

Semester Outline of ALS Animals Standards

ALS: Animals Standards to be covered during Fall Semester

(Level of Importance to Course Content: *low, **medium, ***high)

Standard 1

Taxonomy and Classification

Students know that organisms are classified, concentrating on a general survey of all living things, then specifically how certain characteristics categorize animals in a taxonomic key.

AS.1.4* Identify the major features of chordates, identify the highlights of vertebrate evolution (development of jaws, cartilage to bone, and water to land), and identify the distinguishing characters of fish, birds, and mammals.

Standard 3

Development and Function of Animal Organ Systems

Students know the major vertebrate animal organ systems and the role that the cells and their development play in the function of that system. Various chemicals also influence the function of the system. It is also understood by the students how important the general health and well being of animal is; how systems are maintained by the animal; disease and parasite fighting; and organ/system communication.

Organs and Tissues

AS.3.1*** Identify the major organ systems found in vertebrate animals (fish, birds, and mammals). Focus is upon mammals.

AS.3.2*** Describe the organization of the animal body, cells, tissues, organs and organ systems. Use correct terms.

AS.3.3*** Discuss four basic tissue types: epithelial, connective, muscle, and nervous.

AS.3.4*** Discuss the integumentary, skeletal and muscular systems.

AS.3.5** Identify and describe the two layers of skin: epidermis and dermis.

AS.3.6*** Explain the functions of the skeletal system in terms of body support, mineral storage, and marrow functions.

AS.3.7** Identify the three cell types found in bones: osteoblasts, osteocytes, and osteoclasts.

AS.3.8* Identify the type of joints that are moveable or immovable.

AS.3.9** Describe how muscles are formed from repeating units called sarcomeres, and explain how actin and myosin are used to create movement.

AS.3.10** Describe the chemical process in the formation of bones and muscles and the process of calcification and its impact on animal growth.

AS.3.11** Compare and contrast muscle function under anaerobic and aerobic conditions.

- AS.3.12*** Identify the organs that make up the endocrine and nervous systems.
- AS.3.13*** Describe the relationship between endocrine, neural and brain functions.
- AS.3.14*** Describe the relationship between the senses and the nervous system.
- AS.3.15*** Describe the role of hormones on behavior and in maintaining electrolyte balance (water volume and salt). In addition, discuss how growth hormones affect the endocrine and nervous systems.
- AS.3.16*** Identify the organs that make up the circulatory and respiratory systems.

Reproduction

- AS.3.17*** Compare and contrast the reproductive organs for male and female domesticated animal species.
- AS.3.19*** Define and describe estrous cycle(s). Describe how hormones act during the estrous cycle and how they are used to suppress it.
- AS.3.20* Discuss the social implications of reproductive and genetic technologies used in animal husbandry (e.g., embryo transfer, artificial insemination, gene transfer, cloning).
- AS.3.21*** Describe spermatogenesis and sperm motility. List and explain factors that affect both.
- AS.3.22*** Describe the steps in lactation.
- AS.3.23*** Describe parturition and the method(s) used to predict when it occurs.
- AS.3.24*** Discuss puberty and its relation to sexual maturation and reproduction in animals.
- AS.3.25* Compare and contrast different mating systems and predict which would be successful with agricultural species.
- AS.3.26*** Describe homeostasis and how it is controlled. List the organs involved in the homeostatic process. Explain how pH-buffering capacity contributes to homeostasis. Describe how negative feedback acts to regulate homeostasis. Explain how organs systems interact to control body temperatures. Describe how disease agents impact homeostasis. Discuss the role of membrane receptors in the control of homeostasis. Compare and contrast how the embryo, fetus, and adults each moderate homeostasis. Compare multi-cellular systems and single cell systems.

Organ Development

- AS.3.29** Explain processes in which organ systems communicate and exchange materials. Identify the role of organs in the distribution of nutrients and energy. Compare and contrast communication and material exchange in neonatal, juvenile, and adult animals. Describe aging and its relationship to communication and material exchange among cells.
- AS.3.30*** Compare the impact of various organs and organs system on an overall organism.

Health

- AS.3.31*** Discuss the role of the immune system in host defense.
- AS.3.32*** Explain action potentials and the fact that they contribute to variables that aid in homeostasis.
- AS.3.33*** Identify the different leukocytes (white blood cells) available for immune response.
- AS.3.34*** Compare and contrast non-specific (skin, mucous, chemical, inflammation, pain, fever, swelling, and leukocytes) and specific immunity (humoral/antibody mediated and cellular immunity). Compare and contrast antigens and antibodies. Distinguish between active and passive immunity. Discuss immune system disorders and their role in animal husbandry.
- AS.3.35*** Describe the function of the animal/host defense mechanism.
- AS.3.36** Describe the use of antibiotics in animal health and describe how antibiotics work. Discuss the impact improper use of antibiotics has on antibiotic resistance.
- AS.3.37*** Describe the role of blood in the exchange of materials throughout the body including its chemical makeup, and identify the structure and explain the function of hemoglobin. In addition, describe the chemical process of material exchange in blood
- AS.3.38*** Describe the primary and secondary functions of the respiratory system.
- AS.3.39** Explain partial pressure of oxygen and its role in gas exchange in the body.
- AS.3.40** Discuss the role of blood in host defense.
- AS.3.42** Discuss the impact of disease on animal health.
- AS.3.43* Describe the various parasites and their impact on organ systems. Discuss host specificity and the importance of it.

ALS: Animals Standards to be covered during Spring Semester

(Level of Importance to Course Content: *low, **medium, *high)**

Standard 2

Molecules and Cells

Students know and understand the highlights of chemistry, biochemistry, and biological functions as they relate to the field of animal agricultural science. Included in this study are functions of the cell, such as osmosis, genes, genomes, gene research, respiration, mitosis and cytolysis, and differentiation. Chemicals that assist in cellular determination and catalysts in this area are also to be understood.

Biochemistry of molecules and cells

- AS.2.9*** Identify essential and non-essential nutrients. In addition, describe the relationship between amino acids, vitamins and minerals in the health of cells and organs.
- AS.2.10* Compare and contrast animal, plant, and bacterial cells at the biological and chemical levels.
- AS.2.11*** Describe the biochemistry and functions of animal cell membranes. In doing so, describe the fluid mosaic model of the membrane and the role of the cell membrane proteins in transporting materials in and out of cells.
- AS.2.12*** Define the terms hypertonic, hypotonic, and isotonic. Describe the phenomena of osmosis, and predict the direction that water will move given the concentrations of solutes in adjacent cells.

Biology of molecules and cells

- AS.2.13* Define the term genome. Explain the function of coding regions and noncoding regions within the genome.
- AS.2.14* Describe the genomes in animal cell's nucleus and mitochondria.
- AS.2.15* Explain the phenomenon in which differential gene expression determines which proteins are made, and how this determines the characteristics and functions of a particular cell.
- AS.2.16* Using examples relevant to animal science, track the events involved in expression of individual genes and compartmentalization of the resulting proteins.
- AS.2.21* Discuss permeability of a membrane and identify the three types of transport through membranes and the types of molecules and energy required for successful movement across a membrane.
- AS.2.22** Describe processes in which cells recycle or deal with defective and old structures. Also, discuss the life span of a cell and what happens when it dies.
- AS.2.23* Explain the importance of DNA and differentiate the following terms: genome, gene, chromatin, chromosome, and chromatids.

- AS.2.24** Describe process of cell duplication. Describe the major events of mitosis and cytokinesis.
- AS.2.25* Compare various cells functions including the differential expression of genes and protein synthesis (i.e., meat production and milk production).
- AS.2.26* Explain the roles of various specialized cells in terms of how those cells use common cell mechanisms to carry out specialized roles.
- AS.2.29*** Describe the process of cell communication/signaling and the relationship to electro-chemical compounds. Describe how cells communicate with neighboring cells.
- AS.2.31* Explain how animal cells exchange/convert energy as part of cell metabolism through processes including glycolysis, fermentation (lactic acid), and oxidative respiration.
- AS.2.32*** Describe the role of an enzyme catalyst in cell metabolism.

Standard 3

Development and Function of Animal Organ Systems

Students know the major vertebrate animal organ systems and the role that the cells and their development play in the function of that system. Various chemicals also influence the function of the system. It is also understood by the students how important the general health and well being of animal is; how systems are maintained by the animal; disease and parasite fighting; and organ/system communication.

- AS.3.41 Explain the chemical process of digestion and its products. Compare energy availability of proteins, carbohydrates, lipids, sugars, etc. Discuss the role of vitamins in the utilization of energy. Compare and contrast the chemical makeup of cellulose and starch. Describe how the digestive tract adapts to diet.

Standard 4

Animal Genetics and the Environment

Students learn more in-depth detail of the importance of genetic information and determining biological inheritance. Touching on evolutionary forces and theory of genetic diversity through the past, present, and future is mapped or predicted. Additionally, meiosis, mitosis, genetic transcription and frequency are understood, as well as the biotechnological developments and ecological impacts of cloning, domestication, hybridization, and selection.

Genes

- AS.4.1* Explain the flow of genetic information, and identify the central dogma: DNA-transcription-mRNA-translation-protein. Describe the purpose, function, and production of RNA, and explain how protein synthesis works.

- AS.4.2** Explain why organisms rely on meiosis for reproduction, and describe the steps in meiosis. Explain the purpose of synapsis and crossing over. Compare and contrast the formation of and roles of sperm and eggs.
- AS.4.3* Compare sexual and asexual reproduction including the processes and procedures, advantages/disadvantages of each.
- AS.4.4*** Be able to distinguish between autosomes and sex chromosomes.
- AS.4.5*** Describe the relationship between genotype and phenotype.
- AS.4.6** Explain the process of DNA replication and the relationship between DNA replication and cell division (mitosis and meiosis).
- AS.4.28*** Be able to explain what is involved in the field of ethology (animal behavior).
- AS.4.29** Know the difference between innate and learned behaviors.
- AS.4.30** Explain results of experiments on the genetic selection of behavioral traits.
- AS.4.31*** Explain how animals transfer thermal energy to and from the environment in order to maintain a constant internal body temperature.

Evolution

- AS.4.7** Identify the following Darwin principles: principle of variation, principle of heredity, and the principle of selection (differential reproductive success). Be able to explain the concept of a gene pool.
- AS.4.8** Be able to explain the following evolutionary forces: mutation, genetic drift, and gene flow.
- AS.4.9** Compare and contrast the types of selection: natural selection (directional, stabilizing, and disruptive), sexual selection, and artificial selection.
- AS.4.10** Explain processes through which populations of organisms naturally maintain genetic diversity and the significance of genetic diversity to evolution. Recognize that both meiosis and fertilization contribute to diversity within a gene pool. Explain how outcrossing promotes diversity.
- AS.4.11** Describe ways that animals prevent inbreeding, and discuss how genetic diversity is preserved among both herds and wild animals. Explain the disadvantages of lack of diversity in the wild and domestic animals.
- AS.4.12** List the assumptions of the Hardy-Weinberg Principle.

- AS.4.13** Compare and contrast natural selection with artificial selection, as used by humans to domesticate animals and breed improved varieties. Describe some of the traits that have been selected in the domestication of animals. Also, contrast the rates at which gene frequencies change during natural selection, artificial selection involving traditional breeding, and breeding programs involving biotechnology (e.g., cloning).
- AS.4.15*** Describe the Mendelian theory (law of segregation and the law of independent assortment) and understand its importance.
- AS.4.16*** Describe genetic diversity and natural selection and their contributions to a population's ability to adapt to environmental change. Describe the relationship between genes and alleles, and define terms including incomplete dominance, partial dominance, codominance, pleiotropy, and sex linkage.
- AS.4.17* Describe the role of biotechnology on the process of selection. Discuss the impact of biotechnology on heritability and how genes are passed on, the introduction of novel genetic information, and the use of genes from any source. Explain the role of gene markers in biotechnology applications. Describe and evaluate reproductive technology techniques inherent in biotechnology. Also, describe the impact of biotechnology on the production and synthesis of drugs.
- AS.4.18* Describe the importance of random and non-random sampling in a biotechnological environment.
- AS.4.19* Explain the science behind mammalian cloning. Compare and contrast cloning a gene and an animal.
- AS.4.27** Compare the process of domestication of different species of animals. Recall the history domestication and its role in the development of human societies.

Note: Items for the fall and spring ALS Dual Credit Exams will cover standards for each corresponding semester.