

Chino Valley Unified School District

Instructional Guide

Agriculture Biology

Course Number	5404
Department	Agriculture
Length of Course	One (1) Year, Two (2) Semesters
Grade Level	10-12
Prerequisites	Grade 'C' or better in 8 th grade Science, English 9, English 9CP, Introduction to Agriculture and successful completion of Algebra 1 or concurrently enrolled or teacher recommendation
Credit	5 units per semester/10 total credits
Repeatable	No
Board Approved	May 6, 2004

Description of Course- The student will master an understanding of the nature of living things, their environment, and their relationships with man. The student will know unity, interaction, continuity, and diversity of life. The major concepts that will be covered are cell biology, genetics, stages of maturation, ecology, evolution, and physiology. Students will have access to up-to-date laboratory equipment, science equipment, and technology. The student will be involved in an agriculture project as a “hands – on” application of classroom knowledge. Participation in leadership development activities through FFA is an integral part of this course. This course is aligned to State adopted content standards in science and meets the UC/CSU Biology entrance requirement.

Rationale of Course- Agriculture Biology emphasizes all aspects of the state science content standards primarily through lecture and class discussions. Most topics are supplemented with laboratory activities, discussions regarding current advancements/events in biology and agriculture, class projects, and research activities. Additionally, Agriculture Biology students are required to do more writing, on both class assignments and tests, than students in Biology.

Standard 1 – Students will understand that the fundamental life processes of plants and animals depend on a variety of chemical reactions. Specifically, that those reactions are carried out in specialized areas of the organism’s cells.

- 1.1 Objective: Students understand that cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.

- 1.1.1 Performance Indicator: Given dialysis tubing to mimic a semipermeable membrane, students will complete a laboratory activity that demonstrates diffusion of different sized molecules within the cell.
 - 1.1.2 Performance Indicator: Observe the permeability characteristics of a cell membrane (the effect of salt solution on plant cell membranes and/or the effect of a dye solution on a celery stalk).
- 1.2 Objective: Students understand the uses and effectiveness of enzymes as catalysts in biochemical reactions.
 - 1.2.1 Performance Indicator: Students will be able to discuss and recognize enzymes as biochemical substances that end in –ase. (For example: RNA polymerase)
 - 1.2.2 Performance Indicator: Students will conduct a lab to observe the effects of enzyme action during a chemical reaction. (For example: liver enzymes to decompose hydrogen peroxide.)
- 1.3 Objective: Students will be able to identify and discuss the similarities and differences in the structure and complexity of different cell types. (For example: prokaryotic/ eukaryotic, viral/bacteria, and animal/plant)
 - 1.3.1 Performance Indicator: Students will be able to label cellular organelles in various cell diagrams.
 - 1.3.2 Performance Indicator: Students will be able to complete a chart that compares and contrasts cell types, structures, and functions.
 - 1.3.3 Performance Indicator: Complete a lab in which students will have the opportunity to prepare, view and draw cells of different types (for example: cork cells, elodea cells, cheek cells, onion cells, and others) following correct laboratory procedures.
 - 1.3.4 Performance Indicator: State the basic ideas of the cell theory.
 - 1.3.5 Performance Indicator: Develop a three-dimensional model of a cell.
 - 1.3.6 Performance Indicator: Students will complete a lab to determine how cell size effects diffusion using potatoes cut to different sizes immersed in colored water.
- 1.4 Objective: Students will understand the process of transcription and translation of genetic material.

- 1.4.1 Performance Indicator: Sketch and label the basic structure of DNA and RNA.
- 1.4.2 Performance Indicator: Describe DNA molecule replication.
- 1.4.3 Performance Indicator: Students will be able to organize a flow of information from an incorrect order into the correct sequence of events.
- 1.4.4 Performance Indicator: Students will construct an RNA/DNA ladder using colored construction paper to show base pairing, replication, and transcription.
- 1.5 Objective: Students will be able to understand the role of the endoplasmic reticulum and the golgi apparatus in the process of protein synthesis.
 - 1.5.1 Performance Indicator: Students will be able to compare and contrast, in a written essay or test question, the structure and function of the endoplasmic reticulum and the golgi apparatus.
- 1.6 Objective: Students will understand the process of photosynthesis.
 - 1.6.1 Performance Indicator: Students will be able to write the photosynthesis equation and identify the raw materials, final product, and waste product.
 - 1.6.2 Performance Indicator: Students will distinguish between the light and dark reactions of photosynthesis.
 - 1.6.3 Performance Indicator: Students will write the net reaction of the light and dark reactions and determine the ATP molecules used as well as the total energy produced.
 - 1.6.4 Performance Indicator: Students will be able to draw and label diagrams of chloroplast molecules and discuss the flow of energy through the photosynthetic membrane.
 - 1.6.5 Performance Indicator: Students will be able to explain the impact of photosynthesis on plant production and crop yields.
- 1.7 Objective: Students will understand the role of mitochondria and cellular energy production.
 - 1.7.1 Performance Indicator: Students will diagram and discuss the role of all organelles and how they work together in the cell (for example: golgi apparatus, mitochondria, nucleus).

- 1.7.2 Performance Indicator: Using a chart format, students will be able to make a comparison between photosynthesis and respiration.
- 1.8 Objective: Students will understand the processes of glycolysis, respiration, and protein synthesis
 - 1.8.1 Performance Indicator: Students will write the equations for each of the processes above.
 - 1.8.2 Performance Indicator: Students will draw models of these reactions. For example, amino acids linking to form proteins, or sugars linking to form polysaccharides.
 - 1.8.3 Performance Indicator: Students will identify various amino acids including initiator and stop condons utilizing a triplet sequence type chart.
 - 1.8.4 Performance Indicator: Students will complete a lab to observe fermentation of yeast cells. The instructor will mix molasses with water and yeast. Let set for ½ hour. The students will then observe carbon dioxide production and rapid mitotic division of yeast cells under the microscope.
- 1.9 Objective: Students will understand that the chemosmotic gradients in the mitochondria and chloroplast store energy for ATP production
- 1.10 Objective: Students will understand the form and function of eukaryotic cells.

Standard 2- (Genetics) - Students will understand how mutation and sexual reproduction lead to genetic variation in a population.

- 2.1 Objective: Students will understand the role mitosis plays in cell reproduction and the transfer of genetic information from parent cells to daughter cells.
 - 2.1.1 Performance Indicator: Students will understand and be able to draw the signification and order of each stage of mitosis on the cell cycle.
 - 2.1.2 Performance Indicator: Students will be able to explain the structure and function of chromatics, centrioles, spindle formation, and homologous chromosomes.
 - 2.1.3 Performance Indicator: Students will be able to explain the difference between diploid and haploid in relation to the number of chromosomes.

- 2.2 Objective: Students will understand the process of meiosis and that the resulting cells have a haploid (n) chromosomal number. Additionally, that meiosis occurs in sex cells.
- 2.2.1 Performance Indicator: Students will be able to draw and label diagrams of all meiotic divisions in the correct sequence.
 - 2.2.2 Performance Indicator: Students will be able to explain the difference between Mitosis and Meiosis.
 - 2.2.3 Performance Indicator: Students will be able to explain how mutations occur, for example, crossing-over and the meiotic phase in which it occurs. Students will also understand the types of mutations (frame-shift, point, etc).
 - 2.2.4 Performance Indicator: Students will research and discuss the control of mutagenic substance and dealing with their effects as a matter of both social and individual concern.
 - 2.2.5 Performance Indicator: Students will discuss in essay form how greater genetic variation is possible with sexual rather than asexual reproduction.
 - 2.2.6 Performance Indicator: Students will develop a chart that compares and contrasts the process of mitosis with meiosis. This will be followed by a laboratory that includes the preparation and examination of slides of onion root tips and whitefish blastula.
 - 2.2.7 Performance Indicator: Students will be able to explain the formations and significance of the tetrad formation.
- 2.3 Objective: Students will understand the role of fertilization in sexual reproduction, specifically zygote formations through the fusion of female and male gametes.
- 2.3.1 Performance Indicator: Students will be able to explain that through the process of meiosis the chromosomal number is reduced by half so that when the gametes fuse, the zygote will have the correct number of chromosomes for survival.
 - 2.3.2 Performance Indicator: Students will use library references to find the number of chromosomes in various organisms.

- 2.4 Objective: Students will understand the processes of inheritance, specifically that half of an individual's DNA sequence is derived from each parent.
 - 2.4.1 Performance Indicator: Students will be able to list some patterns of human and livestock inheritance and give examples of each.
 - 2.4.2 Performance Indicator: Students will be able to explain the role of chromosomes in sex determination.
 - 2.4.3 Performance Indicator: Students will explore the scientific theory on why a sterile mule is produced when a horse and donkey breed.
 - 2.4.4 Performance Indicator: Students will be able to make correct livestock breeding decisions based on desirable characteristics within the parents and probable outcome in the offspring.

Standard 3 - Students will understand that the development of a multicellular organism from a single zygote is established at fertilization.

- 3.1 Objective: Students will understand the difference between dominant and recessive alleles.
 - 3.1.1 Performance Indicator: Given a chart of inheritable traits, students will be able to complete a survey of friends, family, and themselves, as it relates to a specific set of traits. They will be able to identify dominant/recessive and homozygous/heterozygous alleles.
 - 3.1.2 Performance Indicator: Students, working with a partner, will flip coins to determine specific genes contributed from each parent for a given list of traits. From the determined traits, students will create a visual representation of the phenotypes.
- 3.2 Objective: Students will be able to identify the differences between phenotypes and genotypes.
 - 3.2.1 Performance Indicator: Referencing the survey from 3.1.2, students will be able to list phenotypes.
- 3.3 Objective: Students will understand the genetic basis for Mendel's Law of Segregation and Independent Assortment.

- 3.3.1 Performance Indicator: Students will be able to explain P, F1, and F2 generations in the crosses of pea plants.
- 3.3.2 Performance Indicator: Students will be able to explain that chromosomes are separated in the formation of gametes (Mendel's Law of Segregation).
- 3.3.3 Performance Indicator: Students will be able to discuss the law of Independent Assortment and that factors for different characteristics are distributed to gametes independently.
- 3.4 Objective: Students will be able to construct Punnett squares to explore the possible genotypes and phenotypes of offspring given the genotype of each parent.
 - 3.4.1 Performance Indicator: Students will be able to follow the given steps to determine the possible gene combinations of an offspring by constructing and completing a Punnett square
 - 3.4.2 Performance Indicator: Students will be able to list genotype/ phenotype ratios given a completed Punnett square.
 - 3.4.3 Performance Indicator: Using a Punnett square, students will be able to predict the probability of genotypes and phenotypes of offspring.
 - 3.4.4 Performance Indicator: Students will be able to compare expected and observed results to see the future outcomes are not effected by previous trials. (Example: If a family has a male child, then their next child will not necessarily be female).
 - 3.4.4.1 Performance Indicator: Students will complete a laboratory experiment with equal samples of two substances (for example: red beans and whites beans-to observe the actual vs. expected outcomes)
 - 3.4.4.2 Performance Indicator: Students will design an experiment to examine the fact that the more trials completed, the closer the expected ratio gets to the observed ratio.
 - 3.4.5 Performance Indicator: Students will be able to utilize the branching technique for two factor crosses (for example: dihybrid, dihybrid cross) and extrapolate accompanying ratios.
- 3.5 Objective: Students will be able to construct and interpret pedigree diagrams to indicate phenotypes.

- 3.5.1 Performance Indicator: Given examples of the genotypes of a member of a family, students will be able to construct pedigrees to predict possible phenotypes/genotypes of offspring.
- 3.5.2 Performance Indicator: Students will select a genetic disorder common in livestock, tell how genes control it, and how an agriculturalist could use a pedigree diagram to make appropriate breeding decisions.
- 3.6 Objective: Students will understand the difference between autosomal and sex chromosomes.
 - 3.6.1 Performance Indicator: Students will understand that autosomes undergo mitosis and sex chromosomes undergo meiosis.

Standard 4-Students will understand that genes are a set of instructions encoded in the DNA sequence of each organism, specifying the sequence of amino acids in protein characteristics of that organism.

- 4.1 Objective: Students will understand the structure and role of DNA in genetics.
 - 4.1.1 Performance Indicator: Students will be able to identify that DNA is composed of 5 carbon, sugar, nucleic acid, and phosphate groups.
 - 4.1.2 Performance Indicator: Students will be able to explain/draw the structures of adenine, thymine, cytosine, and guanine.
 - 4.1.3 Performance Indicator: Students will be able to explain that DNA is combined with base pairing, held together with hydrogen bonding, into a double helical structure.
 - 4.1.4 Performance Indicator: Students will understand the significant roles that James Watson, Francis Crick, and Rosalind Franklin played in discovering the structure of DNA.
 - 4.1.5 Performance Indicator: Students will be able to explain the x-ray evidence and various experiments scientists conducted.
 - 4.1.6 Performance Indicator: Students will be able to understand the process of protein synthesis and the role of ribosome's, tRNA and mRNA.
 - 4.1.7 Performance Indicator: Students will be able to identify different proteins based upon the number and sequence of amino acids.
 - 4.1.8 Performance Indicator: Students will recognize that the sequence of amino acids determines the shape and chemical properties of a protein.

Standard 5- Students will understand that current advances in genetics have led to the alteration of cells.

- 5.1 Objective: Students will be exposed to the benefits and harms of gene splicing and genetic engineering.
 - 5.1.1 Performance Indicator: Students will complete a research paper on genetic engineering in agriculture, including negative and positive affects on the food and fiber supply, followed by a debate.
 - 5.1.2 Performance Indicator: Students will predict new careers that could result in the future from the application of new knowledge and/or technology.

Standard 6 – Students will understand that stability in an ecosystem is a balance between competing effects.

- 6.1 Objective: Students will understand biodiversity and the effect of alterations on habitat.
 - 6.1.1 Performance Indicator: Students will able to define and give an example of a population, a community, an ecosystem, a biome, and define biosphere.
 - 6.1.2 Performance Indicator: Students will be assigned one biome and write a short summary of the inhabitants, animal and plant life, climate patterns, agriculture occurring there, and any other significant or unique characteristics of the biome.
- 6.2 Objective: Students will be able to examine how any change in an ecosystem effects the balance in that ecosystem.
 - 6.2.1 Performance Indicator: Students will be able to explain how an increase in temperature might inhibit plant growth (a food supply for animals), which in turn lowers the animal populations.
 - 6.2.2 Performance Indicator: Students will be able to explain how human activity impacts native wildlife and plant population using current examples in the state of California.
 - 6.2.3 Performance Indicator: Students will examine, through a short (2-3 page) essay, how a housing (for example: Anaheim Hills) or agricultural (for example: Dairy Farm influx in Tulare County) development affects animal and plant populations and what developers have to do to help support the species.

- 6.3 Objective: Students will understand the concept of population size and the effects on the community.
- 6.3.1 Performance Indicator: Students will be able to explain and give examples of countries with zero population growth.
 - 6.3.2 Performance Indicator: Students will be able to explain immigration and emigration, and how they effect population balances.
 - 6.3.3 Performance Indicator: Students will develop and compare tables and graphs and other information regarding population growth and deaths from common diseases, and food production from 1800 to the present.
 - 6.3.4 Performance Indicator: Students will examine human beings ability to perceive the consequences of unchecked population growth and their ability to control their population without the suffering that accompanies disease, starvation and other forms of population limitations.
- 6.4 Objective: Students will understand the water, carbon, nitrogen and oxygen cycles.
- 6.4.1 Performance Indicator: Students will be able to define abiotic and biotic, organic and inorganic, photosynthesis and respiration.
 - 6.4.2 Performance Indicator: Students will draw diagrams of each cycle that show reactants and products as well as intermediate products.
 - 6.4.3 Performance Indicator: Students will be able to explain, using a specific animal and diagrams, how all the above cycles are interrelated and connected.
 - 6.4.4 Performance Indicator: Students will be able to identify plant and animal roles in the above named cycles and how the agriculturalists can utilize certain plants and animals in an effort towards more sustainable agriculture.
- 6.5 Objective: Students will understand the significant role of decomposers and producers as a vital part of an ecosystem.
- 6.5.1 Performance Indicator: Students will be able to give an example of a producer and a decomposer, and explain what they are as well as how they work.

- 6.5.2 Performance Indicator: Students will write an essay to explore how industry utilizes decomposers (for example: alcoholic beverage production, and to clean up sewage or oil spills.)
- 6.6 Objective: Students will understand a food chain, food web, and food pyramid.
 - 6.6.1 Performance Indicator: Students will understand the flow of energy through a food pyramid.
 - 6.6.2 Performance Indicator: Students will be able to explain and give examples of predator and prey relations.
 - 6.6.3 Performance Indicator: Students will be able to explain and/or draw, through specific examples, the fact that a food web consists of several food chains.
 - 6.6.4 Performance Indicator: Students will predict the results of introducing a living organism that preys on only one component of an ecosystem and has no predators there.
- 6.7 Objective: Students will understand the effects of genetic change on an individual organism and a lineage of organisms over time.
 - 6.7.1 Performance Indicator: Students will provide an example and explain how individual organisms have adapted to their environment over time (for example: finches in Galapagos Islands).

Standard 7 - Students will understand allele frequency in populations.

- 7.1 Objective: Students will be able to explain natural selection and that it acts on a phenotype rather than a genotype.
 - 7.1.1 Performance Indicator: Students will give examples of natural selection (for example: the Peppered Moth).
 - 7.1.2 Performance Indicator: Students will be able to define artificial selection and natural selection and identify agriculture's role in selection.
 - 7.1.3 Performance Indicator: Students will use newspaper text sections with holes punched out and other colored paper holes scattered over newspaper. Students will then pick up paper holes that aren't camouflaged.

- 7.2 Objective: Students will understand genetic carriers in a gene pool.
 - 7.2.1 Performance Indicator: Students will be able to give examples, using Punnett squares for evidence, of how lethal homozygous alleles carried in the heterozygous individuals are maintained in a population.
 - 7.2.2 Students will write a short essay on the role of the government in preventing the spread of lethal alleles in our agricultural supply.
- 7.3 Objective: Students will understand that new mutations are constantly being generated in a gene pool.
 - 7.3.1 Performance Indicator: Students will understand the Hardy-Weinberg equation and how to solve it.

Standard 8- Students will understand the concept of evolution.

- 8.1 Objective: Students will understand genetic drift in a population.
 - 8.1.1 Performance Indicator: Students will be able to explain that allele frequency changes as a result of random events.
 - 8.1.2 Performance Indicator: Students will be able to describe the difference between convergent and divergent evolution.
- 8.2 Objective: Students will understand that speciation is effected by reproductive and geographic isolation.
 - 8.2.1 Performance Indicator: Students will be able to give examples of how species evolved independent of each other due to various types of isolation (for examples: those living on islands or separated by mountain ranges).
- 8.3 Objective: Students will be able to analyze how fossil evidence is used to explain biodiversity, episodic speciation, and mass extinction.
 - 8.3.1 Performance Indicator: Students will create their own example of a fossil (for example: film fossils).
 - 8.3.2 Performance Indicator: Students will explain how homologous structures provide evidence about evolution.
 - 8.3.3 Performance Indicator: Students will trace the development of the modern horse based upon known fossil evidence obtained from selected references.

- 8.3.4 Performance Indicator: Students will research, explain, and give examples of why scientists believe certain events in the Earth's history were mass extinction.
- 8.4 Objective: Students will understand that extinction, the dying out of a species, is a natural event.
 - 8.4.1 Performance Indicator: Students will define endangered species, threatened species, and extinction.
 - 8.4.2 Performance Indicator: Students will explore conservation efforts to preserve such species as the California condor, the kangaroo rat, the cheetah, the desert tortoises, red wolves, Siberian tigers, or pink dolphin. Students will determine agriculture's affect on these conservation efforts and the affect of the conservation efforts on agriculture.
 - 8.4.3 Performance Indicator: Students will complete a chart, listing animals and plants that are extinct, endangered, or threatened and where they are located.

Standard 9- Students will understand the physiology (for example: the functions of the organ systems) and homoeostatic nature of the human body.

- 9.1 Objective: Students will understand the respiratory system.
 - 9.1.2 Performance Indicator: Students will be able to explain the process of gas exchange in the lungs and how oxygen is carried to the body by arteries, and carbon dioxide rich blood is carried away from the body by the veins.
 - 9.1.3 Performance Indicator: Students will perform a laboratory experiment using limewater as a carbon dioxide indicator, to observe the byproducts of respiration.
 - 9.1.4 Performance Indicator: Students will be able to explain why respiration becomes more difficult at higher altitudes and how people can live at extreme altitudes.
- 9.2 Objective: Students will understand the nervous system.
 - 9.2.1 Performance Indicator: Students will be able to explain neurons, axons, dendrites, and synapses.

- 9.2.2 Performance Indicator: Students will be able to identify the different parts of the brain and what they control.
- 9.2.3 Performance Indicator: Students will be able to define and demonstrate the workings of reflexes.
- 9.2.4 Performance Indicator: Students will be able to explain and then compare and contrast the somatic and autonomic nervous system as well as sympathetic and parasympathetic.
- 9.2.5 Performance Indicator: Students will be able to explain sensory neurons, their roles, and where they are located in the body.
- 9.2.6 Performance Indicator: Students will be able to compare and contrast sensory, motor, and interneurons.
- 9.2.7 Performance Indicator: Students will explore the relationship between the three types of neurons.
- 9.3 Objective: Students will be able to understand feedback loops involving the nervous and endocrine systems.
 - 9.3.1 Performance Indicator: Students will be able to explain homeostasis.
 - 9.3.2 Performance Indicator: Students will be able to explain the differences and give examples of positive and negative feedback.
 - 9.3.3 Performance Indicator: Students will be able to explain and give examples of the role of hormones in the nervous system
 - 9.3.4 Performance Indicator: Students will be divided into groups and assigned a major endocrine gland. They will discuss function, problems that might occur, and participate in class discussion.
- 9.4 Objective: Students will understand the digestive system.
 - 9.4.1 Performance Indicator: Students will be able to explain the individual function and sites of the digestive enzymes, stomach acid, and bile salts.
 - 9.4.2 Performance Indicator: Students will define and explain the function of proteases, nucleases, and amylases.

- 9.4.3 Performance Indicator: Students will be able to distinguish the avian, ruminant, and monogastric (with and without a cecum) digestion systems and label all of the structures of each of these systems.
- 9.4.4 Performance Indicator: Students will diagram the process of digestion (monogastric, ruminant, and avian), including the organs involved and the location of enzymes.
- 9.5 Objective: Students will understand the excretory system.
 - 9.5.1 Performance Indicator: Students will be able to explain the role of the kidney in the removal of nitrogenous waste.
 - 9.5.2 Performance Indicator: Students will compare and contrast the structure and function of the kidney with other excretory organs such as the lungs and skin.
- 9.6 Objective: Students will understand the physiological processes of muscle contraction, including the role of myosin, actin, calcium and ATP.
 - 9.6.1 Performance Indicator: Students will diagram the flow of calcium into and out of the muscle during contraction.
 - 9.6.2 Performance Indicator: Students will compare and contrast fast and slow twitch muscle fibers and explain where they are found in the body.
 - 9.6.3 Performance Indicator: Students will define and explain the roles of actin and myosin.
 - 9.6.4 Performance Indicator: Students will draw the different muscle types (smooth, cardiac, and skeletal) and state where they are located.
- 9.7 Objective: Students will understand how the structural features of the organs in the circulatory system are related to the transport of materials.
 - 9.7.1 Performance Indicator: Students will understand that the circulatory system is made up of the heart and various types of blood vessels.
 - 9.7.2 Performance Indicator: Students will list various parts of the heart and their functions (for examples: aorta, ventricles, atrium, and valves).
 - 9.7.3 Performance Indicator: Students will understand the various functions and components of blood (for example: platelets, plasma, RBC's, WNC's, and hemoglobin).

- 9.7.4 Performance Indicator: Students will perform a lab that simulates A, B, AB, O blood typing and Rh factors.
- 9.7.5 Performance Indicator: Students will understand and be able to explain disorders of the blood such as sickle cell anemia and hemophilia.
- 9.7.6 Performance Indicator: Students will be able to complete a chart that list the structures and functions of the components of the lymphatic system.
- 9.7.7 Performance Indicator: Students will build a model of the heart using paper cups to demonstrate atria and ventricles and straws to simulate vessels.

Standard 10- Students will understand the human immune system and how it is used to fight disease.

- 10.1 Objective: Students will understand the role the skin plays in disease prevention.
 - 10.1.1 Performance Indicator: Students will be able to list the steps the body goes through to mount an immune response when an infection is introduced.
 - 10.1.2 Performance Indicator: Students will draw the structures of bacteriophages, antibodies, and viruses.
- 10.2 Objective: Students will understand the process and significance of vaccination in the reduction and prevention of disease.
 - 10.3.1 Performance Indicator: Students will research a disease that has been eradicated or significantly reduced through the use of vaccines.
 - 10.3.2 Performance Indicator: Students will be able to explain what a vaccine is, how they are produced, and how they work in the body.
- 10.4 Objective: Students will understand the body's primary defenses against viruses and bacteria.
 - 10.4.1 Performance Indicator: Students will compare and contrast bacteria and viruses with respect to their requirements for growth and reproduction.
 - 10.4.2 Performance Indicator: Students will understand and be able to explain immune response, how an antibody works, and how a body fights infection.

10.5 Objective: Students will understand how a compromised immune system limits a person's or animal's ability to fight otherwise mild diseases.

10.5.1 Performance Indicator: Students will be able to explain how an immune suppressed individual (AIDS or organ transplant) has a weakened immune system, making a person more susceptible to opportunistic infections.

10.5.2 Performance Indicator: Students will identify and explain the functions and role of phagocytes, b-lymphocytes, and t-lymphocytes in the immune system.

10.5.3 Performance Indicator: Students will complete a chart listing the major organs of the immune system, their locations, and functions.

Standard 11- Students know that there are important differences between bacteria and viruses with respect to their structure, their requirements for growth and replication, and their ability to cause illness and disease.

11.1 Objective: Students will understand that bacteria are the most numerous organisms on earth and that it is theorized that all other organisms evolved from bacteria.

11.1.1 Performance Indicator: Students will be able to explain and complete a chart that lists the differences between eubacteria, archaebacteria, cyanobacteria, proteobacteria, and spirochetes.

11.1.2 Performance Indicator: Students will be able to discuss the differences in shape of the type of bacteria and how shape aids in classification.

11.1.3 Performance Indicator: Students will culture bacteria collected from different location on an agriculture facility, examine and draw it daily for three days and then examine colony formation under the microscope, trying to classify each bacteria.

11.1.4 Performance Indicator: Students will be able to explain the spore formation as part of bacterial asexual reproduction.

11.1.5 Performance Indicator: Students will be able to discuss and complete a chart for bacteria energy production.

11.2 Objective: Students will understand that viruses are non-living particles composed of a nucleic acid and a protein coat.

11.2.1 Performance Indicator: Students will be able to describe the reproduction of viruses.

11.2.2 Performance Indicator: Students will be able to list the ways viruses impact society and agriculture.

11.2.3 Performance Indicator: Students will draw a diagram of the viral life cycle and explain in essay form how viruses cause diseases in plant or animals by entering and killing large number of cells.

Standard 12 – Students know how eukaryotic cell differ in complexity and general structure.

12.1 Objective: Students will understand that the kingdom protista contains a diverse collection of eukaryotic organisms protozoa, algae, slime molds, and water mold. The student will be able to describe the structure of a protozoan cell.

12.1.1 Performance indicator: students will be able to discuss the hypothesis for the origin of the protist.

12.1.2 Performance Indicator: Students will be able to complete a chart of all the plant-like and animal like protists including respiration, energy production, reproduction, excretion, and other components necessary for life.

12.1.3 Performance Indicator: Students will be able to explain the ways that protists impact society.

12.1.4 Performance Indicator: Students will examine protists , ameba, paramecium, and euglena under a microscope. Students will also label and draw pictures of what they see.

Standard 13- Students will understand that biologist use the characteristics of organisms to group them with other organisms that have similar characteristics. Today, these methods reflect the evolutionary history of organisms.

13.1 Objective: Students will be introduced to the history of classification, including the works of Aristotle and Linnaeus.

13.1.1 Performance Indicator: Students understand that binomial nomenclature is a system of naming organisms that assigns a two-word (genus and species) name to each organism.

13.1.2 Performance Indicator: Students will be able to explain the modern classification system including the 6 kingdoms and all subdivisions (kingdom, phylum, class, order, family, genus, and species).

Standard 14- Students will know that plants are essential to our survival because they produce virtually all of our food, a variety of products, and play a major role in the cycle of the Earth's water, oxygen, carbon dioxide, and minerals.

14.1 Objective: Students will understand that plants are essential to the survival of animals. Plants effect food production, medicine, clothing, paper, and many other products.

14.1.1 Performance Indicator: Students will complete a chart that lists the diversity of plants, including subdivisions, numbers of species, reproduction, and genetic diversity

14.1.2 Performance Indicator: Students will draw and label structures of flowering plants and leaves (for example: sepal, stamen, palisade layer, stoma).

14.1.3 Performance Indicator: Students will understand the definition of tropism, the types of tropisms, and how they are controlled.

14.1.4 Performance Indicator: Student will understand the similarities and differences between the life cycles and importance of moss, ferns, and other plant species.

14.1.5 Performance Indicator: Students will be able to explain the vascular and non-vascular plant life cycles.

14.1.6 Performance Indicator: Students will be able to draw and label the structure of roots, stem, and leaves , and be able to describe their functions.