
- iCEV50484, John Keele, Ph.D., Molecular Computational Biologist, U.S. Meat Animal Research Center

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## Lab Activities

### Animal Cell Diagram

#### Directions:

Students should use the word bank on the *Animal Cell Diagram Activity* to label and color the animal cell on the sheet. They will define and describe the function of each organelle present. The organelles will be listed on the activity sheet.

### Comparison of Mitosis & Meiosis

#### Directions:

The students will fill in a chart about mitosis and meiosis provided on the *Comparison of Mitosis & Meiosis Activity*. They will define the purpose, beginning & ending chromosome number, number of cells produced, where it occurs, number of cell division, way chromosomes line up at metaphase and what separates at metaphase for mitosis and meiosis.

### Genetics Lab

#### Directions:

Students should make a list of some of their visible characteristics which are easy to test. They will find the possible phenotype and possible genotypes. They should compare characteristics with the other students in the class and test probabilities. Students will then fill out the questions on the *Genetics Lab Activity*.

### Comparisons of DNA & RNA

#### Directions:

Students will use the Venn Diagram provided to compare and contrast DNA and RNA.

### Genetics Lab

#### Directions:

Students will use the Punnett Squares provided to determine phenotypic and genotypic traits for cattle. Use the *Answer Key* to provide the correct answers.



## Projects

### DNA Model

#### Directions:

Students should build a model of DNA using four different colored pipe cleaners to represent each of the four nitrogenous bases. They will use toothpicks to represent the phosphate backbone and Super Bubble<sup>®</sup> gum as the five carbon sugars. After making the model, students should trade with a partner and undergo translation and transcription. Each model must have a minimum of ten rungs. When finished, have students demonstrate what would happen with one mutation.

### Heritable Traits

#### Directions:

Students will create an animal from the traits, such as horned/polled, hair color, double muscling trait, and any other traits prevalent in animals. Each trait will require two cups (or containers). One cup will represent the male gene and the other cup will represent the female gene. Label accordingly. Place the possible gene combinations for each particular trait in the cups. Have the students pull out one gene combination for each trait from both the male and female. From the combinations the student will draw all the possible traits for the first generation cross.

### Vocabulary Game

#### Directions:

This game is based on the television game-show *Password*. The students or players describe vocabulary words to their partner using a one word clue. Refer to the *Vocabulary Game Teacher Instruction Sheet*.