

Animal Biology Course Outline
Pre-requisite: Environmental Biology
Classes: 10-12 or instructor permission
Year long Lab Science

Course Objectives:

1. Discover the importance of livestock and the role animals play in our lives.
2. Justify the importance of food production in society and how biotechnology impacts it.
3. Demonstrate the scientific method and document all laboratory assignments and exercises.
4. Explain how an experimental design is organized.
5. Read and understand a Material Safety Data Sheet and abide by safe laboratory practices.
6. Explain how organisms are named using binomial nomenclature and scientific classification.
7. Demonstrate the correct use of a microscope and making wet mounts.
8. Understand the procedures to ensure a safe food supply.
9. Identify the common breeds of cattle, sheep, swine, goats, poultry, and characteristics of each.
10. Distinguish between ruminant and monogastric animals.
11. Examine the reproductive cycle, physiology, and anatomy of mammals.
12. List the developments that have revolutionized animal agriculture.
13. Justify the selection of different animal traits based on pedigree, conformation, and production.
14. Define terms related to animal science and biotechnology.
15. Identify common diseases, symptoms, treatments, and prevention.
16. Conduct scientific investigations related to diseases and their treatment, analysis of feedstuffs, sperm motility, selecting genes, ELISA technique, gene transfer, and oocyte extraction.
17. Analyze the basic nutritional needs of animals and how feedstuffs can meet those needs.
18. Analyze the factors that influence animal growth.
19. Understand and evaluate the history, use, and importance of biotechnology.
20. Demonstrate how hybrid animals and plants are developed through traditional breeding methods and biotechnology.
21. Understand that biotechnology and genetic engineering are controversial issues and both sides of an issue must be addressed.
22. Demonstrate, compare, contrast, and interpret genetic data from electrophoresis.
23. Apply Polymerase Chain Reaction (PCR) to genetic analysis of plants and animals.
24. Demonstrate the correct skills in running gels, mixing buffers, pouring gels, calibrating equipment, sterilization, autoclaving, and safe operation of laboratory equipment and consumables.
25. Conduct an inquiry experiment in biotechnology and present the results in a student journal publication and public presentation.
26. Understand the human genome project and its implications.

Concept Statements

1. *Farm animals are complicated organisms with systems that must function properly.*
2. *Animal agriculture is dependent on plant production for nutrition.*
3. *Animal agriculture is the crucial to the world's existence.*
4. *The scientific method is essential for conducting scientific experiments.*
5. *Safe and proper use of equipment and consumables is essential.*
6. *Scientific classification is a foundation of how organisms are named.*
7. *Animal reproduction is a foundation of production agriculture.*
8. *Animal growth and management are controlled by many factors.*
9. *Many methods are used to control animal disease.*
10. *Animal selection, nutrition, and management play an important role in the success of production.*
11. *Genetic Engineering is the basis of biotechnology*
12. *Biotechnology and its application is a controversial issue.*

Course Outline:

Animal Science

1. Basic lab practices (1 week)
 - a. Science notebooks
 - b. Microscopes
 - i. Field of measurement
 - c. Units of measurement
 - d. Record Keeping/SAE Project
 - e. Animal Classification
2. Animal Nutrition/Digestion (5 weeks)
 - a. lab analysis of feeds
 - b. calorie burning
 - c. dry matter
 - d. Nutrients and their function
 - e. Feed balancing and rations
 - f. Digestive system (ruminant vs. monogastric)
3. Anatomy and Physiology (1-2 weeks)
 - a. Heart
 - b. Lungs
 - c. Kidney
 - d. Liver
4. Animal Health (3 weeks)
 - a. Antibiotic testing
 - b. Bacteria
 - i. identification
 - ii. bacterial transformation
 - c. Viruses
 - i. method of attack
 - ii. immunity
 - iii. mutations (Bird flu example)
 - d. diagnosis
 - e. kidney function
 - f. treatments, prevention, cures
 - g. disease reports
 - h. Meat Quality Assurance practices
 - i. Bovine Spongiform Encephalopathy
5. Selection – (4 weeks)
 - a. Physical traits (phenotype = genotype+environment)
 - b. Heredity
 - c. Carcass traits
 - d. Breeding traits
 - e. Meat science
 - f. Anatomy
 - g. EPD's – progeny testing
6. Reproduction (2-3 weeks)
 - a. anatomy
 - b. hormones
 - c. heat detection
 - d. artificial insemination

- e. embryo transfer
- f. meiosis/mitosis
- g. sex-traits
- h. hybrid vigor and crossbreeding
- i. fetal development

Biotechnology:

1. History/Overview/Importance/Timeline of Biotechnology (1 week)
2. Basics: (2-3 weeks)cellular structure, eukaryotes, prokaryotes, heredity, genes, chromosomes, DNA, RNA, replication, translation, Mendelian genetics, transcription, codons, electrophoresis, protein synthesis, amino acids, transformation, mitochondrial DNA, paternity testing, recombinant DNA
 - a. DNA extraction (wheat, onion, strawberries, bacteria)
 - b. Restriction enzymes (gels)
 - c. Selecting Genes – genetic linkages, markers
 - d. Equipment and uses, calibration
3. Biotechnology in Animals (4 weeks)
 - a. Products of Biotech
 - b. Transgenic animals
 - c. ELISA technique
 - d. Animal Reproductive Techniques
 - i. semen sexing
 - ii. semen evaluation
 - iii. Oocyte extraction (invitro fertilization)
 - iv. PCR methods – extraction of DNA from animal hairs, blood, tissue
 1. paternity testing
 2. heredity
 3. comparisons between animals and parents
 4. sex linked traits
 - e. Human – Carolina Biological/Dolan Interactive
4. Biotechnology in Plants (3 weeks)
 - i. Importance to animal agriculture
 - ii. Gene transfer
 - iii. PCR of Wisconsin Fast Plants – F1, F2 generation
 - iv. Tissue culture
 - v. Agrobacterium tumefaciens
 - vi. Round-up ready corn (pesticide tolerance)
 - vii. Bt corn
 - viii. Uniformity traits and standard deviation
 - ix. Forestry
5. Issues and Ethics (3 weeks)
 - a. research project
 - b. cloning
 - c. GMO
 - d. Stem cells
 - e. detecting genetically modified foods by PCR
6. Inquiry (4 weeks)
 - a. Scientific method
 - b. Research and protocols
 - c. Possible topics

- i. Disease and pregnancy testing using the ELISA technique
 - ii. Determine genetic diversity of livestock and other animals
 - iii. Detecting genetically modified foods
 - iv. PCR and Wisconsin Fast Plants
- d. presentation and publish at a science fair (local or state)
(teams of 2-3)

Grading Policy: (based on total points)

92-100 = A
90-91.9 = A-
88-89.9 = B+
82-87.9 = B
80-81.9 = B-
78-79.9 = C+
72-77.9 = C
70-71.9 = C-
68-69.9 = D+
60-67.9 = D
0-59.9 = F

Science Notebooks:

Each lab report in the science notebook is worth 10 points, keep lab notebooks in classroom, not at home.

SAE Project – 1st semester worth 100 points

Science Research project worth 100 points, rubric given later

Homework and other assignments are usually worth between 10-40 points each

Late work not accepted after 1 week, student responsibility to make up work when absent on their own time. All late work worth 75% of points earned.

No extra credit given

Keys to success:

- Work turned in on time
- Study for quizzes
- Attendance – do not miss labs or think it is ok to miss class to do work elsewhere
- Participate and understand labs
- Pay attention and follow directions
- Put in extra effort, not one to two word answers where appropriate