

# Advanced Animal Science (IMRA26)

Subject: Career Development and Career and Technical Education

Grade: 12

Expectations: 86

Breakouts: 848

## Employability Skills

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. These standards may not be offered as a standalone course. These standards shall be offered together with the essential knowledge and skills for career and technical education (CTE) courses in this chapter.

(c) Introduction.

- (1) CTE instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.
- (2) The goal of the employability skills standards is to ensure that students develop essential skills for effective performance in the workplace, regardless of the occupation.
- (3) These standards are required to be addressed in their entirety as part of each CTE course based on the level of the course in a CTE program of study.
- (4) CTE courses identified as Level 1 or Level 2 courses in a CTE program of study must address the employability skills standards identified in subsection (d)(1) of this section.
- (5) CTE courses identified as Level 3 or Level 4 courses in a CTE program of study must address the employability skills standards identified in subsection (d)(2) of this section.
- (6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

## Advanced Animal Science

(a) Implementation

- (1) The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.
- (2) School districts shall implement the employability skills student expectations listed in §127.15(d)(2) of this chapter (relating to Career and Technical Education Employability Skills) as an integral part of this course.

(b) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: Biology and Chemistry or Integrated Physics and Chemistry (IPC); Algebra I and Geometry; and either Small Animal Management, Equine Science, or Livestock and Poultry Production. Recommended prerequisite: Veterinary Science. Students must meet the 40% laboratory and fieldwork requirement. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

- (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
- (2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.
- (3) Advanced Animal Science examines the interrelatedness of human, scientific, and technological dimensions of animal production, including canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorpha production. Instruction is designed to allow for the application of scientific and technological aspects of animal science through field and laboratory experiences. To prepare for careers in the field of animal science, students must attain academic knowledge and skills, acquire knowledge and skills related to animal systems, and develop knowledge and skills regarding career opportunities, entry requirements, and industry standards. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills in a variety of settings.
- (4) Nature of science. Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.
- (5) Scientific hypotheses and theories. Students are expected to know that:
  - (A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and
  - (B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.
- (6) Scientific inquiry. Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.
  - (A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.
  - (B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.
- (7) Science and social ethics. Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).
- (8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter.

Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide tools for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and Skills Statements

(0) Employability skills--Levels 3 and 4. In a CTE course identified as a Level 3 or Level 4 course in a CTE program of study, the student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

- (A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site
  - (i) demonstrate dressing appropriately for the profession
  - (ii) demonstrate speaking politely for the profession
  - (iii) demonstrate conducting oneself in a manner appropriate for the profession
  - (iv) demonstrate dressing appropriately for the work site
  - (v) demonstrate speaking politely for the work site
  - (vi) demonstrate conducting oneself in a manner appropriate for the work site
- (B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;
  - (i) analyze how teams can produce better outcomes through cooperation from members of the team
  - (ii) analyze how teams can produce better outcomes through contribution from members of the team
  - (iii) analyze how teams can produce better outcomes through collaboration from members of the team
- (C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions;
  - (i) present written technical communication in a clear manner for a variety of purposes, including explaining decisions
  - (ii) present written technical communication in a concise manner for a variety of purposes, including explaining decisions
  - (iii) present written technical communication in a[n] effective manner for a variety of purposes, including explaining decisions
  - (iv) present written technical communication in a clear manner for a variety of audiences, including explaining decisions
  - (v) present written technical communication in a concise manner for a variety of audiences, including explaining decisions

- (vi) present written technical communication in a[n] effective manner for a variety of audiences, including explaining decisions
- (vii) present written technical communication in a clear manner for a variety of purposes, including justifying decisions
- (viii) present written technical communication in a concise manner for a variety of purposes, including justifying decisions
- (ix) present written technical communication in a[n] effective manner for a variety of purposes, including justifying decisions
- (x) present written technical communication in a clear manner for a variety of audiences, including justifying decisions
- (xi) present written technical communication in a concise manner for a variety of audiences, including justifying decisions
- (xii) present written technical communication in a[n] effective manner for a variety of audiences, including justifying decisions
- (xiii) present written oral communication in a clear manner for a variety of purposes, including explaining decisions
- (xiv) present written oral communication in a concise manner for a variety of purposes, including explaining decisions
- (xv) present written oral communication in a[n] effective manner for a variety of purposes, including explaining decisions
- (xvi) present written oral communication in a clear manner for a variety of audiences, including explaining decisions
- (xvii) present written oral communication in a concise manner for a variety of audiences, including explaining decisions
- (xviii) present written oral communication in a[n] effective manner for a variety of audiences, including explaining decisions
- (xix) present written oral communication in a clear manner for a variety of purposes, including justifying decisions
- (xx) present written oral communication in a concise manner for a variety of purposes, including justifying decisions
- (xxi) present written oral communication in a[n] effective manner for a variety of purposes, including justifying decisions
- (xxii) present written oral communication in a clear manner for a variety of audiences, including justifying decisions
- (xxiii) present written oral communication in a concise manner for a variety of audiences, including justifying decisions
- (xxiv) present written oral communication in a[n] effective manner for a variety of audiences, including justifying decisions

- (D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;
  - (i) use time-management skills independently to prioritize tasks in a way that optimizes efficiency
  - (ii) use time-management skills independently to prioritize tasks in a way that optimizes results
  - (iii) use time-management skills independently to follow schedules in a way that optimizes efficiency
  - (iv) use time-management skills independently to follow schedules in a way that optimizes results
  - (v) use time-management skills independently tend to goal-relevant activities in a way that optimizes efficiency
  - (vi) use time-management skills independently tend to goal-relevant activities in a way that optimizes results
  - (vii) use time-management skills in groups to prioritize tasks in a way that optimizes efficiency
  - (viii) use time-management skills in groups to prioritize tasks in a way that optimizes results
  - (ix) use time-management skills in groups to follow schedules in a way that optimizes efficiency
  - (x) use time-management skills in groups to follow schedules in a way that optimizes results
  - (xi) use time-management skills in groups tend to goal-relevant activities in a way that optimizes efficiency
  - (xii) use time-management skills in groups tend to goal-relevant activities in a way that optimizes results
- (E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;
  - (i) describe the importance of punctuality in reporting for duty
  - (ii) describe the importance of dependability in reporting for duty
  - (iii) describe the importance of reliability in reporting for duty
  - (iv) describe the importance of responsibility in reporting for duty
  - (v) describe the importance of punctuality in performing assigned tasks as directed
  - (vi) describe the importance of dependability in performing assigned tasks as directed
  - (vii) describe the importance of reliability in performing assigned tasks as directed
  - (viii) describe the importance of responsibility in performing assigned tasks as directed
- (F) demonstrate respect for differences in the workplace;
  - (i) demonstrate respect for differences in the workplace
- (G) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;
  - (i) identify the importance of meritocracy in the workplace
  - (ii) identify the importance of a hard work ethic in the workplace
  - (iii) identify the importance of equal opportunity in the workplace
  - (iv) identify the benefits of meritocracy in the workplace
  - (v) identify the benefits of a hard work ethic in the workplace

- (vi) identify the benefits of equal opportunity in the workplace
  - (H) identify consequences relating to discrimination and harassment;
    - (i) identify consequences relating to discrimination
    - (ii) identify consequences relating to harassment
  - (I) demonstrate knowledge of personal and occupational health and safety, applicable regulations, and first aid in the workplace and discuss why it is critical for employees and employers to maintain a safe work environment;
    - (i) demonstrate knowledge of personal health in the workplace
    - (ii) demonstrate knowledge of personal safety in the workplace
    - (iii) demonstrate knowledge of occupational health in the workplace
    - (iv) demonstrate knowledge of occupational safety in the workplace
    - (v) demonstrate knowledge of applicable regulations in the workplace
    - (vi) demonstrate knowledge of first aid in the workplace
    - (vii) discuss why it is critical for employees to maintain a safe work environment
    - (viii) discuss why it is critical for employers to maintain a safe work environment
  - (J) compare skills and characteristics of managers and leaders in the workplace; and
    - (i) compare skills and characteristics of managers in the workplace
    - (ii) compare skills and characteristics of leaders in the workplace
  - (K) identify career development opportunities in the field: education and training; credentialing; internships and apprenticeships; and entrepreneurship opportunities; and
    - (i) identify career development opportunities in the field: education
    - (ii) identify career development opportunities in the field: training
    - (iii) identify career development opportunities in the field: credentialing
    - (iv) identify career development opportunities in the field: internships
    - (v) identify career development opportunities in the field: apprenticeships
    - (vi) identify career development opportunities in the field: entrepreneurship opportunities
  - (L) demonstrate an understanding of legal and ethical responsibilities in relation to the field.
    - (i) demonstrate an understanding of legal responsibilities in relation to the field
    - (ii) demonstrate an understanding of ethical responsibilities in relation to the field
- (1) Scientific and engineering practices. The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:
- (A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

- (i) ask questions based on observations or information from text, phenomena, models, or investigations
  - (ii) define problems based on observations or information from text, phenomena, models, or investigations
- (B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;
- (i) apply scientific practices to plan descriptive investigations
  - (ii) apply scientific practices to plan comparative investigations
  - (iii) apply scientific practices to plan experimental investigations
  - (iv) apply scientific practices to conduct descriptive investigations
  - (v) apply scientific practices to conduct comparative investigations
  - (vi) apply scientific practices to conduct experimental investigations
  - (vii) use engineering practices to design solutions to problems
- (C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;
- (i) use appropriate safety equipment during laboratory investigations as outlined in Texas Education Agency-approved safety standards
  - (ii) use appropriate safety equipment during classroom investigations as outlined in Texas Education Agency-approved safety standards
  - (iii) use appropriate safety equipment during field investigations as outlined in Texas Education Agency-approved safety standards
  - (iv) use appropriate safety practices during laboratory investigations as outlined in Texas Education Agency-approved safety standards
  - (v) use appropriate safety practices during classroom investigations as outlined in Texas Education Agency-approved safety standards
  - (vi) use appropriate safety practices during field investigations as outlined in Texas Education Agency-approved safety standards
- (D) use appropriate tools such as dissection equipment, standard laboratory glassware, microscopes, various prepared slides, measuring devices, micropipettors, hand lenses, thermometers, hot plates, laboratory notebook, timing devices, cameras, Petri dishes, laboratory incubators, models, diagrams, and samples of biological specimens, syringes, needles, scalpels, microscopes slides, cover slips, artificial insemination equipment, and drench gun;
- (i) use appropriate tools
- (E) collect quantitative data using the International System of Units (SI) and qualitative data as evidence;
- (i) collect quantitative data using the International System of Units (SI) as evidence
  - (ii) collect qualitative data as evidence
- (F) organize quantitative and qualitative data using calculators, computers, software, laboratory notebook, recordkeeping system, and reliable sources;
- (i) organize quantitative data using calculators

- (ii) organize quantitative data using computers
- (iii) organize quantitative data using software
- (iv) organize quantitative data using laboratory notebook
- (v) organize quantitative data using recordkeeping system
- (vi) organize quantitative data using reliable sources
- (vii) organize qualitative data using calculators
- (viii) organize qualitative data using computers
- (ix) organize qualitative data using software
- (x) organize qualitative data using laboratory notebook
- (xi) organize qualitative data using recordkeeping system
- (xii) organize qualitative data using reliable sources

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

- (i) develop models to represent phenomena, systems, processes, or solutions to engineering problems
- (ii) use models to represent phenomena, systems, processes, or solutions to engineering problems

(H) distinguish between scientific hypotheses, theories, and laws.

- (i) distinguish between scientific hypotheses, theories, and laws

(2) Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

- (i) identify advantages of models
- (ii) identify limitations of models

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

- (i) analyze data by identifying significant statistical features
- (ii) analyze data by identifying patterns
- (iii) analyze data by identifying sources of error
- (iv) analyze data by identifying limitations

(C) use mathematical calculations to assess quantitative relationships in data; and

- (i) use mathematical calculations to assess quantitative relationships in data

(D) evaluate experimental and engineering designs.

- (i) evaluate experimental designs
- (ii) evaluate engineering designs

- (3) Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:
- (A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;
    - (i) develop explanations supported by data
    - (ii) develop explanations supported by models
    - (iii) develop explanations consistent with scientific ideas
    - (iv) develop explanations consistent with scientific principles
    - (v) develop explanations consistent with scientific theories
    - (vi) propose solutions supported by data
    - (vii) propose solutions supported by models
    - (viii) propose solutions consistent with scientific ideas
    - (ix) propose solutions consistent with scientific principles
    - (x) propose solutions consistent with scientific theories
  - (B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
    - (i) communicate explanations individually in a variety of settings
    - (ii) communicate explanations individually in a variety of formats
    - (iii) communicate explanations collaboratively in a variety of settings
    - (iv) communicate explanations collaboratively in a variety of formats
    - (v) communicate solutions individually in a variety of settings
    - (vi) communicate solutions individually in a variety of formats
    - (vii) communicate solutions collaboratively in a variety of settings
    - (viii) communicate solutions collaboratively in a variety of formats
  - (C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.
    - (i) engage respectfully in scientific argumentation using applied scientific explanations
    - (ii) engage respectfully in scientific argumentation using empirical evidence
- (4) Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to:
- (A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;
    - (i) analyze scientific explanations by using empirical evidence to encourage critical thinking by the student
    - (ii) analyze scientific explanations by using logical reasoning to encourage critical thinking by the student

- (iii) analyze scientific explanations by using experimental and observational testing to encourage critical thinking by the student
  - (iv) analyze scientific solutions by using empirical evidence to encourage critical thinking by the student
  - (v) analyze scientific solutions by using logical reasoning to encourage critical thinking by the student
  - (vi) analyze scientific solutions by using experimental and observational testing to encourage critical thinking by the student
  - (vii) evaluate scientific explanations by using empirical evidence to encourage critical thinking by the student
  - (viii) evaluate scientific explanations by using logical reasoning to encourage critical thinking by the student
  - (ix) evaluate scientific explanations by using experimental and observational testing to encourage critical thinking by the student
  - (x) evaluate scientific solutions by using empirical evidence to encourage critical thinking by the student
  - (xi) evaluate scientific solutions by using logical reasoning to encourage critical thinking by the student
  - (xii) evaluate scientific solutions by using experimental and observational testing to encourage critical thinking by the student
  - (xiii) critique scientific explanations by using empirical evidence to encourage critical thinking by the student
  - (xiv) critique scientific explanations by using logical reasoning to encourage critical thinking by the student
  - (xv) critique scientific explanations by using experimental and observational testing to encourage critical thinking by the student
  - (xvi) critique scientific solutions by using empirical evidence to encourage critical thinking by the student
  - (xvii) critique scientific solutions by using logical reasoning to encourage critical thinking by the student
  - (xviii) critique scientific solutions by using experimental and observational testing to encourage critical thinking by the student
- (B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and
- (i) relate the impact of past research on scientific thought including research methodology of diverse scientists as related to the content
  - (ii) relate the impact of past research on scientific thought including cost-benefit analysis of diverse scientists as related to the content
  - (iii) relate the impact of past research on scientific thought including contributions of diverse scientists as related to the content
  - (iv) relate the impact of past research on society including research methodology of diverse scientists as related to the content
  - (v) relate the impact of past research on society including cost-benefit analysis of diverse scientists as related to the content
  - (vi) relate the impact of past research on society including contributions of diverse scientists as related to the content

- (vii) relate the impact of current research on scientific thought including research methodology of diverse scientists as related to the content
- (viii) relate the impact of current research on scientific thought including cost-benefit analysis of diverse scientists as related to the content
- (ix) relate the impact of current research on scientific thought including contributions of diverse scientists as related to the content
- (x) relate the impact of current research on society including research methodology of diverse scientists as related to the content
- (xi) relate the impact of current research on society including cost-benefit analysis of diverse scientists as related to the content
- (xii) relate the impact of current research on society including contributions of diverse scientists as related to the content

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field in order to investigate STEM careers.

- (i) research resources in order to investigate STEM careers
- (ii) explore resources in order to investigate STEM careers

(5) The student develops a supervised agricultural experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agricultural experience program as an experiential learning activity; and

- (i) plan a supervised agricultural experience program as an experiential learning activity
- (ii) propose a supervised agricultural experience program as an experiential learning activity
- (iii) conduct a supervised agricultural experience program as an experiential learning activity
- (iv) document a supervised agricultural experience program as an experiential learning activity
- (v) evaluate a supervised agricultural experience program as an experiential learning activity

(B) use appropriate record-keeping skills in a supervised agricultural experience program.

- (i) use appropriate record-keeping skills in a supervised agricultural experience program

(6) The student develops leadership skills through participation in an agricultural youth organization. The student is expected to:

(A) participate in youth agricultural leadership opportunities;

- (i) participate in youth agricultural leadership opportunities

(B) review and participate in a local program of activities; and

- (i) review a local program of [agricultural] activities
- (ii) participate in a local program of [agricultural] activities

(C) create or update documentation of relevant agricultural experience such as community service, professional, or classroom experiences.

(i) create or update documentation of relevant agricultural experience

(7) The student analyzes the history, domestication, and evaluation of animals, including canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs. The student is expected to:

(A) research and describe the history, including evolution, domestication, and introduction of species to countries, of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;

(i) research the history, including evolution of canine

(ii) research the history, including evolution of feline

(iii) research the history, including evolution of bovine

(iv) research the history, including evolution of equine

(v) research the history, including evolution of caprine

(vi) research the history, including evolution of porcine

(vii) research the history, including evolution of ovine

(viii) research the history, including evolution of poultry

(ix) research the history, including evolution of lagomorphs

(x) describe the history, including evolution of canine

(xi) describe the history, including evolution of feline

(xii) describe the history, including evolution of bovine

(xiii) describe the history, including evolution of equine

(xiv) describe the history, including evolution of caprine

(xv) describe the history, including evolution of porcine

(xvi) describe the history, including evolution of ovine

(xvii) describe the history, including evolution of poultry

(xviii) describe the history, including evolution of lagomorphs

(xix) research the history, including domestication of canine

(xx) research the history, including domestication of feline

(xxi) research the history, including domestication of bovine

(xxii) research the history, including domestication of equine

(xxiii) research the history, including domestication of caprine

(xxiv) research the history, including domestication of porcine

(xxv) research the history, including domestication of ovine

(xxvi) research the history, including domestication of poultry

- (xxvii) research the history, including domestication of lagomorphs
- (xxviii) describe the history, including domestication of canine
- (xxix) describe the history, including domestication of feline
- (xxx) describe the history, including domestication of bovine
- (xxxi) describe the history, including domestication of equine
- (xxxii) describe the history, including domestication of caprine
- (xxxiii) describe the history, including domestication of porcine
- (xxxiv) describe the history, including domestication of ovine
- (xxxv) describe the history, including domestication of poultry
- (xxxvi) describe the history, including domestication of lagomorphs
- (xxxvii) research the history [of canine], including [the] introduction of species to countries
- (xxxviii) research the history [of feline], including [the] introduction of species to countries
- (xxxix) research the history [of bovine] including [the] introduction of species to countries
  - (xl) research the history [of equine], including [the] introduction of species to countries
  - (xli) research the history [of caprine], including [the] introduction of species to countries
  - (xlii) research the history [of porcine], including [the] introduction of species to countries
  - (xliii) research the history [of ovine], including [the] introduction of species to countries
  - (xliv) research the history [of poultry], including [the] introduction of species to countries
  - (xlv) research the history [of lagomorphs], including [the] introduction of species to countries
  - (xlvii) describe the history [of canine], including [the] introduction of species to countries
  - (xlviii) describe the history [of feline], including [the] introduction of species to countries
  - (xlviii) describe the history [of bovine] including [the] introduction of species to countries
  - (xlix) describe the history [of equine], including [the] introduction of species to countries
    - (l) describe the history [of caprine], including [the] introduction of species to countries
    - (li) describe the history [of porcine], including [the] introduction of species to countries
    - (lii) describe the history [of ovine], including [the] introduction of species to countries
    - (liii) describe the history [of poultry], including [the] introduction of species to countries
    - (liv) describe the history [of lagomorphs], including [the] introduction of species to countries
- (B) analyze and describe how changes in the global food market impact the animal production industry; and
  - (i) analyze how changes in the global food market impact the animal production industry
  - (ii) describe how changes in the global food market impact the animal production industry

(C) evaluate breeds of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorph based on purpose and conformation.

- (i) evaluate breeds of canine based on purpose
- (ii) evaluate breeds of feline based on purpose
- (iii) evaluate breeds of bovine based on purpose
- (iv) evaluate breeds of equine based on purpose
- (v) evaluate breeds of caprine based on purpose
- (vi) evaluate breeds of porcine based on purpose
- (vii) evaluate breeds of ovine based on purpose
- (viii) evaluate breeds of poultry based on purpose
- (ix) evaluate breeds of lagomorph based on purpose
- (x) evaluate breeds of canine based on conformation
- (xi) evaluate breeds of feline based on conformation
- (xii) evaluate breeds of bovine based on conformation
- (xiii) evaluate breeds of equine based on conformation
- (xiv) evaluate breeds of caprine based on conformation
- (xv) evaluate breeds of porcine based on conformation
- (xvi) evaluate breeds of ovine based on conformation
- (xvii) evaluate breeds of poultry based on conformation
- (xviii) evaluate breeds of lagomorph based on conformation

(8) The student defines how an organism grows and how specialized cells, tissues, and organs develop. The student is expected to:

- (A) compare cells to show specialization of structure and function;
  - (i) compare cells to show specialization of structure
  - (ii) compare cells to show specialization of function
- (B) explain cell division, including mitosis and meiosis;
  - (i) explain cell division, including mitosis
  - (ii) explain cell division, including meiosis
- (C) explain cell differentiation in the development of tissues and organs; and
  - (i) explain cell differentiation in the development of tissues
  - (ii) explain cell differentiation in the development of organs
- (D) identify and explain the biological levels of organization in animals.

- (i) identify the biological levels of organization in animals
- (ii) explain the biological levels of organization in animals

(9) The student examines and compares anatomy and physiology in animals. The student is expected to:

(A) compare the external anatomy of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;

- (i) compare the external anatomy of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs

(B) identify the anatomical structures and physiological functions of the skeletal, muscular, circulatory, genitourinary, respiratory, nervous, immune, and endocrine systems of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs; and

- (i) identify the anatomical structures of the skeletal systems of canine
- (ii) identify the anatomical structures of the skeletal systems of feline
- (iii) identify the anatomical structures of the skeletal systems of bovine
- (iv) identify the anatomical structures of the skeletal systems of equine
- (v) identify the anatomical structures of the skeletal systems of caprine
- (vi) identify the anatomical structures of the skeletal systems of porcine
- (vii) identify the anatomical structures of the skeletal systems of ovine
- (viii) identify the anatomical structures of the skeletal systems of poultry
- (ix) identify the anatomical structures of the skeletal systems of lagomorphs
- (x) identify the anatomical structures of the muscular systems of canine
- (xi) identify the anatomical structures of the muscular systems of feline
- (xii) identify the anatomical structures of the muscular systems of bovine
- (xiii) identify the anatomical structures of the muscular systems of equine
- (xiv) identify the anatomical structures of the muscular systems of caprine
- (xv) identify the anatomical structures of the muscular systems of porcine
- (xvi) identify the anatomical structures of the muscular systems of ovine
- (xvii) identify the anatomical structures of the muscular systems of poultry
- (xviii) identify the anatomical structures of the muscular systems of lagomorphs
- (xix) identify the anatomical structures of the circulatory systems of canine
- (xx) identify the anatomical structures of the circulatory systems of feline
- (xxi) identify the anatomical structures of the circulatory systems of bovine
- (xxii) identify the anatomical structures of the circulatory systems of equine
- (xxiii) identify the anatomical structures of the circulatory systems of caprine
- (xxiv) identify the anatomical structures of the circulatory systems of porcine

- (xxv) identify the anatomical structures of the circulatory systems of ovine
- (xxvi) identify the anatomical structures of the circulatory systems of poultry
- (xxvii) identify the anatomical structures of the circulatory systems of lagomorphs
- (xxviii) identify the anatomical structures of the genitourinary systems of canine
- (xxix) identify the anatomical structures of the genitourinary systems of feline
- (xxx) identify the anatomical structures of the genitourinary systems of bovine
- (xxxi) identify the anatomical structures of the genitourinary systems of equine
- (xxxii) identify the anatomical structures of the genitourinary systems of caprine
- (xxxiii) identify the anatomical structures of the genitourinary systems of porcine
- (xxxiv) identify the anatomical structures of the genitourinary systems of ovine
- (xxxv) identify the anatomical structures of the genitourinary systems of poultry
- (xxxvi) identify the anatomical structures of the genitourinary systems of lagomorphs
- (xxxvii) identify the anatomical structures of the respiratory systems of canine
- (xxxviii) identify the anatomical structures of the respiratory systems of feline
- (xxxix) identify the anatomical structures of the respiratory systems of bovine
- (xl) identify the anatomical structures of the respiratory systems of equine
- (xli) identify the anatomical structures of the respiratory systems of caprine
- (xlii) identify the anatomical structures of the respiratory systems of porcine
- (xlili) identify the anatomical structures of the respiratory systems of ovine
- (xliv) identify the anatomical structures of the respiratory systems of poultry
- (xlv) identify the anatomical structures of the respiratory systems of lagomorphs
- (xlvi) identify the anatomical structures of the nervous systems of canine
- (xlvii) identify the anatomical structures of the nervous systems of feline
- (xlviii) identify the anatomical structures of the nervous systems of bovine
- (xlix) identify the anatomical structures of the nervous systems of equine
- (l) identify the anatomical structures of the nervous systems of caprine
- (li) identify the anatomical structures of the nervous systems of porcine
- (lii) identify the anatomical structures of the nervous systems of ovine
- (liii) identify the anatomical structures of the nervous systems of poultry
- (liv) identify the anatomical structures of the nervous systems of lagomorphs
- (lv) identify the anatomical structures of the immune systems of canine
- (lvi) identify the anatomical structures of the immune systems of feline

- (lvii) identify the anatomical structures of the immune systems of bovine
- (lviii) identify the anatomical structures of the immune systems of equine
- (lix) identify the anatomical structures of the immune systems of caprine
- (lx) identify the anatomical structures of the immune systems of porcine
- (lxi) identify the anatomical structures of the immune systems of ovine
- (lxii) identify the anatomical structures of the immune systems of poultry
- (lxiii) identify the anatomical structures of the immune systems of lagomorphs
- (lxiv) identify the anatomical structures of the endocrine systems of canine
- (lxv) identify the anatomical structures of the endocrine systems of feline
- (lxvi) identify the anatomical structures of the endocrine systems of bovine
- (lxvii) identify the anatomical structures of the endocrine systems of equine
- (lxviii) identify the anatomical structures of the endocrine systems of caprine
- (lxix) identify the anatomical structures of the endocrine systems of porcine
- (lxx) identify the anatomical structures of the endocrine systems of ovine
- (lxxi) identify the anatomical structures of the endocrine systems of poultry
- (lxxii) identify the anatomical structures of the endocrine systems of lagomorphs
- (lxxiii) identify the physiological structures of the skeletal systems of canine
- (lxxiv) identify the physiological structures of the skeletal systems of feline
- (lxxv) identify the physiological structures of the skeletal systems of bovine
- (lxxvi) identify the physiological structures of the skeletal systems of equine
- (lxxvii) identify the physiological structures of the skeletal systems of caprine
- (lxxviii) identify the physiological structures of the skeletal systems of porcine
- (lxxix) identify the physiological structures of the skeletal systems of ovine
- (lxxx) identify the physiological structures of the skeletal systems of poultry
- (lxxxii) identify the physiological structures of the skeletal systems of lagomorphs
- (lxxxiii) identify the physiological structures of the muscular systems of canine
- (lxxxiv) identify the physiological structures of the muscular systems of feline
- (lxxxv) identify the physiological structures of the muscular systems of bovine
- (lxxxvi) identify the physiological structures of the muscular systems of equine
- (lxxxvii) identify the physiological structures of the muscular systems of caprine
- (lxxxviii) identify the physiological structures of the muscular systems of porcine
- (lxxxviii) identify the physiological structures of the muscular systems of ovine

- (lxxxix) identify the physiological structures of the muscular systems of poultry
- (xc) identify the physiological structures of the muscular systems of lagomorphs
- (xci) identify the physiological structures of the circulatory systems of canine
- (xcii) identify the physiological structures of the circulatory systems of feline
- (xciii) identify the physiological structures of the circulatory systems of bovine
- (xciv) identify the physiological structures of the circulatory systems of equine
- (xcv) identify the physiological structures of the circulatory systems of caprine
- (xcvi) identify the physiological structures of the circulatory systems of porcine
- (xcvii) identify the physiological structures of the circulatory systems of ovine
- (xcviii) identify the physiological structures of the circulatory systems of poultry
- (xcix) identify the physiological structures of the circulatory systems of lagomorphs
- (c) identify the physiological structures of the genitourinary systems of canine
- (ci) identify the physiological structures of the genitourinary systems of feline
- (cii) identify the physiological structures of the genitourinary systems of bovine
- (ciii) identify the physiological structures of the genitourinary systems of equine
- (civ) identify the physiological structures of the genitourinary systems of caprine
- (cv) identify the physiological structures of the genitourinary systems of porcine
- (cvi) identify the physiological structures of the genitourinary systems of ovine
- (cvii) identify the physiological structures of the genitourinary systems of poultry
- (cviii) identify the physiological structures of the genitourinary systems of lagomorphs
- (cix) identify the physiological structures of the respiratory systems of canine
- (cx) identify the physiological structures of the respiratory systems of feline
- (cxii) identify the physiological structures of the respiratory systems of bovine
- (cxiii) identify the physiological structures of the respiratory systems of equine
- (cxiv) identify the physiological structures of the respiratory systems of caprine
- (cxv) identify the physiological structures of the respiratory systems of porcine
- (cxvi) identify the physiological structures of the respiratory systems of ovine
- (cxvii) identify the physiological structures of the respiratory systems of poultry
- (cxviii) identify the physiological structures of the respiratory systems of lagomorphs
- (cxviii) identify the physiological structures of the nervous systems of canine
- (cxix) identify the physiological structures of the nervous systems of feline
- (cxx) identify the physiological structures of the nervous systems of bovine

- (cxxi) identify the physiological structures of the nervous systems of equine
- (cxxii) identify the physiological structures of the nervous systems of caprine
- (cxxiii) identify the physiological structures of the nervous systems of porcine
- (cxxiv) identify the physiological structures of the nervous systems of ovine
- (cxxv) identify the physiological structures of the nervous systems of poultry
- (cxxvi) identify the physiological structures of the nervous systems of lagomorphs
- (cxxvii) identify the physiological structures of the immune systems of canine
- (cxxviii) identify the physiological structures of the immune systems of feline
- (cxxix) identify the physiological structures of the immune systems of bovine
- (cxxx) identify the physiological structures of the immune systems of equine
- (cxxxii) identify the physiological structures of the immune systems of caprine
- (cxxxiii) identify the physiological structures of the immune systems of porcine
- (cxxxiv) identify the physiological structures of the immune systems of ovine
- (cxxxv) identify the physiological structures of the immune systems of poultry
- (cxxxvi) identify the physiological structures of the immune systems of lagomorphs
- (cxxxvii) identify the physiological structures of the endocrine systems of canine
- (cxxxviii) identify the physiological structures of the endocrine systems of feline
- (cxxxix) identify the physiological structures of the endocrine systems of bovine
- (cxl) identify the physiological structures of the endocrine systems of equine
- (cxli) identify the physiological structures of the endocrine systems of caprine
- (cxlii) identify the physiological structures of the endocrine systems of porcine
- (cxliii) identify the physiological structures of the endocrine systems of ovine
- (cxliiii) identify the physiological structures of the endocrine systems of poultry
- (cxliv) identify the physiological structures of the endocrine systems of lagomorphs

(C) investigate and describe the interrelationship among animal body systems.

- (i) investigate the interrelationship among animal body systems
- (ii) describe the interrelationship among animal body systems

(10) The student understands the anatomical structures and physiological functions of the digestive system to determine nutritional requirements of ruminant and non-ruminant animals. The student is expected to:

- (A) describe the structures and functions of the digestive systems of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
  - (i) describe the structures of the digestive systems of canine

- (ii) describe the structures of the digestive systems of feline
- (iii) describe the structures of the digestive systems of bovine
- (iv) describe the structures of the digestive systems of equine
- (v) describe the structures of the digestive systems of caprine
- (vi) describe the structures of the digestive systems of porcine
- (vii) describe the structures of the digestive systems of ovine
- (viii) describe the structures of the digestive systems of poultry
- (ix) describe the structures of the digestive systems of lagomorphs
- (x) describe the functions of the digestive systems of canine
- (xi) describe the functions of the digestive systems of feline
- (xii) describe the functions of the digestive systems of bovine
- (xiii) describe the functions of the digestive systems of equine
- (xiv) describe the functions of the digestive systems of caprine
- (xv) describe the functions of the digestive systems of porcine
- (xvi) describe the functions of the digestive systems of ovine
- (xvii) describe the functions of the digestive systems of poultry
- (xviii) describe the functions of the digestive systems of lagomorphs

(B) identify and describe sources of nutrients and classes of feeds for canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;

- (i) identify sources of nutrients and classes of feeds for canine
- (ii) identify sources of nutrients and classes of feeds for feline
- (iii) identify sources of nutrients and classes of feeds for bovine
- (iv) identify sources of nutrients and classes of feeds for equine
- (v) identify sources of nutrients and classes of feeds for caprine
- (vi) identify sources of nutrients and classes of feeds for porcine
- (vii) identify sources of nutrients and classes of feeds for ovine
- (viii) identify sources of nutrients and classes of feeds for poultry
- (ix) identify sources of nutrients and classes of feeds for lagomorphs
- (x) describe sources of nutrients and classes of feeds for canine
- (xi) describe sources of nutrients and classes of feeds for feline
- (xii) describe sources of nutrients and classes of feeds for bovine
- (xiii) describe sources of nutrients and classes of feeds for equine

- (xiv) describe sources of nutrients and classes of feeds for caprine
  - (xv) describe sources of nutrients and classes of feeds for porcine
  - (xvi) describe sources of nutrients and classes of feeds for ovine
  - (xvii) describe sources of nutrients and classes of feeds for poultry
  - (xviii) describe sources of nutrients and classes of feeds for lagomorphs
- (C) identify and describe the feed additives and supplements used to meet the nutritional requirements of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
- (i) identify the feed additives and supplements used to meet the nutritional requirements of canine
  - (ii) identify the feed additives and supplements used to meet the nutritional requirements of feline
  - (iii) identify the feed additives and supplements used to meet the nutritional requirements of bovine
  - (iv) identify the feed additives and supplements used to meet the nutritional requirements of equine
  - (v) identify the feed additives and supplements used to meet the nutritional requirements of caprine
  - (vi) identify the feed additives and supplements used to meet the nutritional requirements of porcine
  - (vii) identify the feed additives and supplements used to meet the nutritional requirements of ovine
  - (viii) identify the feed additives and supplements used to meet the nutritional requirements of poultry
  - (ix) identify the feed additives and supplements used to meet the nutritional requirements of lagomorphs
  - (x) describe the feed additives and supplements used to meet the nutritional requirements of canine
  - (xi) describe the feed additives and supplements used to meet the nutritional requirements of feline
  - (xii) describe the feed additives and supplements used to meet the nutritional requirements of bovine
  - (xiii) describe the feed additives and supplements used to meet the nutritional requirements of equine
  - (xiv) describe the feed additives and supplements used to meet the nutritional requirements of caprine
  - (xv) describe the feed additives and supplements used to meet the nutritional requirements of porcine
  - (xvi) describe the feed additives and supplements used to meet the nutritional requirements of ovine
  - (xvii) describe the feed additives and supplements used to meet the nutritional requirements of poultry
  - (xviii) describe the feed additives and supplements used to meet the nutritional requirements of lagomorphs
- (D) formulate rations based on different nutritional requirements, including age, gestation, lactation, sex, and purpose, for canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
- (i) formulate rations based on different nutritional requirements, including age for canine
  - (ii) formulate rations based on different nutritional requirements, including age for feline
  - (iii) formulate rations based on different nutritional requirements, including age for bovine
  - (iv) formulate rations based on different nutritional requirements, including age for equine
  - (v) formulate rations based on different nutritional requirements, including age for caprine

- (vi) formulate rations based on different nutritional requirements, including age for porcine
- (vii) formulate rations based on different nutritional requirements, including age for ovine
- (viii) formulate rations based on different nutritional requirements, including age for poultry
- (ix) formulate rations based on different nutritional requirements, including age for lagomorphs
- (x) formulate rations based on different nutritional requirements, including gestation for canine
- (xi) formulate rations based on different nutritional requirements, including gestation for feline
- (xii) formulate rations based on different nutritional requirements, including gestation for bovine
- (xiii) formulate rations based on different nutritional requirements, including gestation for equine
- (xiv) formulate rations based on different nutritional requirements, including gestation for caprine
- (xv) formulate rations based on different nutritional requirements, including gestation for porcine
- (xvi) formulate rations based on different nutritional requirements, including gestation for ovine
- (xvii) formulate rations based on different nutritional requirements, including gestation for poultry
- (xviii) formulate rations based on different nutritional requirements, including gestation for lagomorphs
- (xix) formulate rations based on different nutritional requirements, including lactation for canine
- (xx) formulate rations based on different nutritional requirements, including lactation for feline
- (xxi) formulate rations based on different nutritional requirements, including lactation for bovine
- (xxii) formulate rations based on different nutritional requirements, including lactation for equine
- (xxiii) formulate rations based on different nutritional requirements, including lactation for caprine
- (xxiv) formulate rations based on different nutritional requirements, including lactation for porcine
- (xxv) formulate rations based on different nutritional requirements, including lactation for ovine
- (xxvi) formulate rations based on different nutritional requirements, including lactation for poultry
- (xxvii) formulate rations based on different nutritional requirements, including lactation for lagomorphs
- (xxviii) formulate rations based on different nutritional requirements, including sex for canine
- (xxix) formulate rations based on different nutritional requirements, including sex for feline
- (xxx) formulate rations based on different nutritional requirements, including sex for bovine
- (xxxi) formulate rations based on different nutritional requirements, including sex for equine
- (xxxii) formulate rations based on different nutritional requirements, including sex for caprine
- (xxxiii) formulate rations based on different nutritional requirements, including sex for porcine
- (xxxiv) formulate rations based on different nutritional requirements, including sex for ovine
- (xxxv) formulate rations based on different nutritional requirements, including sex for poultry
- (xxxvi) formulate rations based on different nutritional requirements, including sex for lagomorphs
- (xxxvii) formulate rations based on different nutritional requirements, including purpose for canine

- (xxxviii) formulate rations based on different nutritional requirements, including purpose for feline
  - (xxxix) formulate rations based on different nutritional requirements, including purpose for bovine
  - (xl) formulate rations based on different nutritional requirements, including purpose for equine
  - (xli) formulate rations based on different nutritional requirements, including purpose for caprine
  - (xlii) formulate rations based on different nutritional requirements, including purpose for porcine
  - (xliii) formulate rations based on different nutritional requirements, including purpose for ovine
  - (xliv) formulate rations based on different nutritional requirements, including purpose for poultry
  - (xlv) formulate rations based on different nutritional requirements, including purpose for lagomorphs
- (E) analyze feeding practices in relation to nutritional requirements, including age, gestation, lactation, sex, and purpose, for canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
- (i) analyze feeding practices in relation to nutritional requirements, including age for canine
  - (ii) analyze feeding practices in relation to nutritional requirements, including age for feline
  - (iii) analyze feeding practices in relation to nutritional requirements, including age for bovine
  - (iv) analyze feeding practices in relation to nutritional requirements, including age for equine
  - (v) analyze feeding practices in relation to nutritional requirements, including age for caprine
  - (vi) analyze feeding practices in relation to nutritional requirements, including age for porcine
  - (vii) analyze feeding practices in relation to nutritional requirements, including age for ovine
  - (viii) analyze feeding practices in relation to nutritional requirements, including age for poultry
  - (ix) analyze feeding practices in relation to nutritional requirements, including age for lagomorphs
  - (x) analyze feeding practices in relation to nutritional requirements, including gestation for canine
  - (xi) analyze feeding practices in relation to nutritional requirements, including gestation for feline
  - (xii) analyze feeding practices in relation to nutritional requirements, including gestation for bovine
  - (xiii) analyze feeding practices in relation to nutritional requirements, including gestation for equine
  - (xiv) analyze feeding practices in relation to nutritional requirements, including gestation for caprine
  - (xv) analyze feeding practices in relation to nutritional requirements, including gestation for porcine
  - (xvi) analyze feeding practices in relation to nutritional requirements, including gestation for ovine
  - (xvii) analyze feeding practices in relation to nutritional requirements, including gestation for poultry
  - (xviii) analyze feeding practices in relation to nutritional requirements, including gestation for lagomorphs
  - (xix) analyze feeding practices in relation to nutritional requirements, including lactation for canine
  - (xx) analyze feeding practices in relation to nutritional requirements, including lactation for feline
  - (xxi) analyze feeding practices in relation to nutritional requirements, including lactation for bovine
  - (xxii) analyze feeding practices in relation to nutritional requirements, including lactation for equine

- (xxiii) analyze feeding practices in relation to nutritional requirements, including lactation for caprine
- (xxiv) analyze feeding practices in relation to nutritional requirements, including lactation for porcine
- (xxv) analyze feeding practices in relation to nutritional requirements, including lactation for ovine
- (xxvi) analyze feeding practices in relation to nutritional requirements, including lactation for poultry
- (xxvii) analyze feeding practices in relation to nutritional requirements, including lactation for lagomorphs
- (xxviii) analyze feeding practices in relation to nutritional requirements, including sex for canine
- (xxix) analyze feeding practices in relation to nutritional requirements, including sex for feline
- (xxx) analyze feeding practices in relation to nutritional requirements, including sex for bovine
- (xxxi) analyze feeding practices in relation to nutritional requirements, including sex for equine
- (xxxii) analyze feeding practices in relation to nutritional requirements, including sex for caprine
- (xxxiii) analyze feeding practices in relation to nutritional requirements, including sex for porcine
- (xxxiv) analyze feeding practices in relation to nutritional requirements, including sex for ovine
- (xxxv) analyze feeding practices in relation to nutritional requirements, including sex for poultry
- (xxxvi) analyze feeding practices in relation to nutritional requirements, including sex for lagomorphs
- (xxxvii) analyze feeding practices in relation to nutritional requirements, including purpose for canine
- (xxxviii) analyze feeding practices in relation to nutritional requirements, including purpose for feline
- (xxxix) analyze feeding practices in relation to nutritional requirements, including purpose for bovine
  - (xl) analyze feeding practices in relation to nutritional requirements, including purpose for equine
  - (xli) analyze feeding practices in relation to nutritional requirements, including purpose for caprine
  - (xlii) analyze feeding practices in relation to nutritional requirements, including purpose for porcine
  - (xliii) analyze feeding practices in relation to nutritional requirements, including purpose for ovine
  - (xliv) analyze feeding practices in relation to nutritional requirements, including purpose for poultry
  - (xlv) analyze feeding practices in relation to nutritional requirements, including purpose for lagomorphs
- (F) analyze feed quality issues and determine their effect on the health of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
  - (i) analyze feed quality issues
  - (ii) determine [feed quality issues] effect on the health of canine
  - (iii) determine [feed quality issues] effect on the health of feline
  - (iv) determine [feed quality issues] effect on the health of bovine
  - (v) determine [feed quality issues] effect on the health of equine
  - (vi) determine [feed quality issues] effect on the health of caprine
  - (vii) determine [feed quality issues] effect on the health of porcine

- (viii) determine [feed quality issues] effect on the health of ovine
- (ix) determine [feed quality issues] effect on the health of poultry
- (x) determine [feed quality issues] effect on the health of lagomorphs

(G) research and compare the nutritional value of feeds for all species discussed;

- (i) research the nutritional value of feeds for all species discussed
- (ii) compare the nutritional value of feeds for all species discussed

(H) identify forage plants used for livestock grazing and analyze the protein levels of each; and

- (i) identify forage plants used for livestock grazing
- (ii) analyze the protein levels of each [forage plant used for livestock grazing]

(I) research grazing practices such as rotational grazing and deferred grazing and explain the advantages and disadvantages of each using the scientific and engineering design process.

- (i) research grazing practices
- (ii) explain the advantages of each [grazing practice] using the scientific process
- (iii) explain the advantages of each [grazing practice] using the engineering design process
- (iv) explain the disadvantages of each [grazing practice] using the scientific process
- (v) explain the disadvantages of each [grazing practice] using the engineering design process

(11) The student understands the principles of molecular genetics and heredity. The student is expected to:

(A) explain Mendel's laws of inheritance and predict genotypes and phenotypes of offspring using a Punnett square;

- (i) explain Mendel's laws of inheritance
- (ii) predict genotypes of offspring using a Punnett square
- (iii) predict phenotypes of offspring using a Punnett square

(B) use a Punnett square and assign alleles to justify genotype and phenotype predictions;

- (i) use a Punnett square
- (ii) [using a Punnett square] assign alleles to justify genotype predictions
- (iii) [using a Punnett square] assign alleles to justify phenotype predictions

(C) identify the parts of the nucleotide and differentiate between the nucleotides found in deoxyribonucleic acid (DNA) and ribonucleic acid (RNA); and

- (i) identify the parts of the nucleotide
- (ii) differentiate between the nucleotides found in deoxyribonucleic acid (DNA) and ribonucleic acid (RNA)

(D) explain the functions of DNA and RNA.

- (i) explain the functions of DNA
- (ii) explain the functions of RNA

(12) The student applies the principles of reproduction and breeding to animal improvement. The student is expected to:

- (A) describe and compare reproductive anatomy of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
  - (i) describe reproductive anatomy of canine
  - (ii) describe reproductive anatomy of feline
  - (iii) describe reproductive anatomy of bovine
  - (iv) describe reproductive anatomy of equine
  - (v) describe reproductive anatomy of caprine
  - (vi) describe reproductive anatomy of porcine
  - (vii) describe reproductive anatomy of ovine
  - (viii) describe reproductive anatomy of poultry
  - (ix) describe reproductive anatomy of lagomorphs
  - (x) compare reproductive anatomy of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs
  
- (B) analyze and compare reproductive cycles and phases of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
  - (i) analyze reproductive cycles of canine
  - (ii) analyze reproductive cycles of feline
  - (iii) analyze reproductive cycles of bovine
  - (iv) analyze reproductive cycles of equine
  - (v) analyze reproductive cycles of caprine
  - (vi) analyze reproductive cycles of porcine
  - (vii) analyze reproductive cycles of ovine
  - (viii) analyze reproductive cycles of poultry
  - (ix) analyze reproductive cycles of lagomorphs
  - (x) analyze reproductive phases of canine
  - (xi) analyze reproductive phases of feline
  - (xii) analyze reproductive phases of bovine
  - (xiii) analyze reproductive phases of equine
  - (xiv) analyze reproductive phases of caprine
  - (xv) analyze reproductive phases of porcine
  - (xvi) analyze reproductive phases of ovine
  - (xvii) analyze reproductive phases of poultry

- (xviii) analyze reproductive phases of lagomorphs
  - (xix) compare reproductive cycles and phases of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs
- (C) correlate the reproductive cycles and phases to animal behavior;
- (i) correlate the reproductive cycles to animal behavior
  - (ii) correlate the reproductive phases to animal behavior
- (D) research breeding systems, including grading up, crossbreeding, linebreeding, and inbreeding, and explain the advantages and disadvantages of each using the scientific and engineering design process; and
- (i) research breeding systems, including grading up
  - (ii) research breeding systems, including crossbreeding
  - (iii) research breeding systems, including linebreeding
  - (iv) research breeding systems, including inbreeding
  - (v) explain the advantages of each [breeding system] using the scientific process
  - (vi) explain the advantages of each [breeding system] using the engineering design process
  - (vii) explain the disadvantages of each [breeding system] using the scientific process
  - (viii) explain the disadvantages of each [breeding system] using the engineering design process
- (E) research breeding methods, including embryo transfer, artificial insemination, and natural mating, and explain the advantages and disadvantages of each using the scientific and engineering design process.
- (i) research breeding methods, including embryo transfer
  - (ii) research breeding methods, including artificial insemination
  - (iii) research breeding methods, including natural mating
  - (iv) explain the advantages of each [breeding method] using the scientific process
  - (v) explain the advantages of each [breeding method] using the engineering design process
  - (vi) explain the disadvantages of each [breeding method] using the scientific process
  - (vii) explain the disadvantages of each [breeding method] using the engineering design process

(13) The student analyzes how diseases and parasites affect animal health. The student is expected to:

- (A) examine how factors such as geographic location, age, genetic composition, and inherited diseases influence the health of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
- (i) examine how factors influence the health of canine
  - (ii) examine how factors influence the health of feline
  - (iii) examine how factors influence the health of bovine
  - (iv) examine how factors influence the health of equine
  - (v) examine how factors influence the health of caprine

- (vi) examine how factors influence the health of porcine
  - (vii) examine how factors influence the health of ovine
  - (viii) examine how factors influence the health of poultry
  - (ix) examine how factors influence the health of lagomorphs
- (B) describe the process of immunity and disease transmission of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
- (i) describe the process of immunity of canine
  - (ii) describe the process of immunity feline
  - (iii) describe the process of immunity bovine
  - (iv) describe the process of immunity equine
  - (v) describe the process of immunity caprine
  - (vi) describe the process of immunity porcine
  - (vii) describe the process of immunity ovine
  - (viii) describe the process of immunity poultry
  - (ix) describe the process of immunity lagomorphs
  - (x) describe the process of disease transmission of canine
  - (xi) describe the process of disease transmission of feline
  - (xii) describe the process of disease transmission of bovine
  - (xiii) describe the process of disease transmission of equine
  - (xiv) describe the process of disease transmission of caprine
  - (xv) describe the process of disease transmission of porcine
  - (xvi) describe the process of disease transmission of ovine
  - (xvii) describe the process of disease transmission of poultry
  - (xviii) describe the process of disease transmission of lagomorphs
- (C) identify and describe pathogens and the diseases they cause in canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
- (i) identify pathogens in canine
  - (ii) identify pathogens in feline
  - (iii) identify pathogens in bovine
  - (iv) identify pathogens in equine
  - (v) identify pathogens in caprine
  - (vi) identify pathogens in porcine

- (vii) identify pathogens in ovine
  - (viii) identify pathogens in poultry
  - (ix) identify pathogens in lagomorphs
  - (x) identify the diseases [pathogens] cause in canine
  - (xi) identify the diseases [pathogens] cause in feline
  - (xii) identify the diseases [pathogens] cause in bovine
  - (xiii) identify the diseases [pathogens] cause in equine
  - (xiv) identify the diseases [pathogens] cause in caprine
  - (xv) identify the diseases [pathogens] cause in porcine
  - (xvi) identify the diseases [pathogens] cause in ovine
  - (xvii) identify the diseases [pathogens] cause in poultry
  - (xviii) identify the diseases [pathogens] cause in lagomorphs
  - (xix) describe pathogens in canine
  - (xx) describe pathogens in feline
  - (xxi) describe pathogens in bovine
  - (xxii) describe pathogens in equine
  - (xxiii) describe pathogens in caprine
  - (xxiv) describe pathogens in porcine
  - (xxv) describe pathogens in ovine
  - (xxvi) describe pathogens in poultry
  - (xxvii) describe pathogens in lagomorphs
  - (xxviii) describe the diseases [pathogens] cause in canine
  - (xxix) describe the diseases [pathogens] cause in feline
  - (xxx) describe the diseases [pathogens] cause in bovine
  - (xxxi) describe the diseases [pathogens] cause in equine
  - (xxxii) describe the diseases [pathogens] cause in caprine
  - (xxxiii) describe the diseases [pathogens] cause in porcine
  - (xxxiv) describe the diseases [pathogens] cause in ovine
  - (xxxv) describe the diseases [pathogens] cause in poultry
  - (xxxvi) describe the diseases [pathogens] cause in lagomorphs
- (D) describe the effects that diseases have on various body systems of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;

- (i) describe the effects that diseases have on various body systems of canine
  - (ii) describe the effects that diseases have on various body systems of feline
  - (iii) describe the effects that diseases have on various body systems of bovine
  - (iv) describe the effects that diseases have on various body systems of equine
  - (v) describe the effects that diseases have on various body systems of caprine
  - (vi) describe the effects that diseases have on various body systems of porcine
  - (vii) describe the effects that diseases have on various body systems of ovine
  - (viii) describe the effects that diseases have on various body systems of poultry
  - (ix) describe the effects that diseases have on various body systems of lagomorphs
- (E) research and explain the methods of prevention and control for diseases of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
- (i) research the methods of prevention for diseases of canine
  - (ii) research the methods of prevention for diseases of feline
  - (iii) research the methods of prevention for diseases of bovine
  - (iv) research the methods of prevention for diseases of equine
  - (v) research the methods of prevention for diseases of caprine
  - (vi) research the methods of prevention for diseases of porcine
  - (vii) research the methods of prevention for diseases of ovine
  - (viii) research the methods of prevention for diseases of poultry
  - (ix) research the methods of prevention for diseases of lagomorphs
  - (x) research the methods of control for diseases of canine
  - (xi) research the methods of control for diseases of feline
  - (xii) research the methods of control for diseases of bovine
  - (xiii) research the methods of control for diseases of equine
  - (xiv) research the methods of control for diseases of caprine
  - (xv) research the methods of control for diseases of porcine
  - (xvi) research the methods of control for diseases of ovine
  - (xvii) research the methods of control for diseases of poultry
  - (xviii) research the methods of control for diseases of lagomorphs
  - (xix) explain the methods of prevention for diseases of canine
  - (xx) explain the methods of prevention for diseases of feline
  - (xxi) explain the methods of prevention for diseases of bovine

- (xxii) explain the methods of prevention for diseases of equine
  - (xxiii) explain the methods of prevention for diseases of caprine
  - (xxiv) explain the methods of prevention for diseases of porcine
  - (xxv) explain the methods of prevention for diseases of ovine
  - (xxvi) explain the methods of prevention for diseases of poultry
  - (xxvii) explain the methods of prevention for diseases of lagomorphs
  - (xxviii) explain the methods of control for diseases of canine
  - (xxix) explain the methods of control for diseases of feline
  - (xxx) explain the methods of control for diseases of bovine
  - (xxxi) explain the methods of control for diseases of equine
  - (xxxii) explain the methods of control for diseases of caprine
  - (xxxiii) explain the methods of control for diseases of porcine
  - (xxxiv) explain the methods of control for diseases of ovine
  - (xxxv) explain the methods of control for diseases of poultry
  - (xxxvi) explain the methods of control for diseases of lagomorphs
- (F) identify parasites of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs using common and scientific names;
- (i) identify parasites of canine using common names
  - (ii) identify parasites of feline using common names
  - (iii) identify parasites of bovine using common names
  - (iv) identify parasites of equine using common names
  - (v) identify parasites of caprine using common names
  - (vi) identify parasites of porcine using common names
  - (vii) identify parasites of ovine using common names
  - (viii) identify parasites of poultry using common names
  - (ix) identify parasites of lagomorphs using common names
  - (x) identify parasites of canine using scientific names
  - (xi) identify parasites of feline using scientific names
  - (xii) identify parasites of bovine using scientific names
  - (xiii) identify parasites of equine using scientific names
  - (xiv) identify parasites of caprine using scientific names
  - (xv) identify parasites of porcine using scientific names

- (xvi) identify parasites of ovine using scientific names
  - (xvii) identify parasites of poultry using scientific names
  - (xviii) identify parasites of lagomorphs using scientific names
- (G) describe the life cycles of various parasites and relate them to animal health issues;
- (i) describe the life cycles of various parasites
  - (ii) relate [the life cycles of various parasites] to animal health issues
- (H) explain how parasites are transmitted and the effect they have on canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs;
- (i) explain how parasites are transmitted [to] canine
  - (ii) explain how parasites are transmitted [to] feline
  - (iii) explain how parasites are transmitted [to] bovine
  - (iv) explain how parasites are transmitted [to] equine
  - (v) explain how parasites are transmitted [to] caprine
  - (vi) explain how parasites are transmitted [to] porcine
  - (vii) explain how parasites are transmitted [to] ovine
  - (viii) explain how parasites are transmitted [to] poultry
  - (ix) explain how parasites are transmitted [to] lagomorphs
  - (x) explain the effect [parasites] have on canine
  - (xi) explain the effect [parasites] have on feline
  - (xii) explain the effect [parasites] have on bovine
  - (xiii) explain the effect [parasites] have on equine
  - (xiv) explain the effect [parasites] have on caprine
  - (xv) explain the effect [parasites] have on porcine
  - (xvi) explain the effect [parasites] have on ovine
  - (xvii) explain the effect [parasites] have on poultry
  - (xviii) explain the effect [parasites] have on lagomorphs
- (I) conduct or simulate parasite diagnostic tests; and
- (i) conduct or simulate parasite diagnostic tests
- (J) explain the methods of prevention, control, and treatment of parasites of canine, feline, bovine, equine, caprine, porcine, ovine, poultry, and lagomorphs.
- (i) explain the methods of prevention of [canine] parasites
  - (ii) explain the methods of prevention of [feline] parasites

- (iii) explain the methods of prevention of [bovine] parasites
- (iv) explain the methods of prevention of [equine] parasites
- (v) explain the methods of prevention of [caprine] parasites
- (vi) explain the methods of prevention of [porcine] parasites
- (vii) explain the methods of prevention of [ovine] parasites
- (viii) explain the methods of prevention of [poultry] parasites
- (ix) explain the methods of prevention of [lagomorph] parasites
- (x) explain the methods of control of [canine] parasites
- (xi) explain the methods of control of [feline] parasites
- (xii) explain the methods of control of [bovine] parasites
- (xiii) explain the methods of control of [equine] parasites
- (xiv) explain the methods of control of [caprine] parasites
- (xv) explain the methods of control of [porcine] parasites
- (xvi) explain the methods of control of [ovine] parasites
- (xvii) explain the methods of control of [poultry] parasites
- (xviii) explain the methods of control of [lagomorph] parasites
- (xix) explain the methods of treatment of [canine] parasites
- (xx) explain the methods of treatment of [feline] parasites
- (xxi) explain the methods of treatment of [bovine] parasites
- (xxii) explain the methods of treatment of [equine] parasites
- (xxiii) explain the methods of treatment of [caprine] parasites
- (xxiv) explain the methods of treatment of [porcine] parasites
- (xxv) explain the methods of treatment of [ovine] parasites
- (xxvi) explain the methods of treatment of [poultry] parasites
- (xxvii) explain the methods of treatment of [lagomorph] parasites

(14) The student discusses livestock market readiness and harvesting methods. The student is expected to:

- (A) explain the stages of animal growth and development and how they relate to market readiness;
  - (i) explain the stages of animal growth and development
  - (ii) explain how [the stages of growth and development] relate to market readiness
- (B) evaluate market class and grades of livestock;
  - (i) evaluate market class of livestock
  - (ii) evaluate grades of livestock

- (C) compare harvesting methods for various species using the scientific and engineering design process;
  - (i) compare harvesting methods for various species using the scientific process
  - (ii) compare harvesting methods for various species using the engineering design process
- (D) research and describe federal and state meat inspection standards such as safety, hygiene, and quality control standards;
  - (i) research federal meat inspection standards
  - (ii) research state meat inspection standards
  - (iii) describe federal meat inspection standards
  - (iv) describe state meat inspection standards
- (E) identify wholesale and retail cuts of meat and correlate to major muscle groups; and
  - (i) identify wholesale cuts of meat
  - (ii) identify retail cuts of meat
  - (iii) correlate [wholesale cuts of meat] to major muscle groups
  - (iv) correlate [retail cuts of meat] to major muscle groups
- (F) research animal by-products and explain their impact on society.
  - (i) research animal by-products
  - (ii) explain [animal by-products] impact on society

(15) The student explores methods of marketing animals and animal products. The student is expected to:

- (A) compare various methods of animal marketing such as auction, contract sales, private treaty, internet sales, value-based, and exhibition of various animals;
  - (i) compare various methods of animal marketing and exhibition of various animals
- (B) describe methods of marketing animal products such as farmers market, direct sales, wholesale, and retail;
  - (i) describe methods of marketing animal products
- (C) research and evaluate the effectiveness of various strategies and campaigns to market animal products based on consumption patterns and consumer preferences; and
  - (i) research the effectiveness of various strategies to market animal products based on consumption patterns
  - (ii) research the effectiveness of various strategies to market animal products based on consumer preferences
  - (iii) research the effectiveness of various campaigns to market animal products based on consumption patterns
  - (iv) research the effectiveness of various campaigns to market animal products based on consumer preferences

- (v) evaluate the effectiveness of various strategies to market animal products based on consumption patterns
  - (vi) evaluate the effectiveness of various strategies to market animal products based on consumer preferences
  - (vii) evaluate the effectiveness of various campaigns to market animal products based on consumption patterns
  - (viii) evaluate the effectiveness of various campaigns to market animal products based on consumer preferences
- (D) research and evaluate the effectiveness of various labeling options to market animal products such as organic, farm-raised, hormone-free, cage-free, grass-fed, antibiotic-free, and non-GMO labels based on consumption patterns and consumer preferences.
- (i) research the effectiveness of various labeling options to market animal products based on consumption patterns
  - (ii) research the effectiveness of various labeling options to market animal products based on consumer preferences
  - (iii) evaluate the effectiveness of various labeling options to market animal products based on consumption patterns
  - (iv) evaluate the effectiveness of various labeling options to market animal products based on consumer preferences

(16) The student demonstrates an understanding of policies and current issues in animal science. The student is expected to:

- (A) investigate and discuss the use of biotechnology and biosecurity in the animal science industry;
- (i) investigate the use of biotechnology in the animal science industry
  - (ii) investigate the use of biosecurity in the animal science industry
  - (iii) discuss the use of biotechnology in the animal science industry
  - (iv) discuss the use of biosecurity in the animal science industry
- (B) identify governmental regulations and policies such as environmental and animal welfare and research the impacts on animal production; and
- (i) identify governmental regulations on animal production
  - (ii) identify [governmental] policies on animal production
  - (iii) research impacts [of governmental regulations] on animal production
  - (iv) research impacts [of governmental policies] on animal production
- (C) identify and research a current issue in scientific animal agriculture and design a protocol to address the issue using the scientific and engineering design process.
- (i) identify a current issue in scientific animal agriculture
  - (ii) research a current issue in scientific animal agriculture
  - (iii) design a protocol to address the issue using the scientific process

- (iv) design a protocol to address the issue using the engineering design process