



Grade: 9-12

Course: Applied Biology/Chemistry I

- 1

Topic: Inquiry, Process and Problem Solving

Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.
- 2

Topic: Inquiry, Process and Problem Solving

Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.
- 3

Topic: Laboratory Safety

Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.
- 4

Topic: Natural Resources

Standard: Decides whether or not a natural resource will be available in the future. 4.1 Identifies and gives examples of natural resources. 4.2 Classifies natural resources by the following categories: a. limited resources b. unlimited resources c. renewable resources d. nonrenewable resources. 4.3 Describes the chemical composition of fossil fuels. 4.4 Explains how soil is formed from organic and inorganic materials. 4.5 Explains how minerals are cycled through the environment. 4.6 Identifies uses of plants and animals as being consumptive or nonconsumptive. (B 25, PS 11, C17, ENS 5, ENS 7, ENS 15)
- 5

Topic: Natural Resources

Standard: Gives examples of how natural resources are used to produce energy, makes products, provides food and shelter and improves the quality of life. 5.1 Identifies uses of fossil fuels. 5.2 Describes the chemical composition of fossil fuels. 5.3 Explains the combustion of fossil fuels as a chemical reaction. 5.4 Describes the composition of air. 5.5 Explains the two main reasons that air is an essential natural resource. 5.6 Describes what an aquifer is and how it is maintained. 5.7 Relates three physical and chemical properties of water to its importance as a natural resource. 5.8 Evaluates how soil layers and soil composition affect soil's ability to support life. 5.9 Identifies the ways that people use plants and animals as natural resources. 5.10 Explains how plants and animals are related through the food web and through the carbon dioxide-oxygen cycle. (B 25, PS 4, PS 6, PS 11, ENS 5, ENS 7)
- 6

Topic: Natural Resources

Standard: Analyzes problems that result from obtaining and using natural resources. 6.1 Explains what depletion and degradation mean in terms of natural resources. 6.2 Analyzes major problems of using fossil fuels. 6.3 Analyzes the causes and effects of problems related to air as a natural resource. 6.4 Explains ways that physical and chemical changes in water may affect its quality. 6.5 Explains factors that influence the amount of water available for use. 6.6 Describes how plants are affected by soils lacking nitrogen, phosphorus and potassium. 6.7 Identifies three major soil-related problems and the causes. 6.8 Explains the major problems that affect plants and animals as natural resources. (B 6, B 18, B 19, B27, ENS 9)
- 7

Topic: Natural Resources

Standard: Proposes solutions to problems resulting from obtaining and using natural resources. 7.1 Evaluates possibilities for replacing fossil fuels with alternative sources of energy. 7.2 Suggests ways to reduce problems related to air. 7.3 Proposes steps that industries and communities may take to preserve water quality and reduce water shortages. 7.4 Proposes ways to respond to problems related to soil. 7.5 Proposes ways to respond to problems related to plants and animals. (B 27, PS 12, ENS 7, ENS 9, ENS 11, ENS 12, ENS 15, ENS 21, ENS 31)
- 8

Topic: Natural Resources

Standard: Relates jobs to natural resources. 8.1 Analyzes jobs to see how natural resources are involved in every job. 8.2 Identifies jobs related to fossil fuels. 8.3 Identifies jobs that are concerned with air and air quality. 8.4 Assesses ways that jobs are affected by the quality and quantity of water. 8.5 Identifies jobs that are related to soil. 8.6 Discusses jobs that are directly involved with plants and animals.

- 9** **Topic:** Synthetic Materials
Standard: Relates uses of materials to their chemical and physical properties. 9.1 Selects materials that might be appropriate for certain uses, based on some of the observable properties of these materials. 9.2 Relates the physical and chemical properties of metals and alloys to their uses. 9.3 Investigates a selected ceramics application in modern technology. 9.4 Researches products made from composite materials to find out their structure, their components, and properties. 9.5 Devises a table that related composite products and the processes used to make them. (PS 5, C 15)
- 10** **Topic:** Synthetic Materials
Standard: Uses the periodic table to predict how certain elements are likely to bond with others. 10.1 Uses appropriate resources, identifies materials that have specific physical and chemical properties. 10.2 Relates types of chemical bonding to material properties. 10.3 Explains the properties of metals and alloys in terms of atomic, crystalline, and grain structure. 10.4 Distinguishes ceramics from other materials such as metals and polymers on the basis of their chemical structure and properties. 10.5 Explains how the molecular structure of polymer affects their properties. (PS 5, PS 8,C 5, C 8, C 15)
- 11** **Topic:** Synthetic Materials
Standard: Predicts the properties that will result from the use of different chemical and physical manufacturing processes. 11.1 Makes sketches of known crystals and compares them to a table of crystal systems. 11.2 Identifies five types of chemical reactions that play a role in the formation of materials. 11.3 Relates the differences in structure between crystalline and glass ceramics to the differences in their properties. 11.4 Explains why high temperatures and atmospheric control are necessary for ceramic manufacturing processes. 11.5 Models the chemical bonding involved in polymerization reaction. 11.6 Distinguishes between the structure of thermosetting and thermoplastic polymers and the properties and uses of each. (PS 4, PS 9, C 8, C 9, C 15, HAP 8)
- 12** **Topic:** Synthetic Materials
Standard: Assesses the effects of the chemical and physical manufacturing processes used to produce various materials. 12.1 Predicts the properties of steel based on the processes used to make them. 12.2 Explains why high temperatures and atmospheric control are necessary for ceramic manufacturing processes. 12.3 Analyzes the effect on a composite's performance of using different kinds of structural components. (PS 4,C 9)
- 13** **Topic:** Synthetic Materials
Standard: Evaluates the impact of material processing and production on worker health and the environment. 13.1 Investigates the safety, health, and/or environmental problems associated with the manufacture of selected polymers. (B27)
- 14** **Topic:** Synthetic Materials
Standard: Practices industry methods for measurement and testing selected materials. 14.1 Characterizes metals based on their performance in a test for certain properties. 14.2 Demonstrates selected tests that are used to verify the physical and/or chemical properties of some polymers. 14.3 Compares the properties of a composite materials with that of one of its components, using accepted test methods. (S 1, PS 5)
- 15** **Topic:** Synthetic Materials
Standard: Simulates the process by which a product is designed in industry - designing for manufacturability, environmental standards, and profitability. 15.1 Uses sol-gel synthesis to make a simple ceramic material. 15.2. Compares and contrasts the different ways in which polymers are formed. 15.3 Summarizes the advantages and disadvantages of different matrix materials in a composite.
- 16** **Topic:** Air and Other Gases
Standard: Analyzes the pressure, volume, and temperature relationships of gases in biological and chemical system. 16.1 Differentiates among different types of particles making up gases: atoms, ions, and molecules. 16.2 Relates the process of fractional distillation to phase changes of matter. 16.3 Demonstrates how air temperature, air pressure, and relative humidity of the air are measured. 16.4 Predicts the effect of a rapid change of atmospheric pressure on the dissolved gas in a solution. 16.5 Converts Celsius and Fahrenheit temperatures to Kelvin and Rankine temperatures, as appropriate, so that Charles' law can be used to solve problems. 16.6 Uses the Combined Gas law to solve commercial problems concerning temperature, volume, and pressure. (PS 4, PS 6, C 5, C 13, C15, ENS 20, ENS 22)
- 17** **Topic:** Air and Other Gases
Standard: Analyzes the importance of each component of the atmosphere to plant and animal life. 17.1 Describes some of the vital functions and uses of atmospheric gases. 17.2 Describes photoionization and its role in structuring of the atmosphere. 17.3 Describes the relationship between altitude and atmospheric pressure. 17.4 Describes the cycles of the three atmospheric gases most essential to life: carbon dioxide, oxygen, and nitrogen. 17.5 Analyzes the mechanics of breathing, using the pressure/ volume relationship of gases. 17.6 Analyzes animal respiration in terms of three aspects of the behavior of gases: gas diffusion, partial pressure, and the solubility of gases. 17.7 Explains how photosynthesis replenishes cellular energy. 17.8 Explains what happens during cellular respiration at the molecular level. (PS 10, PS 13, B 7, B22, B24, B 26, C 15, HAP 16, ENS 27)

18

Topic: Air and Other Gases

Standard: Evaluates the economic, environmental, and personal impact of commercial uses of gases. 18.1 Provides the rationale for planting legumes as a rotational crop in specific agricultural environment. 18.2 Designs a floricultural environment to maximize plant growth, considering the factors of transpiration, photosynthesis, respiration, and nitrogen fixation. 18.3 Demonstrates through a schematic drawing and an oral presentation the principles at work in a pneumatic device. 18.4 Explains how pressure in a steam boiler is related to boiler temperature. 18.5 Describes at least two ways in which gas is used as a fuel. 18.6 Gives examples of commercial enterprises in which a gas is incorporated into a desirable end product. 18.7 Describes the use of a gas in processing other products or chemicals in which the gas is not used to form part of the end product. 18.8 Recommends safe handling procedures for gases used in commercial settings based on their physical and chemical properties. (PS 12, B 27, C 3, C 15, ENS 15, ENS 27)

19

Topic: Air and Other Gases

Standard: Predicts the effects on animal and plant life of industrial and agricultural activities that produce different types of atmospheric pollutants. 19.1 Relates the chemical structure of ozone to the problem of too much ozone in the lower atmosphere. 19.2 Explains how gases are used in agricultural and industrial setting to prevent combustion or contamination by atmospheric gases. 19.3 Analyzes the role of molecular weight and density in the spreading of odors and polluting gases. 19.4 Explains the dispersion of potentially hazardous gases in terms of Graham's law. 19.5 Makes informed decisions about the potential effects on the ozone layer of several types of consumer products. 19.6 Evaluates reports about global warming by noting the scientific authorities cited and the type of evidence presented. 19.7 Recommends ways to minimize the effect of air pollution on health. (PS 8, PS 9, B 26, B 27, C 9, C 11, HAP 11, ENS 9, ENS 10)

20

Topic: Water

Standard: Evaluates the effect of different water uses on water quality and water quantity. 20.1 Investigates the sources and uses of water in your community. 20.2 Creates categories for the different uses of water according to the properties that make water useful. 20.3 Explains how water is used in these devices: a home heating system, a power plant condenser, and evaporative cooler, a car radiator. 20.4 Links the physical and chemical properties of water to its function as transporter of nutrients inside plants and animals. 20.5 Assesses the impact of water quantity of used by different sectors of society: domestic, industrial, and agricultural. (PS 12, B 27, P 8, C 8, ENS 12, ENS 13)

21

Topic: Water

Standard: Analyzes the role of water in maintaining life: as a transporter of nutrients, in biochemical reactions, in maintaining water balance and in regulating temperature. 21.1 Predicts how selected organisms will react to environmental temperature changes, based on the role of water as a temperature regulator. 21.2 Describes the role of water in biochemical reactions in organisms. 21.3 Chooses an organism and evaluates its ability to maintain water balance in an extreme condition. 21.4 Recommends strategies for supplying water to livestock. 21.5 Describes how diffusion and osmosis help animals and plants to obtain nutrients and maintain water balance. (B 5, B 27, PS 4, PS 9, PS 12, C 8, C14, P 8, ENS 3, ENS 12, ENS 25)

22

Topic: Water

Standard: Expresses the concentration of solutes in solvent appropriately according to an occupational setting. 22.1 Develops a guideline for predicting what materials will float in water. 22.2 Explains how the structure of a water molecule affects the way water behaves, especially the way that water dissolves materials. 22.3 Explains how hydrogen bonding affects water's function as a solvent. 22.4 Gives examples of the "like dissolves like" rule in the everyday use of solutions. 22.5 Creates an advertisement that illustrates the way soap aids water in dissolving nonpolar solutes. 22.6 Determines the amounts of solute required for solutions of various concentrations, using three different types of units: molar, normal and percent composition, as appropriate. 22.7 Calculates the dilution to a desired concentration. 22.8 Describes at least three occupations in which a knowledge of solutions is needed. (PS 4, PS 5, B 6, C 16, P 8, ENS 4)

23

Topic: Water

Standard: Carries out titration procedures such as might be used in an occupational setting. 23.1 Identifies at least three commonly used acids and three commonly used bases. 23.2 Contrasts the ionization of pure water with the ionization that occurs in an acidic or basic solution. 23.3 Calculates the concentration of hydroxide ions, given the concentration of hydrogen ions, and vice versa. (B 6, C16, ENS 31)

24

Topic: Water

Standard: Analyzes neutralization reactions and reactions involving buffer solutions such as those that might be carried out in an industrial setting. 24.1 Predicts how a hazardous acid spill might be neutralized and list the factors of the spill that would have to be taken into consideration. 24.2 Explains what is meant by the use of the words "strong" and "weak" in relation to acids and bases. 24.3 Predicts what kind of substance might act as a buffer for a strong acid in what kind of situation buffering might be useful. (B 6, B 27, C 11, ENS 9)

25

Topic: Water

Standard: Interprets pH reading and uses pH scale as an indicator of water's acidity or alkalinity. 25.1 Explains the relationship between the molar concentration of hydrogen ions and the pH scale. (C11, ENS 3, ENS 12)

26

Topic: Water

Standard: Explains tests to determine water quality, including pH, biochemical oxygen demand, total solids, and concentrations of various water solutes in water. 26.1 Analyzes the relationship between water quality and water quantity. 26.2 Predicts the potential impact on the quality of surface and/or groundwater of a least seven different types of water pollution. 26.3. Conducts at least four of seven tests of water quality. (B 27, ENS 4, ENS 12, ENS 13, ENS 14)

- 27** **Topic:** Water
Standard: Links water-treatment methods to different types of wastewater contamination that treatment is intended to address. 27.1 Appraises the methods that are used to treat water to address different types of water pollution problems. (B 27, ENS 12, ENS 17, ENS 21)
- 28** **Topic:** Water
Standard: Suggests several different methods to prevent water pollution during personal and domestic use of water and handling of water. 28.1 Identifies the sources of water pollution. 28.2 Distinguishes between point-source and nonpoint-source pollution. 28.3 Investigates five ways that pollution can be prevented or reduced. (B 27, ENS 13, ENS 14)
- 29** **Topic:** Wastes and Waste Management
Standard: Discusses the environment's natural capacity for assimilating and absorbing waste. 29. 1 Investigates the drainage system and primary soil type associated with the watershed in your region. 29.2 Describes the physical, chemical, and biological processes for breaking down waste and eventually decomposing it. 29.3 Appraises the potential limits to degradation and decomposition associated with different environments and different materials. 29.4 Discusses the effects of acid rain. (B 15, B 27, ENS 9, ENS 12, ENS 13, ENS 14, ENS 17)
- 30** **Topic:** Wastes and Waste Management
Standard: Investigates various components of the waste stream and identifies their sources. 30.1 Analyzes (records, measures, and classifies) the waste produced in a single day in your immediate environment (home or school). 30.2 Analyzes waste in terms of its source material. 30.3 Discusses the effects of acid rain. 30.4 Analyzes your own household waste to determine the percent (approximately by volume) and types of hazardous waste disposed of by your household. 30.5 Compares waste-generation habits in the United States with those of other developed countries with a similar gross national product. 30.6 Conducts a simplified product life cycle analysis. 30.7 Analyzes waste habits in your home or school to identify potential strategies for source reduction. (B 27, ENS 27, ENS 29, ENS 30)
- 31** **Topic:** Wastes and Waste Management
Standard: Suggests appropriate waste treatment based on properties of waste and local conditions. 31.1 Appraises the potential limits to degradation and decomposition associated with different environments and different materials. 31. 2 Investigates the problems and procedures at your community landfill. 31.3 Identifies the concerns associated with waste-to-energy plants. 31.4 Evaluates biomass-conversion methods in terms of energy efficiency and environmental effects. 31.5 Weighs the pros and cons of several methods of hazardous-waste containment and cleanup, including secure landfills, incineration, and bioremediation. 31.6 Analyzes some of the economic issues involved in managing hazardous waste. 31.7 Names at least four commonly recycled materials. 31.8 Discusses at least two factors needed to make a material recyclable. 31.9 Describes how one city runs its recycling program. 31.10 Distinguishes between source reduction and other approaches to waste handling. (B 27, ENS 6, ENS 17)
- 32** **Topic:** Wastes and Waste Management
Standard: Analyzes concerns related to various kinds of hazardous waste and their disposal. 32.1 Identifies the concerns associated with waste-to-energy plants. 32.2 Simulates the protocol required by a "chain of custody" document. 32.3 Identifies four types of toxins and their potential effects on the environment and on human health. 32.4 Discusses the nature of radioactive waste and its potential effects. 32.5 Describes what authorities must know and be ready to do to respond properly to emergencies involving hazardous materials. 32.6 Weighs the pros and cons of several methods of hazardous-waste containment and cleanup, including secure landfills, incineration, and bioremediation. 32.7 Describes the role of the federal government in controlling hazardous-waste disposal in the environment. 32.8 Analyzes some of the economic issues involved in managing hazardous waste. 32.9 Assesses the importance of reducing toxins as a part of overall source reduction. (B 27, C 7, ENS 6, ENS 17)
- 33** **Topic:** Wastes and Waste Management
Standard: Evaluates strategies for implementing recycling, reuse, and source reduction of waste by consumers and industries. 33.1 Evaluates biomass-conversion methods in terms of energy efficiency and environmental effects. 33.2 Defines the difference between recycle and reuse. 33.3 Names at least four commonly recycled materials. 33.4 Discusses at least two factors needed to make a material recyclable. 33.5 Describes how organic waste is recycled. 33.6 Describes how one city runs its recycling program. 33.7 Distinguishes between source reduction and other approaches to waste handling. 33.8 Assesses the importance of reducing toxic materials as a part of overall source reduction. 33.9 Conducts a simplified product life cycle analysis. 33.10 Constructs diagrams that can be used to help people understand five different approaches to source reduction. 33.11 Analyzes waste habits at home or school to identify potential strategies for source reduction. (B 27, ENS 30, ENS 31)
- 34** **Topic:** Wastes and Waste Management
Standard: Plans safe and efficient strategies for dealing with waste generated in your community. 34.1 Investigates the problems associated with waste-to-energy plants. 34.2 Identifies the concerns associated with waste-to-energy plants. 34.3 Describes what authorities must know and be ready to respond properly to emergencies involving hazardous materials. 34.4 Describes how one city runs its recycling program. 34.5 Analyzes waste habits in your home or school to identify potential strategies for source reduction. (B 27, ENS 3, ENS 9, ENS 30)

- 35** **Topic:** Microorganisms
Standard: Relates the basic characteristics of each of the four groups of microorganisms to their ability to survive and reproduce under various conditions. 35.1 Determines the nutrients required for a given microbe by growing it on different culture media. 35.2 Determines the environmental requirements for a given microbial culture by growing it under different environmental conditions. 35.3 Evaluates a given environment in terms of what kind of habitat it provides for microorganisms. 35.4 Assesses how various environmental factors affect the population of given microorganism. 35.5 Compares the genetic makeup of bacteria to that of other organisms. (B 13, B 15, B 25, ENS 2)
- 36** **Topic:** Microorganisms
Standard: Evaluates the contribution of various groups of microorganisms to cycling of matter and energy through the environment. 36.1 Evaluates the importance of microorganisms in different natural environments. 36.2 Discusses properties of the six chemical elements that make up organic matter. 36.3. Sketches a biogeochemical cycle for the elements of carbon, nitrogen, phosphorus, and sulfur. 36.4 Balances chemical equations that are vital to the cycling of elements. (PS 10, B 7, B 15, B 16, ENS 27)
- 37** **Topic:** Microorganisms
Standard: Compares the quality of water, soil, food, air, and the health of plants and animals to the numbers and types of microorganisms present in a given environment. 37.1 Describes three roles that microorganisms can take in nature and in industry. 37.2 Cultures microorganisms that you sample from food, air, water, and soil on prepared media. 37.3 Identifies six types of relationships that microorganisms can have with one another and with other organisms. 37.4 Gives examples of species relationships in which microorganisms participates. 37.5 Identifies six types of relationships that microorganisms can have with one another and with other organisms. 37.6 Analyzes the role of microorganisms in the making of dairy products, alcoholic drinks, and bread. 37.7 Demonstrates the action of microbes in selected foods such as bread, yogurt, and sauerkraut. 37.8 Constructs an immunization schedule that could be used to remind parents of when to take children for early childhood immunizations. 37.9 Writes a brief report on the causes, symptoms, prevention, control, and treatment of human infectious disease. 37.10 Develops a set of guidelines for disease prevention in a breed of livestock or pet. 37.11 Investigates the cause and prevention of a plant disease. 37.12 Recommends way to prevent and control food and feed spoilage by microbes. (B 14, B15, B16, B17, ENS 29, ENS 30, ENS 32, ENS 33)
- 38** **Topic:** Microorganisms
Standard: Describes the methods by which microorganisms are manipulated to produce better crops, treat diseases, and process waste. 38.1 Prepares culture media on which to grow microorganisms. 38.2 Teaches someone else the aseptic technique for working with microorganisms in the lab. 38.3 Evaluates the potential of engineered microorganisms to improve crops. 38.4 Investigates the role of microorganisms in four different types of waste processing: toxic chemical waste treatment, wastewater treatment, sludge treatment, and fermentation of solid waste to produce fuel. 38.5 Relates the use of antibiotics to the development of antibiotic resistance in pathogens. (B 11, B 15, ENS 17, ENS 32)
- 39** **Topic:** Microorganisms
Standard: Evaluates the potential, societal, and economic impact of genetically engineered microorganisms. 39.1 Outlines the steps by which microorganisms are genetically manipulated. 39.2 Identifies drugs, hormones, vaccines, and enzymes that are the products of recombinant DNA technology. 39.3 Explains how gene therapy may be used in the future to treat genetic diseases. (B 11, B 15, ENS 32)
- 40** **Topic:** Microorganisms
Standard: Shows how metabolic processes in microorganisms are commercially applied. 40.1 Creates a flowchart that shows the problems that must be solved in order to use bioprocessing to make a given product. 40.2 Summarizes the ways in which microbes can be used to help mine natural resources. 40.3 Identifies measures taken in various industries to prevent damage by microbes to inanimate raw materials or products. (B 7, B 15, B 16, B 17, ENS 29)
- 41** **Topic:** Microorganisms
Standard: Analyzes the way disease-causing microorganisms spread, multiply, and cause harm in their hosts. 41.1 Analyzes data tables based on indicator organisms to determine the pollution classification of a given stream. 41.2 Detects patterns in the outbreak of an infectious disease that might provide information on how to control future outbreaks. 41.3 Recommends precautions to take when traveling in areas where contagious diseases are prevalent. (B 13, B 15, B 16, HAP 15, ENS 12)

Course: Applied Biology/Chemistry II

- 1** **Topic:** Inquiry, Process and Problem Solving
Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.

2 **Topic:** Inquiry, Process and Problem Solving

Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.

3 **Topic:** Laboratory Safety

Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.

4 **Topic:** Continuity of Life

Standard: Relates the continuation of life to the cell's chemical code. 4.1 Using a model, demonstrates how cells are organized and how they relate to their environment via a membrane. 4.2 Constructs a model of DNA. 4.3 Explains how we can distinguish between two individuals by analyzing tissue samples. 4.4 Explains how DNA is able to control the activities of the cell. 4.5 Explains how a cell is able to make a copy of itself (reproduce). 4.6 Relates errors in cell activities to diseases in humans. 4.7 Explains how the sex of a child is determined. 4.8 Compares the genetic makeup of identical and fraternal twins. 4.9 Explains what a mutation is. 4.10 Explains how certain environmental agents increase the chances of mutations. (B 4, B 8, B 9, B 10, HAP 4, HAP 5)

5 **Topic:** Continuity of Life

Standard: Relates the male and female reproductive systems to their reproductive functions. 5.1 Relates sexual changes occurring in adolescents to the development and function of their reproductive systems. 5.2 Explains the events of the menstrual cycles in terms of hormones and their effects. 5.3 Weighs the advantages and disadvantages of internal and external fertilization for animals. 5.4 Compares the methods of artificial insemination used in humans and other animals. (B 20, B 21, B 22, B 23, B 24, HAP 3, HAP 20)

6 **Topic:** Continuity of Life

Standard: Compares how different methods of birth control prevent pregnancy. 6.1 Evaluates various methods of birth control for their ease of use and effectiveness. (B 23, B 24)

7 **Topic:** Continuity of Life

Standard: Predicts the special needs of the expectant mother and the developing fetus during different states of pregnancy and birth. 7.1 Illustrates the connections between mother and fetus during pregnancy. Relate these connections to the exchange of nutrients and waste between mother and fetus. 7.2 Relates physiological changes in an expectant mother to fetal development and birth. 7.3 Links birth defects in humans and other animals to the factors thought to be responsible for them. 7.4 Describes techniques used to detect the condition of the fetus inside the uterus. 7.5 Recommends changes a pregnant woman should make in her lifestyle, diet, and behavior to ensure a normal birth. (B 11, B 22, B 23, B 24, HAP 20)

8 **Topic:** Continuity of Life

Standard: Explains what animal breeders need to know about genetic inheritance in animals to produce more economically valuable breeds. 8.1 Interprets a karyotype, using a knowledge of chromosomes and how they are inherited. 8.2 Explains how the sex of a child is determined. 8.3 Analyzes the genetic relationship among members of the same family. 8.4 Contrasts the inheritance pattern of a dominant trait with a recessive trait. 8.5 Predicts the characteristics of an offspring based on a knowledge of genotypes. 8.6 Predicts the characteristics of an offspring using a family pedigree. 8.7 Identifies the causes for variation in a genetic characteristic among individuals in a plant or animal population. (B 8, B 10, B 11)

9 **Topic:** Continuity of Life

Standard: Compares the results of natural selection in wild populations to the results of artificial selection in similar domesticated species. 9.1 Explains what a mutation is and how it may affect inherited biological traits. 9.2 Evaluates contributions each of the following has made to the diversity of life on Earth: a. mutations in DNA, b. natural selection, c. artificial selection 9.3 Compares and contrast the effects of natural and artificial selection in animal populations. 9.4 Predicts how an environmental change will encourage or discourage: a. formation of a new species, b. extinction of existing animal species. (B 11, B 12, B 25)

10 **Topic:** Continuity of Life

Standard: Outlines methods for altering the genetic makeup of an organism. 10.1 Explains how new technologies can be used to detect defects in genes. 10.2 Describes the basic processes used in genetic engineering. (B 11, HAP 4)

11 **Topic:** Continuity of Life

Standard: Predicts how genetics engineering might affect society during your lifetime. 11.1 Identifies the ways genetic engineering can benefit mankind. 11.2 Evaluates the ethical issues surrounding the use of genetic engineering. (B 11)

12 **Topic:** Plant Growth and Reproduction

Standard: Evaluates the roles of different plant parts in growth and reproduction of a plant. 12.1 Locates the main vegetative and reproductive parts of plants. 12.2 Observes with a microscope how plant cells are organized into tissues. 12.3 Matches the abnormal appearance of plant leaves, stems, or roots to the disease, pest, or nutritional condition that is causing the change in appearance. 12.4 Relates the growth pattern of a tree or a branch to its age. (B 18, B 19)

- 13** **Topic:** Plant Growth and Reproduction
Standard: Investigates the conditions under which different types of plants grow and reproduce. 13.1 Compares the results of germination in different types of seeds you collect. 13.2 Evaluates those factors that make soil suitable for growth of plants. 13.3 Compares the primary, secondary, and trace nutrients required by plants in terms of why they are required and how available they may be in the soil. 13.4 Selects a method of transplanting according to the type of plant to be moved. 13.5 Relates the process of DNA replication and mitosis to different methods of vegetative propagation. 13.6 Describes the importance of flower structure to the practice of artificial pollination. (B 1, B 9, B 18, B 19)
- 14** **Topic:** Plant Growth and Reproduction
Standard: Rates the value of various plants for the following uses and gives examples for each use: human and other animal foods, chemical compounds, paper, wood, fabrics, shading and other landscaping surfaces, and various aesthetic uses. 14.1 Identifies the many ways that plants are useful to us. 14.2 Describes how different types of plants are used in and around homes and offices. 14.3 Identifies the characteristics of various woods used for lumber. 14.4 Describes how paper is made. 14.5 Identifies pharmaceutical and chemical products derived from trees. 14.6 Classifies plant fibers according to the products they make and the plants from which they are derived. (B 1, B 26, B 27, ENS 30)
- 15** **Topic:** Plant Growth and Reproduction
Standard: Creates an environment which provides optimal growth conditions for a selected plant. 15.1 Traces the movement of forms of nitrogen and phosphorus through the environment as they become available to given plants. (B 25)
- 16** **Topic:** Plant Growth and Reproduction
Standard: Compares methods used by commercial growers to propagate plants. 16.1 Uses tissue culture techniques to produce plants that are genetically identical to a given plant. 16.2 Relates the importance of meiosis to the process by which a plant breeder develops hybrid varieties. (B 9, B 11, B 19)
- 17** **Topic:** Plant Growth and Reproduction
Standard: Explains how a plant breeder creates varieties of plants with desirable traits. 17.1 Predicts which genotypes the offspring of two plant varieties will exhibit, by using Punnett squares. (B 10)
- 18** **Topic:** Plant Growth and Reproduction
Standard: Evaluates decisions made in modern crop farming from the standpoint of cost to the grower, yield of the year's crop, and management of the land for continued high yield. 18.1 Analyzes the decisions involved in planting seeds as they relate to seed variety, moisture, temperature, spacing, and care of seedlings. 18.2 Analyzes the relationship between crop yield and different types of farming practices such as irrigation, soil conditioning, and pest control. 18.3 Describes farming methods that are used to improve soil quality and prevent soil erosion. 18.4 Compares the effectiveness and suitability of different irrigation practices for a given set of farming conditions. 18.5 Evaluates the advantages and disadvantages of different methods of pest control. 18.6 Identifies the factors in harvesting that can affect crop yield and quality. 18.7 Correlates the cotton grower's method of cultivation to the cotton product to be marketed. (B 1, ENS 27, ENS 28)
- 19** **Topic:** Animal Life Processes
Standard: Analyzes the role of the senses in helping humans and other animals to maintain stable internal conditions under changing conditions in their environment. 19.1 Identifies the types of stimuli that can be perceived by each of our senses. 19.2 Compares the capacities of human senses with those of other animals. 19.3 Draws a diagram to show the basic path of information through the human body as sensations are converted into the action of muscles. 19.4 Explains how different types of stimuli - light, sound, pressure, etc. - are converted to impulses that can be carried by neurons. 19.5 Carries out a routine activity with one or more of your senses artificially impaired. 19.6 Analyzes how sense contributes to the body's ability to protect itself and maintain proper conditions for life. 19.7 Evaluates different types of hearing and vision corrective devices according to their appropriate use, risks, comfort, and durability. (B 22, B 23, B 24, PS 13, PS 16, HAP 10, HAP 11, P 14)
- 20** **Topic:** Animal Life Processes
Standard: Traces the path and describes the processes by which food is transformed into energy within the body. 20.1 Explains how the body gets energy from a meal. 20.2 Relates a person's energy level to: a. eating habits b. the way the body processes energy-rich substances. 20.3 Compares the energy value of complex carbohydrates to that of simple sugars for various types of activities. 20.4 Weighs the expected outcomes of various dieting techniques against possible side effects. (B 7, B 24, C13, HAP 4, HAP 17, HAP 18)
- 21** **Topic:** Animal Life Processes
Standard: Appraises the effect of various health states and environmental conditions on the maintenance of fluid balance in the human body. 21.1 Predicts the solubility of different substances in water, then test your predictions. 21.2 Compares the ability of water to keep body temperature stable with the same ability of other solvents. 21.3 Explains the source of blood pressure and predicts the effect of hydrostatic pressure on measured blood pressure. 21.4 Identifies the ways of human body gains and loses water. 21.5 Identifies signs that indicate a person is dehydrated. 21.6 Recommends a recovery procedure for a dehydrated athlete. 21.7 Selects foods that would help a person working in outdoor heat maintain fluid balance. 21.8 Describes four ways in which you might typically gain or lose body heat in specific climate, based on the clothing you wear. 21.9 Makes a diagram that shows the role of neuromuscular, endocrine, and circulatory systems in controlling a cold-water diver's body temperature. (B 2, B 22, B 23, B 24, HAP 7, HAP 13, HAP 14, HAP 18, HAP 19)

- 22** **Topic:** Animal Life Processes
Standard: Traces the path and the process by which waste products are produced and eliminated from the body. 22.1 Describes the release of carbon dioxide waste in the blood. 22.2 Analyzes a simulated urine sample in order to identify its characteristics. 22.3 Describes the roles of the liver, kidney, and large intestine in processing body wastes, including toxic substances. 22.4 Discusses the issues involved in drug testing in the workplace. 22.5 Recommends foods that help ensure an adequate daily fiber intake in your diet. (B 23, B 24, B 25, HAP 3, HAP 14 HAP 16, HAP 17, HAP 19)
- 23** **Topic:** Animal Life Processes
Standard: Recommends ways to prevent, recognize and treat overexposure to heat or cold. 23.1 Identifies symptom of hypothermia in another individual. 23.2 Recommends the proper response to cold injuries by an untrained person and by trained personnel. 23.3 Recommends ways that outdoor crews can prevent hyperthermia while working in extreme conditions. 23.4 Identifies symptoms of hyperthermia in another individual. 23.5 Describes how emergency medical personnel help return a hyperthermia patient's body temperature to normal. (B 13, B 24, HAP 7, HAP 9, HAP 10, HAP 11, HAP 13)
- 24** **Topic:** Animal Life Processes
Standard: Projects realistic expectations for physical and emotional growth of an infant, child or adolescent. 24.1 Evaluates factors that influence body weight. 24.2 Rates various types of exercise for their ability to help maintain proper body weight. 24.3 Evaluates an infant or child's development based on photographic evidence and growth curves. 24.4 Explains how physical development changes during adolescence may influence the appearance and self-image of teenagers. 24.5 Relates key developmental changes in the nervous system to the progress of mental development. 24.6 Develops guidelines for skin, hair, nail, and tooth care based on what you have learned about life processes in these tissues. 24.7 Describes life processes important to the repair of damaged tissues. 24.8 Makes a diagram of the hormonal feedback system that control ovulation and menstruation in human females. 24.9 Identifies the role of organs in the male and female reproductive systems that undergo change during adolescent development. (B 1, B 2, B 23, B 24, B 25, HAP 7, HAP 8, HAP 10, HAP 12, HAP 14, HAP 20)
- 25** **Topic:** Animal Life Processes
Standard: Plans an appropriate environment and care plan for an animal that takes into account that animal's needs to maintain homeostasis. 25.1 Predicts the daily weight gain of livestock under different rearing conditions. 25.2 Develops a hypothesis about the dietary habits of ectothermic and endothermic animals, based on data you have compiled. (B 6, HAP 3)
- 26** **Topic:** Nutrition
Standard: Determines the presence of key nutrients in foods by conducting laboratory tests. 26.1 Analyzes the basic building blocks of the following nutrients: proteins, carbohydrates, and fats. 26.2 Relates the chemical structure of each nutrient to its nutritional role. 26.3 Determines the presence of selected nutrients to its nutritional role. 26.4 Evaluates the nutrient content of sample diets and menus on how adequately the four major groups as distributed in the diet. (PS 11,B 6, B 23, B 24, B 25, HAP 4,HAP 18)
- 27** **Topic:** Nutrition
Standard: Analyzes the components and functions of nutrients in an optimal diet and optimal feed ration. 27.1 Links the different types of nutrients to their functions in the body. 27.2 Identifies different food/feed selection criteria used in various health conditions including age, pregnancy, and disease states. 27.3 Judges whether a given diet - over a period of several days- would meet the Recommended Daily Allowances for nutrients in the following categories: protein, carbohydrates, fats, vitamins, and minerals. 27.4 Selects animal feeds, based on feed-label information, that satisfy the Nutrient Requirement Tables for animals. (B 23, B 24, B 25, HAP 4, HAP 18)
- 28** **Topic:** Nutrition
Standard: Evaluates the nutritional value of popular foods, advertised diet plans, and your own dietary intake. 28.1 Distinguishes the differences among various diets/ration regimens (high protein, low carbohydrate, antibiotics-supplemented feeds, etc.) 28.2 Evaluates diets to determine the balance of your caloric intake and average caloric usage, and predicts the effect that such a diet might have on your body weight. (B 23, B 24, B 25, HAP 4, HAP 18)
- 29** **Topic:** Nutrition
Standard: Relates symptoms of unbalanced diets/rations to the function of nutrients in humans and animals. 29.1 Matches physical symptoms of vitamin and mineral deficiencies to specific nutrients that may be lacking. 29.2 Investigates the effects on the body of protein shortages. 29.3 Describes the effects of starvation on an animal, citing physical symptoms and behavioral changes. 29.4 Predicts the type of health problems a person may develop from consuming the following diets: low fiber, high fat, low protein. 29.5 Relates animal-production practices to low-fat animal products. (B 23, B 24, B 25, HAP 4, HAP 18)
- 30** **Topic:** Nutrition
Standard: Appraises the advantages and disadvantages of different methods of food processing and feed milling. 30.1 Analyzes the way current food-processing methods improve shelf life. 30.2 Identifies the advantages and disadvantages of different food-processing and feed-milling practices. (B 23, B 24, B 25, HAP 18)
- 31** **Topic:** Nutrition
Standard: Evaluates the benefits and problems associated with different types of food/ration additives and supplements. 31.1 Evaluates the benefits and risks to humans of various additives and supplements to human or animals diets. (B 23, B 24, B 25, HAP 18)

- 32** **Topic:** Nutrition
Standard: Recommends food storage, handling, and preparation methods to ensure food quality and health in food-handling operations, both commercial and domestic. 32.1 Writes a list of proper food storage and handling guidelines to ensure food quality and hygiene in a food-service operation. 32.2 Evaluates various methods of food preparation. (B 15, HAP 18, ENS 29, ENS 30)
- 33** **Topic:** Nutrition
Standard: Links digestive-system anatomy and physiology in humans and other animals to their food or feed requirements. 33.1 Draws a diagram of the human digestive tract, identifying nutritional roles of each part. 33.2 Describes the mechanical processes by which food is broken down in the body. 33.3 Relates the chemical nature of acids, bases, and salts to their roles in digestion. 33.4 Relates the "lock and key" action of enzymes to the way enzymes help digest food. 33.5 Explains how nutrients in food are absorbed into the bloodstream and made available to cells throughout the body. 33.6 Identifies the role of gut microorganisms in digestion. 33.7 Compares and contrasts the functioning of human, ruminant, and nonruminant digestive systems. (B 6, B21, B 23, B 24, B 25, HAP 3, HAP 17, HAP 18)
- 34** **Topic:** Nutrition
Standard: Formulates and evaluates solutions to nutritional problems. 34.1 Identifies factors - other than nutritional needs - that affect people's diets and eating patterns. (B 2, HAP 18)
- 35** **Topic:** Disease and Wellness
Standard: Reports on some major health threats and leading causes of disease in the United States. 35.1 Investigates these major categories of disease to finding out what causes them (if known) and how they can affect our health: a. cardiovascular disease, b. cancer, c. infectious disease, d. congenital disease, e. hereditary disease, f. immune-system disease, g. aging disease, h. traumatic injuries. 35.2 Compares the effects of acute and chronic disease on both the affected person and the health-care system. 35.3 Explores the link between American lifestyles (nutrition, exercise, work, and play) and major health threats. 35.4 Explains how major disorders such as coronary artery disease, heart attack, and high blood pressure affect the cardiovascular system. 35.5 Compares and contrasts both the causes and the effects on the body of several different types of cancer. 35.6 Identifies the most common cancer symptoms and treatments. 35.7 Describes hypertension and its relation to stroke. 35.8 Describes and discusses diabetes and its side effects. 35.9 Relates environmental hazards and workplace conditions to specific diseases. (B 23, B 24, B 25)
- 36** **Topic:** Disease and Wellness
Standard: Recommends methods of disease prevention and control according to what is known about how diseases originate. 36.1 Evaluates personal habits and environmental conditions according to their potential for allowing microorganisms (pathogens) to invade the human body. 36.2 Explores the link between American lifestyles (nutrition, exercise, work, and play) and major health threats. 36.3 Identifies the most common cancer symptoms and treatments. 36.4 Relates environmental hazards and workplace conditions to specific diseases. 36.5 Explains patterns of abuse, such as experimental, occasional, regular, and dependent user, and how dependency can be classified as a disease state. 36.6 Predicts the effects of particular patterns of abuse of specific substances on the body and the mental state of the user. 36.7 Distinguishes between the wise use of pharmaceuticals, (medicines) and substance abuse. 36.8 Discusses various treatments to cure addictive disease. (B 15, B 23, B 24, B 25, HAP 15)
- 37** **Topic:** Disease and Wellness
Standard: Analyzes how the body defends itself against disease. 37.1 Contrasts the ability of a person with a healthy immune system to fight disease with that of a person with a weakened immune system. 37.2 Explains ways that an immune system can be weakened or even destroyed (AIDS, chemotherapy, genetic disease, etc.) 37.3 Describes how some people's immune systems actually work against their own bodies (autoimmune disease). (B 23, B 24, B 25, HAP 14, HAP 15, ENS 33)
- 38** **Topic:** Disease and Wellness
Standard: Compares and contrasts bacterial and viral infections, their treatment, and prevention. 38.1 Describes the major pathogens that invade the human body. 38.2 Evaluates personal habits and environmental conditions according to their potential for allowing microorganisms (pathogens) to invade the human body. (B 14, B 15, HAP 15)
- 39** **Topic:** Disease and Wellness
Standard: Evaluates facts and beliefs about different types of abused chemicals and their effects on the body. 39.1 Defines terms that are used when discussing chemical addiction: drug, drug tolerance, dependency, addiction, abuse, and controlled substances. 39.2 Categorizes different abused substances - amphetamines, cocaine, tobacco, barbiturates, valium, librium, methaqualine, marijuana, heroin, alcohol, etc.- according to their effects on the body. 39.3 Explains patterns of abuse, such as experimental, occasional regular, and dependent user: and how dependency can be classified as a disease state. 39.4 Predicts the effects of particular patterns of abuse of specific substances on the body and the mental state of the user. 39.5 Distinguishes between the wise use of pharmaceuticals (medicines) and substance abuse. (B 24)

- 40** **Topic:** Disease and Wellness
Standard: Prepares a plan for reducing your health risks and improving or maintaining your health. 40.1 Evaluates personal habits and environmental conditions according to their potential for allowing microorganisms (pathogens) to invade the human body. 40.2 Explores the link between American lifestyles (nutrition, exercise, work, and play) and major health threats. 40.3 Relates environmental hazards and workplace conditions to specific diseases. 40.4 Devises your own guidelines for good fitness and health, considering your needs for exercise, nutrition, sleep, etc. 40.5 Identifies preventive measures for major health threats. 40.6 Describes symptoms of the body that require immediate medical attention. 40.7 Recommends measures for maintaining good mental health. 40.8 Suggests changes you could make in your daily routine that would improve your health (or lessen your risk of getting sick). (B 24, HAP 18)
- 41** **Topic:** Disease and Wellness
Standard: Appraises health-care careers according to these criteria: the role performed (prevention, control, diagnoses, care and treatment, and support); level (entry, technical, and professional); and requirements for employment. 41.1 Researches employment opportunities in health care related to the categories of diseases. 41.2 Characterizes various health careers according to their role in dealing with disease (prevention and control, diagnosis, care and treatment, and support). 41.3 Relates the role and level of selected health careers to the education required and the personal characteristics identified with success in that career. (B 24)
- 42** **Topic:** Community of Life
Standard: Uses the terms population, community, ecosystem, and biome to organize the living world and its relationship to the nonliving world. 42.1 Chooses one species and identifies its biological community, its habitat, and the ecosystem in which it lives. 42.2 Makes observations of a biological community and describes how its species are interdependent. 42.3 Evaluates the immediate and gradual effects of different types of disturbance on an ecosystem. (B 25, B 26, B 27)
- 43** **Topic:** Community of Life
Standard: Assesses the diversity of biological communities and the importance of this diversity to humans. 43.1 Evaluates factors that may influence the diversity of a biological community. 43.2 Argues for or against preserving biological diversity on Earth. 43.3 Evaluates our dependence on natural ecosystems for food, fiber, and chemicals. (B 25, B 26, B 27, ENS 23)
- 44** **Topic:** Community of Life
Standard: Describes the adaptations of species to climate, soil, and other factors in various biological communities. 44.1 Chooses one species with which you are familiar and identifies its biological community, its habitat, and the ecosystem in which it lives. 44.2 Chooses one species in a biological community you have observed and describe its niche. 44.3 Describes the range of physical conditions found in saltwater habitats. 44.4 Matches advantages of marine organisms to the physical conditions of their habitats. 44.5 Explains how a plant or animal species is challenged by a seasonal change in its environment and show how a particular adaptation helps. 44.6 Compares the adaptations of organisms living in prairies with those of organisms living in deserts. 44.7 Interprets graphs of annual weather data. (B 25, ENS 14, ENS 20, ENS 25)
- 45** **Topic:** Community of Life
Standard: Uses a food-web diagram to show the interdependence of species within a community. 45.1 Measures physical characteristics such as salinity, pH, and temperature of a sample of saltwater. 45.2 Mixes an "artificial seawater" solution such as might be used to create a marine habitat. 45.3 Predicts the effects of change in one species on other species in a food web. 45.4 Analyzes a marine food web to determine the types of interactions that occur among species in the web. 45.5 Diagrams food webs that include species on which most urban organisms depend for food. 45.6 Compares the flow of matter and energy through food chains that do and do not include humans. (B 25, ENS 14, ENS 23, ENS 25)
- 46** **Topic:** Community of Life
Standard: Predicts the effects of a natural or human disturbance on an ecosystem and the course of the ecosystem's recovery. 46.1 Predicts the impact of extreme climatic events on biological communities. 46.2 Tracks changes in plant and animal life in a local area that has been disturbed. 46.3 Investigates the reasons for the potential effects of immigration and emigration on a given area. (B 27, ENS 2, ENS 24, ENS 25)
- 47** **Topic:** Community of Life
Standard: Analyzes factors affecting the size of human populations and the consequences of population changes. 47.1 Interprets graphs and tables that contain demographic information to answer questions about population trends. 47.2 Charts the growth of a population by obtaining yearly information on birth and death rates and rates of immigration and emigration. 47.3 Predicts future population trends based on current information about the population in a given area. 47.4 Investigates the reasons for and the potential effects of immigration and emigration on a given area. 47.5 Evaluates the effects of human-population growth on natural resources and human health. (B 27, ENS 2)
- 48** **Topic:** Community of Life
Standard: Evaluates the effects of human activities on climate, soil, and other physical features of the environment. 48.1 Relates human activities to possible long-term changes in global climate. 48.2 Correlates cultural patterns with land use in urban areas. 48.3 Evaluates the effects of human-population growth on natural resources and human health. (B 27, ENS 2, ENS 9, ENS 26)

Topic: Community of Life

Standard: Describes the role of organisms in the cycling of matter and the flow of energy through the biosphere. 49.1 Analyzes a marine food web to determine the types of interactions that occur among species in the web. 49.2 Evaluates the effects of human-population growth on natural resources and human health. 49.3. Demonstrates how ecosystems depend on one another. (B 25, ENS 14, ENS 25)

Course: ~~Astronomy~~

1

~~**Topic:** Inquiry, Process and Problem Solving~~

~~**Standard:** Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.~~

2

~~**Topic:** Inquiry, Process and Problem Solving~~

~~**Standard:** Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.~~

3

~~**Topic:** Laboratory Safety~~

~~**Standard:** Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.~~

4

~~**Topic:** The science of astronomy~~

~~**Standard:** Recognizes astronomy as a quantitative science devoid of superstition. 4.1 Identifies astronomy as a study of physical objects in space. 4.2 Recognizes that the study of the cycles in space may have made astronomy the most ancient of sciences. 4.3 Investigates the beginnings of astronomy as a science. 4.4 Identifies the economic, political, and societal importance of astronomy.~~

5

~~**Topic:** Measurement and motion~~

~~**Standard:** Observes, investigates, and models the motions of the earth, moon, sun, planets and stars. 5.1 Demonstrates the relationship among the various means of measuring distances in space. 5.2 Distinguishes physical effects on earth that are the result of celestial motions, e.g., the seasons. 5.3 Measures altitude and azimuth. 5.4 Observes the motion of stars located close to the celestial equator. 5.5 Analyzes how ideas of celestial motion evolved over the ages. 5.6 Compares the methods used by ancient astronomers to measure the distances between and the sizes of the sun, moon, and earth. 5.7 Explains how a knowledge of celestial motions and mechanics enabled humans to leave the planet earth. 5.8 Applies knowledge of measurements and motions to practical terrestrial navigation.~~

6

~~**Topic:** Celestial clocks~~

~~**Standard:** Recognizes the significance of the relative motions of the sun, moon, and earth. 6.1 Discovers the relationships between the length of day and the season of the year. 6.2 Distinguishes the difference between a solar day and a sidereal day. 6.3 Identifies methods by which early humans subdivided the solar day. 6.4 Recognizes that time is arbitrary. 6.5 Defines the concept and purpose of daylight savings time. 6.6 Theorizes the impact that a changed rotation of the earth might have on humanity.~~

7

~~**Topic:** The moon~~

~~**Standard:** Determines the orbital and physical characteristics of the moon. 7.1 Distinguishes between lunar and solar eclipses. 7.2 Describes physical characteristics of the moon. 7.3 Quantitatively calculates a surface feature of the moon as observed from the earth. 7.4 Analyzes the motions of the moon. 7.5 Postulates possible origins of the moon. 7.6 Relates the effect of the moon on earth tides. 7.7 Recognizes the various factors involved in sending humans to the moon.~~

8

~~**Topic:** The Solar system~~

~~**Standard:** Describes the major characteristics of the planets. 8.1 Identifies non-planetary objects. 8.2 Determines the distances between and the sizes of the planets. 8.3 Recognizes the observable motions of the planets. 8.4 Distinguishes orbital characteristics of meteors, asteroids and comets. 8.5 Researches the discoveries of the outer planets. 8.6 Analyzes possible origins of solar systems. 8.7 Relates the significance of our space program and the potential for beneficial discoveries.~~

9

~~**Topic:** Stars~~

~~**Standard:** Explains the life cycle of a star. 9.1 Examines the interior structure of stars and how energy is transformed. 9.2 Classifies stars according to standard criteria. 9.3 Identifies early theories concerning stars. 9.4 Traces the historic progress in measuring stellar distances. 9.5 Analyzes the impact of fusion reactions. 9.6 Develops the concept of supernova.~~

- 10** **Topic:** The sun
Standard: ~~Contrasts our sun with other stars. 10.1 Determines the physical differences between the sun and the earth. 10.2 Identifies three apparent motions of the sun as observed from the earth. 10.3 Recognizes the historical significance of our sun. 10.4 Evaluates the significance of solar energy for human beings.~~
- 11** **Topic:** The Milky Way and other galaxies
Standard: ~~Describes the evolution of a galaxy. 11.1 Distinguishes characteristics of the Milky Way Galaxy. 11.2 Locates the sun's position in our galaxy. 11.3 Recognizes the existence of other galaxies in the universe. 11.4 Examines early beliefs about the Milky Way galaxy. 11.5 Investigates the promise of future energy production from studies of galaxies and quasars.~~
- 12** **Topic:** Cosmology
Standard: ~~Investigates possible beginnings of the known universe. 12.1 Develops ideas concerning origins of the universe. 12.2 Investigates beliefs concerning the universe from ancient to modern times.~~

Course: ~~Biology~~

- 1** **Topic:** Science Process Skills, and Laboratory Safety
Standard: ~~Uses terms and processes employed in scientific research. 1.1. Demonstrates proficiency in the use of science process skills in laboratory and/or field activities involving observation, classification, communication, metric measurement, prediction, inference, identifying variables, formulating hypotheses, controlling variables, making operational definitions, designing investigations, experimenting, collecting qualitative and/or quantitative data, constructing a data table, graphing, analyzing, and interpreting data and/or drawing conclusions. 1.2. Produces written reports of laboratory and/or field activities in accepted formats and use precise language for presentations of procedure, tables of data, graphs, analytical methods, results, and analyses of error. 1.3. Uses laboratory equipment to conduct safe and accurate laboratory work. 1.4 Demonstrates the proper care and use of the microscope and how to prepare slides.~~
- 2** **Topic:** Research
Standard: ~~Demonstrates appropriate use of reference sources to access, analyze, evaluate, and present information related to research problems. 2.1 Uses media resources such as print, audiovisual, and online services to find information.~~
- 3** **Topic:** Nature of Biology
Standard: ~~Explains the significance of biology (e.g., impact on daily life). 3.1 Defines biology and major divisions (e.g., botany and genetics). 3.2 Explains the use of biology in daily life.~~
- 4** **Topic:** Cellular Biology (Structure)
Standard: ~~Explains the cellular basis of life. 4.1 Distinguishes between living and nonliving things (e.g., characteristics of living things). 4.2 States the cell theory. 4.3 Differentiates between prokaryotes and eukaryotes. 4.4 Identifies common cell organelles and describe the function of each (e.g., diagrams and microscopic examinations). 4.5 Distinguishes between unicellular and multicellular organisms.~~
- 5** **Topic:** Cellular Biology (Homeostasis)
Standard: ~~Explains homeostasis and describes the transport of materials through cell membranes. 5.1 Explains the role of homeostasis in maintaining life. 5.2 Cites examples of homeostatic mechanisms in unicellular and multicellular organisms. 5.3 Describes processes whereby substances enter and leave the cell (passive and active transport mechanisms) 5.4 Compares the reaction of plant and animal cells in solutions of different solute concentrations, (e.g., isotonic, hypotonic, and hypertonic solutions).~~
- 6** **Topic:** Biochemistry (Chemical Concepts)
Standard: ~~Recognizes that life has a chemical basis. 6.1 Demonstrates an understanding of basic chemical principles, (e.g., phases of matter, atomic structure, bonding, acids, bases). 6.2 Identifies the elements of the earth's atmosphere and crust that comprise living cells. 6.3 Explains the special role of water in living systems. 6.4 Describes the four basic types of organic compounds (carbohydrates, lipids, proteins, and nucleic acids) and their functions in the cell.~~
- 7** **Topic:** Biochemistry (Photosynthesis and Respiration)
Standard: ~~Explains the processes of photosynthesis and respiration. 7.1 Diagrams and explains ATP-ADP cycle. 7.2 Lists the reactants, products, and other requirements of photosynthesis. 7.3 Lists the reactants, products, and other requirements of respiration.~~
- 8** **Topic:** Biochemistry (Protein Synthesis)
Standard: ~~Explains the structure of DNA and RNA and their role in protein synthesis. 8.1 Describes the double-helix model. 8.2 Summarizes the processes of replication, transcription, and translations.~~

- 9 **Topic:** ~~Genetics (Cell Division)~~
Standard: ~~Describes the process of cell division. 9.1 Identifies the phases of mitosis. 9.2 Describes the process of cytokinesis. 9.3 States the significance of mitosis to unicellular and multicellular organisms. 9.4 Compares meiosis in sperm and egg formation, (e.g., cell number, cell size, and chromosome number).~~
- 10 **Topic:** ~~Genetics (Mendelian Genetics)~~
Standard: ~~Explains and uses the basic Mendelian genetic principles. 10.1 Defines important genetic terms. 10.2 Given parental genotypes, predicts the phenotypic, and genotypic probabilities of subsequent generations.~~
- 11 **Topic:** ~~Genetics (Patterns of Inheritance)~~
Standard: ~~Describes patterns of inheritance and genetic engineering. 11.1 Relates normal patterns of genetic inheritance to genetic variation (e.g., crossing over). 11.2 Relates abnormal patterns of genetic inheritance to genetic disorders and disease (e.g., nondisjunction). 11.3 Lists significant contributions of genetic engineering to agricultural and medical practices.~~
- 12 **Topic:** ~~The Theory of Evolution: Origins of Life and the Universe~~
Standard: ~~Describes and applies concepts of origins. 12.1 Explains historical and current theories of origins (e.g., Big Bang, evolution, and others). 12.2 Compares micro and macro evolution. 12.3 Explains natural selection and how it is affected by environmental changes.~~
- 13 **Topic:** ~~Classification~~
Standard: ~~Discriminates relationships when using a classification model to group living things. 13.1 Recognizes and uses the Linnean system of nomenclature as an accepted system of classification. 13.2 Uses a dichotomous key to classify a variety of living things based on structural similarities and differences in a laboratory setting. 13.3 Describes characteristics of organisms and identifies examples of at least five different kingdoms. 13.4 Identifies common examples of organisms in each of the kingdoms.~~
- 14 **Topic:** ~~Diversity of Life (Viruses)~~
Standard: ~~Explains the structure and function of viruses. 14.1 Describes the structure of viruses and the manner in which they infect living cells. 14.2 Describes transmission, treatment, and possible prevention of specific viral diseases.~~
- 15 **Topic:** ~~Diversity of Life (Kingdom Monera)~~
Standard: ~~Describes characteristics and examples of monerans. 15.1 Describes the cellular structure and the conditions necessary for growth and reproduction. 15.2 Describes common diseases caused by bacteria and their treatments (e.g., streptococcal, infections, pneumonia). 15.3 Describes methods of bacterial control in food preparation, handling, and storage. 15.4 Lists beneficial effects of monerans.~~
- 16 **Topic:** ~~Diversity of Life (Kingdom Protista)~~
Standard: ~~Describes the characteristics and examples of protists. 16.1 Compares the phyla of protozoa. 16.2 Compares alga phyla and identify examples of each. 16.3 Describes the beneficial and harmful effects of protozoa and algae.~~
- 17 **Topic:** ~~Diversity of Life (Kingdom Fungi)~~
Standard: ~~Describes the characteristics and list examples of fungi. 17.1 Compares and identifies fungi phyla. 17.2 Explains the beneficial and harmful effects of fungi.~~
- 18 **Topic:** ~~Diversity of Life (Kingdom Plantae: Spore Producers)~~
Standard: ~~Describes the similarities and differences of spore producing plants. 18.1 Identifies the structure for nonvascular and vascular spore producing plants. 18.2 Describes the conditions necessary for growth and reproduction. 18.3 Explains the life cycles of mosses and ferns.~~
- 19 **Topic:** ~~Diversity of Life (Kingdom Plantae: Seed Producers)~~
Standard: ~~Describes the similarities and differences of seed producing plants. 19.1 Lists and describes distinguishing characteristics of gymnosperms and angiosperms. 19.2 Describes the structure and function of roots, stems, leaves, and flowers. 19.3 Explains the process of sexual and asexual plant reproduction (e.g., pollination, fertilization, germination). 19.4 Describes the importance of seed plants for food, medicine, and other products.~~
- 20 **Topic:** ~~Diversity of Life (Kingdom Animalia: Invertebrates)~~
Standard: ~~Describes the anatomy and physiology of each phyla of invertebrates. 20.1 Explains the classification of organisms within each phyla. 20.2 Identifies major structures and their functions for common organisms in each phylum of invertebrates. 20.3 Describes the life processes of selected organisms in each phylum, i.e., 20.4 Evaluates the economic significance of certain invertebrates.~~
- 21 **Topic:** ~~Diversity of Life (Kingdom Animalia: Vertebrates)~~
Standard: ~~Describes the anatomy and physiology of classes of vertebrates. 21.1 Explains the taxonomy of each class of vertebrates. 21.2 Identifies major structures and their functions for common organisms in each class of vertebrates. 21.3 Describes the life processes of common organisms in each class of vertebrates (reproduction, response, nutrition, and behavior).~~

- 22** ~~Topic: Human Body (Organization)~~
~~Standard: Analyzes the overall organization of the human body. 22.1 Describes the basic function of each body system. 22.2 Explains how the organ systems interact to maintain homeostasis.~~
- 23** ~~Topic: Human Body (Anatomy)~~
~~Standard: Describes the anatomy of each system. 23.1 Identifies the organs and structural parts present in each system (e.g., circulatory: heart, arteries, veins, and capillaries). 23.2 Describes the basic structure of the major organ in each system (e.g., heart: chambers, valves; lungs: bronchi, bronchioles, and alveoli).~~
- 24** ~~Topic: Human Body (Physiology)~~
~~Standard: Describes the physiology of each system. 24.1 Identifies the function of each structural part in the human body system. 24.2 Explains how the parts interrelate in a functioning system.~~
- 25** ~~Topic: Ecology (Ecosystems)~~
~~Standard: Explains the structure of an ecosystem. 25.1 Identifies and explains the interactions of biotic and abiotic factors in an ecosystem. 25.2 Explains the components of a community (e.g., populations, species, niche, and habitat). 25.3 Traces the flow of matter and energy through a food chain and food webs. 25.4 Describes changes that occur in an ecosystem (e.g., ecological succession). 25.5 Uses the principles of population growth to describe how a population changes.~~
- 26** ~~Topic: Ecology (Biomes)~~
~~Standard: Lists and describes the major biomes of the world. 26.1 Locates the major biomes on a world map. 26.2 Compares the biotic and abiotic factors that distinguish the major biomes.~~
- 27** ~~Topic: Ecology (Environmental Issues)~~
~~Standard: Assesses the impact of man's activities on the environment and explore ways to help solve ecological problems. 27.1 Analyzes the possible causes of certain ecological problems (e.g., acid rain and pollution). 27.2 Identifies possible solutions to current ecological problems.~~

Course: ~~Botany~~

- 1** ~~Topic: Inquiry, Process and Problem Solving~~
~~Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.~~
- 2** ~~Topic: Inquiry, Process and Problem Solving~~
~~Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.~~
- 3** ~~Topic: Laboratory Safety~~
~~Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.~~
- 4** ~~Topic: Introduction to Botany~~
~~Standard: Recognizes the importance of plants in the balance of nature. 4.1 Identifies the specialized areas of botany. 4.2 Identifies examples of the economic influence of plants. 4.3 Demonstrates an understanding of the structure and function of the plant cell. 4.4 Describes the historical events in the discovery of the cell. 4.5 Differentiates the organization of prokaryote and eukaryote cells. 4.6 Determines the factors that affect diffusion, osmosis and facilitated transport in plant cells. 4.7 Applies the principle of homeostasis to plant cells.~~
- 5** ~~Topic: Photosynthesis and Respiration~~
~~Standard: Distinguishes the general process of photosynthesis. 5.1 Describes the light reactions of photosynthesis. 5.2 Describes the dark reactions of photosynthesis. 5.3 Identifies the plant structures, the steps, and the products involved in photosynthesis. 5.4 Describes the general process of respiration. 5.5 Analyzes the steps in plant anaerobic respiration. 5.6 Describes fermentation. 5.7 Analyzes the steps in plant aerobic respiration. 5.8 Identifies the structures, steps, and products of plant respiration.~~
- 6** ~~Topic: Classification~~
~~Standard: Applies the rules associated with the construction and use of a dichotomous key. 6.1 Discusses the classification of plants and plant-like organisms.~~

- 7 ~~Topic:~~ Classification
~~Standard:~~ Demonstrates an understanding of the historical studies of viruses. 7.1 Analyzes the nature of viruses, viral diseases, and defenses against viruses.
- 8 ~~Topic:~~ Classification
~~Standard:~~ Demonstrates an understanding of the structure, life processes, and importance of bacteria. 8.1 Describes the contributions of early microbiologists. 8.2 Recognizes the beneficial activities of bacteria. 8.3 Describes the structures and life processes of bacteria. 8.4 Distinguishes the variables that affect the growth of bacteria. 8.5 Describes the transfer of DNA in bacteria.
- 9 ~~Topic:~~ Classification
~~Standard:~~ Demonstrates an understanding of the classification, characteristics, and economic importance of cyanobacteria. 9.1 Justifies placement of the cyanobacteria in the moneran kingdom. 9.2 Distinguishes cyanophyta and cyanobacteria. 9.3 Classifies Nostoc, Anaebaena, and Oscillatoria as cyanobacteria.
- 10 ~~Topic:~~ Classification
~~Standard:~~ Demonstrates an understanding of the classification, characteristics, and economic importance of fungi. 10.1 Varies environmental factors to determine the effect on fungal growth. 10.2 Distinguishes the characteristics of the four classes of fungi. 10.3 Distinguishes the characteristics of the slime molds.
- 11 ~~Topic:~~ Classification
~~Standard:~~ Evaluates problems in classifying the protists. 11.1 Identifies the characteristics of Chrysophyta and the economic importance of diatoms. 11.2 Identifies the characteristics of Euglenophyta and the economic importance of Euglena. 11.3 Identifies the characteristics of Pyrrophyta and the dino-flagellates.
- 12 ~~Topic:~~ Classification — Algae
~~Standard:~~ Identifies, describes, and recognizes diversity among the algal members of the plant kingdom. 12.1 Compares Chlorophyta to higher plants. 12.2 Sites the characteristics of Phaeophyta and Rhodophyta. 12.3 Determines the economic and ecological importance of the algae. 12.4 Distinguishes characteristics of lichens.
- 13 ~~Topic:~~ Classification
~~Standard:~~ Analyzes the characteristics of Bryophytes. 13.1 Explains the life cycle of mosses. 13.2 Explains why Bryophytes have not adapted completely to land. 13.3 Identifies examples of mosses and liverworts. 13.4 Evaluates the economic and ecological importance of Bryophytes.
- 14 ~~Topic:~~ Classification
~~Standard:~~ Determines the specialized structures of vascular plants. 14.1 Distinguishes diversity among many spore-bearing tracheophytes. 14.2 Observes and explains the life cycle of the fern. 14.3 Discusses the economic and ecological importance of ferns. 14.4 Distinguishes diversity among the seed-bearing vascular plants. 14.5 Describes the characteristics and life cycles of gymnosperms and angiosperms. 14.6 Collects and classifies examples of conifers, monocots and dicots.
- 15 ~~Topic:~~ Flowering Plants
~~Standard:~~ Analyzes vegetative reproduction in angiosperms. 15.1 Determines the variables affecting vegetative propagation. 15.2 Describes sexual reproduction in flowering plants. 15.3 Describes the structure and function of parts of a typical flower. 15.4 Describes the stages in the life cycle of a flowering plant. 15.5 Analyzes seed development, dispersal and germination. 15.6 Analyzes fruit morphology, anatomy, and different types of fruits.
- 16 ~~Topic:~~ Flowering Plants
~~Standard:~~ Identifies and cites major characteristics of some dominant angiosperm families. 16.1 Creates a herbarium. 16.2 Defines a weed. 16.3 Differentiates between horticultural and native plants. 16.4 Evaluates the importance of plant classification, identification, and preservation.
- 17 ~~Topic:~~ Flowering Plants
~~Standard:~~ Analyzes the major types of plant tissues found in roots, stems, and leaves. 17.1 Describes primary and secondary root growth. 17.2 Describes primary and secondary stem growth. 17.3 Distinguishes the structure and function of parts of a leaf.
- 18 ~~Topic:~~ Plant functions
~~Standard:~~ Analyzes the importance of soil structure to the soil-water-plant relationship. 18.1 Describes water and mineral absorption in plants. 18.2 Traces water movement in a plant. 18.3 Describes translocation of food in plants. 18.4 Analyzes the role of turgor pressure in supporting plant tissue. 18.5 Analyzes leaf functions.
- 19 ~~Topic:~~ Plant functions
~~Standard:~~ Explains growth regulators and how plants are affected. 19.1 Evaluates the economic, political, and environmental implications of the commercial use of plant growth regulators. 19.2 Describes photoperiodism and its effect on plant growth. 19.3 Analyzes dormancy in plants. 19.4 Determines the climatic factors that determine plant growth.

20

~~Topic: Economic Botany~~

~~Standard: Describes plants of medicinal importance. 20.1 Distinguishes plants that can produce psychoactive results. 20.2 Identifies poisonous plants. 20.3 Identifies major food plants. 20.4 Distinguishes common spices, the plants they come from, and their role in history. 20.5 Identifies the role of plants in history. 20.6 Analyzes the importance of agriculture to society.~~

Course: ~~Chemistry~~

1

~~Topic: Inquiry, Process and Problem Solving~~

~~Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.~~

2

~~Topic: Inquiry, Process and Problem Solving~~

~~Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.~~

3

~~Topic: Inquiry, Process and Problem Solving~~

~~Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.~~

4

~~Topic: Inquiry, Process and Problem Solving~~

~~Standard: Gives examples of industrial processes that have been derived from scientific research and describe the impact on society.~~

5

~~Topic: Atomic Structure and Patterns of Reactivity~~

~~Standard: Describes the fundamental parts of the atom. 5.1 Uses the periodic table to identify atomic number and mass. 5.2 Relates relative position of elements on the periodic chart to period and group reactivity trends. 5.3 Describes the relationships of ionization energy and electron affinity to atomic radius and describes the relationship of valence electrons to reactivity trends in the periodic table.~~

6

~~Topic: Electron Configuration~~

~~Standard: Describes electron orbital configuration of common elements. 6.1 Illustrates the patterns of filling s, p, d, and f orbitals and its relation to quantum number. 6.2 Uses emission spectroscopy to illustrate change in energy levels between orbitals. 6.3 Draws electron dot structures to represent electron arrangements of atoms and molecules.~~

7

~~Topic: Nuclear Chemistry~~

~~Standard: Describes how energy is produced in nuclear fission reactions. 7.1 Describes alpha, beta and gamma particles and how they are involved in nuclear reactions. 7.2 Evaluates the societal, economic, political and environmental impact of nu.~~

8

~~Topic: Bonding and Formation of Chemical Compounds~~

~~Standard: Writes formulas for and names a variety of compounds. 8.1 Describes ionic and covalent bonds and describes conditions under which each would occur. 8.2 Uses electron configuration to predict the shape and therefore properties of molecules. 8.3 Determines polarity of bonds and molecules to describe characteristics of compounds. 8.4 Describes weak bond interactions such as Van de Waals, hydrogen, dipole-dipole, or ion-dipole bonds.~~

9

~~Topic: Writing and Balancing Chemical Equations~~

~~Standard: Classifies four types of chemical reactions. 9.1 Uses the law of conservation of matter and provides standard rules for writing and balancing equations. 9.2 Predicts products of replacement reactions based on relative reactivity of reactants in terms of ionization energy, electronegativity and location in the periodic table. 9.3 Classifies products of a reaction as heterogeneous or homogeneous and demonstrates how they may be separated. 9.4 Defines the term mole and uses this concept to determine relative amounts of reactants and products in a given equation. 9.5 Determines empirical formula of a compound from experimental data. 9.6 Provides evidence from an experiment that a chemical reaction has occurred. 9.7 Determines experimentally the percentage by weight or volume of a compound.~~

10

~~Topic: Equilibrium~~

~~Standard: Writes a general expression for an equilibrium constant. 10.1 Uses Le Chatelier's principle to predict relative position of an equilibrium during a reaction with a variation of temperature and pressure. 10.2 Evaluates the importance of chemical equilibrium to production efficiency in industry. 10.3 Calculates ionization constants of common salts in water.~~

- 11** ~~Topic: Acids, Bases and Salts~~
~~Standard: Writes formulas for and names a variety of acids, bases and salts. 11.1 Operationally defines acids, bases and salts in an experimental setting using selected indicators. 11.2 Compares the descriptions of acid/ bases including Arrhenius, Bronsted-Lowery and Lewis. 11.3 Uses experimentally determined pH to calculate hydrogen ion concentrations in solutions. 11.4 Explains the roles of indicators in determining relative pH of a substance. 11.5 Conducts neutralization reactions in a laboratory by titration method.~~
- 12** ~~Topic: Kinetics, Thermodynamics, Collision Theory, and Rates of Chemical Reaction.~~
~~Standard: Graphically illustrates activation energy, activated complex, reactant, product and reaction rates by means of a potential energy diagram. 12.1 Describes the rate and spontaneity of a reaction in terms of free energy, entropy and enthalpy. 12.2 Uses potential energy diagram to predict the rate and extent of a reaction. 12.3 Explains the effect of concentration, temperature, pressure, surface area and catalysts on the rate of a reaction.~~
- 13** ~~Topic: Oxidation, Reduction~~
~~Standard: Defines oxidation and reduction and describes common reactions of each. 13.1 Describes compounds as oxidizing or reducing agents.~~
- 14** ~~Topic: Phase Changes~~
~~Standard: Uses vapor pressure to describe boiling points and intermolecular interactions and uses crystal structure to describe melting points. 14.1 In a laboratory, determines variables which affect evaporation, vaporization, condensation and sublimation. 14.2 Operationally defines calorie and temperature. 14.3 In a laboratory setting, determines and graphs the total heat involved in changing a solid to a gas (e.g., ice to steam).~~
- 15** ~~Topic: Solids, Liquids and Gases~~
~~Standard: Compares solids, liquids, and gases in terms of collision theory and physical properties. 15.1 Describes crystalline structures that define types of solids. 15.2 Uses vapor pressure, density, and intermolecular interactions to describe liquids. 15.3 Uses Boyle's, Charles', and ideal Gas Laws to calculate and explain the relationship of temperature, and pressure on the volume of a gas. 15.4 Uses concept of molar volume in calculations of gaseous products of a chemical reaction. 15.5 Distinguishes between ideal gases and those that are not. 15.6 Applies concepts related to the behavior of gases to everyday life (e.g., seasonal tire pressure variation).~~
- 16** ~~Topic: Solutions~~
~~Standard: Given a mixture of liquids and/or solids, classifies the mixture as: homogeneous, heterogeneous, miscible, immiscible, or a colloid. 16.1 Determines if a reaction is endothermic or exothermic when two substances are mixed. 16.2 Identifies factors that affect solubility of a substance and theories that explain the formation of solutions. 16.3 Calculates appropriate amounts of substances and prepares solutions that have differing molarity, molality and normality. 16.4 Determines the effects of solute on boiling point elevation and freezing point depression and uses data to calculate molecular weight of a solute. 16.5 Describes the formation and properties (Tyndall effect) of colloids and their uses in the everyday world.~~
- 17** ~~Topic: Organic Chemistry~~
~~Standard: Uses the structure of methane as a model structure to draw configurations of, and name, representative classes of organic compounds. Discusses the solubility properties of such compounds. 17.1 Describes the applications of organic compounds to modern industry, such as the pharmaceuticals and plastics industries.~~

Course: ~~Earth Science~~

- 1** ~~Topic: Inquiry, Process and Problem Solving~~
~~Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.~~
- 2** ~~Topic: Inquiry, Process and Problem Solving~~
~~Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.~~
- 3** ~~Topic: Laboratory Safety~~
~~Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.~~
- 4** ~~Topic: Properties of the earth~~
~~Standard: Describes the shape of the earth as an oblate spheroid. 4.1 Uses current theories to explain polar flattening and equatorial bulge. 4.2 Determines the circumference of a globe using Eratosthenes' method. 4.3 Cites the modern scientific methods used to determine the actual size of the earth.~~

- 5** **Topic:** Properties of the earth
Standard: Distinguishes among the various types of maps. 5.1 Summarizes the type of information that can be obtained from a variety of maps. 5.2 Demonstrates how time is determined by the rotation of the earth. 5.3 Demonstrates the use of models of the earth to locate points on the earth's surface. 5.4 Demonstrates the use of topographic maps to examine surface features. 5.5 Describes how topographic maps are made from aerial and satellite photographs. 5.6 Identifies mean sea level as the point to which all topographic heights and oceanic depths are referenced. 5.7 Relates the importance of accurate, current, geological and topographical information to urban planning.
- 6** **Topic:** Properties of the earth
Standard: Determines the relationship between the earth's magnetic field and the Van Allen belts. 6.1 Relates solar wind and the Van Allen belts to the formation of the aurora. 6.2 Describes the relationship between the geographic poles and the geomagnetic poles. 6.3 Uses magnetic declination information to determine true geographic north. 6.4 Evaluates possible causes of magnetic drift. 6.5 Describes the dynamo theory of geomagnetic fields as it relates to the rotation of the earth.
- 7** **Topic:** Properties of the earth
Standard: Uses a pendulum apparatus to determine gravity. 7.1 Describes modern techniques for measuring gravity. 7.2 Assesses the changes that have occurred in instrumentation and the resulting impact on the accuracy of measurements made in both future and past studies. 7.3 Describes the significance of Newton's contributions, namely the Laws of Motion and Law of Universal Gravitation.
- 8** **Topic:** Composition of the earth
Standard: Classifies layers of the earth according to composition, state and relative hardness. 8.1 Describes ways in which data is collected about the earth's layers.
- 9** **Topic:** Composition of the earth
Standard: Identifies the relationship among the eight most common elements and the most abundant minerals in the earth's crust. 9.1 Distinguishes between atoms and molecules, elements and compounds, compounds and structural units. 9.2 Identifies common minerals by characteristic properties. 9.3 Classifies the basic crystal systems. 9.4 Explains the shape of a crystal in terms of internal molecular structure.
- 10** **Topic:** Composition of the earth
Standard: Associates particular minerals with the land form in which the minerals are most often found. 10.1 Describes ways in which minerals are formed, discovered, extracted and used. 10.2 Compares the abundance and value of economically important minerals.
- 11** **Topic:** Composition of the earth
Standard: Identifies rocks by mineral composition. 11.1 Describes the rock cycle and the importance of heat and pressure. 11.2 Hypothesizes about the origin of a rock specimen. 11.3 Evaluates the economic importance of certain rock deposits. 11.4 Identifies conditions necessary for the formation of deposits used as fossil fuels.
- 12** **Topic:** The Water Cycle
Standard: Investigates the general properties of water. 12.1 Relates the structural characteristics of the water molecule to its properties. 12.2 Observes clouds to determine the motion of air and the relative water vapor content in the atmosphere. 12.3 Distinguishes among the various types of precipitation with respect to both type and origin.
- 13** **Topic:** The Water Cycle
Standard: Identifies the processes involved in the water cycle. 13.1 Discusses the properties that distinguish the different atmospheric zones. 13.2 Investigates the causes of different optical effects that result as light passes through the atmosphere. 13.3 Collects data related to weather forecasting. 13.4 Identifies and compares various methods of heat transfer. 13.5 Relates the effects of air temperature, pressure, density, and vertical air movement on weather. 13.6 Identifies the causes of cloud formation. 13.7 Uses a sequence of weather data to make a weather forecast. 13.8 Describes the factors that affect the major climatic zones. 13.9 Distinguishes between weather and climate. 13.10 Describes the major wind patterns and the effects on climate.
- 14** **Topic:** The Water Cycle
Standard: Identifies sources of fresh water on and under the surface of the earth. 14.1 Analyzes the relationship between slope and velocity of runoff. 14.2 Predicts the effect a change in the size of soil particles has on the amount of water the soil can hold and the rate at which the water will move through the soil. 14.3 Prepares and interprets water budget graphs. 14.4 Explains the cause of flooding. 14.5 Evaluates the economic impact of flooding. 14.6 Analyzes the impact people have on the existence of fresh water bodies.

- 15** **Topic:** The Water Cycle
Standard: Identifies the major source of materials dissolved in sea water. 15.1 Recognizes the ocean as one continuous body of water. 15.2 Identifies topographic features of the ocean floor. 15.3 Analyzes the relationship among ocean currents, sediments and structures. 15.4 Identifies the major ocean currents. 15.5 Determines the energy source of waves and currents. 15.6 Investigates the relationship between Coriolis and surface ocean currents. 15.7 Investigates factors that affect wave height, speed, magnitude and rhythm. 15.8 Describes how energy and materials are exchanged between the ocean surface and the atmosphere. 15.9 Infers the climatic effects of ocean currents. 15.10 Predicts the local effects that ocean currents have on the climate of an adjacent land mass. 15.11 Describes shoreline and barrier island development and evaluate the social, economic and environmental importance. 15.12 Describes the characteristics of estuaries.
- 16** **Topic:** Formation of the earth's features
Standard: Differentiates between the two types of weathering; decomposition and disintegration. 16.1 Investigates the role of water as the "universal solvent." 16.2 Describes how weathering affects soil formation. 16.3 explains how soils reflect the climatic conditions under which the soils were formed. 16.4 Examines a soil profile in the field and identifies the type of soil. 16.5 Analyzes the relationship between erosion and gravity. 16.6 Evaluates the effectiveness of each of the agents of erosion. 16.7 Describes the appearance of topography influenced by each of the agents of erosion. 16.8 Investigates the relationships among slope, velocity and load. 16.9 Investigates stream development. 16.10 Evaluates the economic impact of weathering and erosion. 16.11 Evaluates the interrelationship between soil formation and plants and animals.
- 17** **Topic:** Formation of the earth's features
Standard: Describes the conditions under which deposition can occur. 17.1 Recognizes the patterns that are characteristic of deposited materials. 17.2 Assesses the conditions under which deposition of materials can be harmful and beneficial.
- 18** **Topic:** Formation of the earth's features
Standard: Classifies all movement of the solid parts of the earth as diastrophism. 18.1 Differentiates between deformation and displacement. 18.2 Distinguishes between synclines and anticlines and identifies where, on the earth's surface, synclines may be forming. 18.3 Distinguishes between magnitude and intensity of earthquakes. 18.4 Discusses the causes and occurrences of earthquakes. 18.5 Compares compression (P) waves with shear (S) waves. 18.6 Locates the epicenter of an earthquake. 18.7 Uses the various intensity scales for earthquakes to describe the impact an earthquake has on humans. 18.8 Evaluates the status of technology for predicting earthquakes and the social and economic importance of prediction.
- 19** **Topic:** Formation of the earth's features
Standard: Describes the theory of plate tectonics. 19.1 Identifies the major crustal plates. 19.2 Determines the relationship between volcanic activity and crustal plate boundaries. 19.3 Sites evidence that supports the theory of plate tectonics. 19.4 Describes island formation in light of volcanic activity.
- 20** **Topic:** Formation of the earth's features
Standard: Observes, describes and interprets the physiographic regions found in Georgia and the United States. 20.1 Evaluates the balance between erosion, deposition and uplift. 20.2 Compares and contrasts the characteristics of the physiographic region in which s/he lives with other regions. 20.3 Analyzes the geologic processes that might have caused the characteristics of the physiographic regions of Georgia.
- 21** **Topic:** The earth's history
Standard: Distinguishes the principles of uniformitarianism, superposition and fossil correlation. 21.1 Investigates the difference between relative time and measured time. 21.2 Simulates radioactive decay rates. 21.3 Explains the relationships between geologic history and sedimentary rocks. 21.4 Distinguishes the top of a sedimentary layer from the bottom of a sedimentary layer. 21.5 Models the Geologic Time Scale. 21.6 Cites the Geologic Time Scale from Cambrian to the present. 21.7 Relates the divisions of geologic eras to geologic revolutions. 21.8 Associates geologic events with specific geologic periods.
- 22** **Topic:** The earth's history
Standard: Associates the types of fossil organisms with specific geologic periods. 22.1 Analyzes the ways that fossils form. 22.2 Models and interprets fossil casts. 22.3 Explains how fossils are used to classify sedimentary rocks. 22.4 Describes how rock strata are matched by fossil and rock types. 22.5 Infers past conditions of an area by interpreting the fossil history of that area. 22.6 Observes species variation in fossil records as an explanation of the changes in organisms over time. 22.7 Evaluates the economic impact of the technology of fossil correlation on the coal, petroleum and other mineral industries.
- 23** **Topic:** The earth's place in the universe
Standard: Recognizes the earth, sun and moon as a system. 23.1 Compares and contrasts the landscape of the moon with that of the earth. 23.2 Hypothesizes as to the origin of the moon. 23.3 Estimates the time of day from the phase of the moon and its position in the sky. 23.4 Models the earth-moon-sun positions during different phases of the moon and during lunar and solar eclipses. 23.5 Demonstrates the movements of the earth. 23.6 Demonstrates the relationship between the tilt of the earth and the seasons. 23.7 Demonstrates the effect of the earth's orbital position on the seasons.

- 24** ~~Topic: The earth's place in the universe~~
Standard: Describes the general properties of the various planets. 24.1 Evaluates theories that describe the possible origin of the solar system. 24.2 Demonstrates planetary motion around the sun and explains retrograde motion. 24.3 Analyzes the impact of Kepler's first two laws. 24.4 Assesses the importance of the discovery of the asteroid belt.
- 25** ~~Topic: The earth's place in the universe~~
Standard: Identifies the nearest star, our sun, as a typical star. 25.1 Measures the diameter of the sun and describes the source of the sun's energy. 25.2 Estimates the number of stars that can be seen by the unaided eye and identifies factors that affect this number. 25.3 Uses a star chart to locate constellations. 25.4 Describes methods of measuring distance and obtaining information about the composition of stars. 25.5 Plots and interprets a Hertzsprung-Russell diagram.
- 26** ~~Topic: The earth's place in the universe~~
Standard: Relates the universality principle. 26.1 Discusses the possibility of the existence of anti-matter. 26.2 Compares and contrasts the Milky Way to other galaxies. 26.3 Explains how data is gathered from deep space. 26.4 Analyzes the Big Bang Theory and its relation to the expanding universe concept.
- 27** ~~Topic: The earth's place in the universe~~
Standard: Identifies milestones in the history of human beings in space. 27.1 Differentiates between natural and artificial satellites. 27.2 Identifies the major problems associated with research, development and production of space vehicles. 27.3 Identifies the scientific principles upon which space travel is based. 27.4 Evaluates the personal, social, economic and political impact of the uses of artificial satellites. 27.5 predicts future developments of space technology. 27.6 Evaluates the personal, social, economic and political impact of the space program. 27.7 Evaluates the personal, social, economic and political impact of space program "spin-offs."

Course: ~~Entomology~~

- 1** ~~Topic: Inquiry, Process and Problem Solving~~
Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.
- 2** ~~Topic: Inquiry, Process and Problem Solving~~
Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.
- 3** ~~Topic: Laboratory Safety~~
Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.
- 4** ~~Topic: History of Entomology~~
Standard: Relates individuals and events that have influenced the development of entomology. 4.1 Defines entomology. 4.2 Associates major events contributing to the development of entomology with North America and international pioneers in the field. 4.3 Relates the impact of significant early experiments in entomology.
- 5** ~~Topic: Athropods: Insects and Their Relatives~~
Standard: Distinguishes taxonomic relationships of arthropods. 5.1 Identifies characteristics of arthropods. 5.2 Determines the basis for classification of arthropods. 5.3 Classifies arthropods by subphyla. 5.4 Distinguishes characteristics of classes of arthropods. 5.5 Classifies arthropods by classes. 5.6 Distinguishes characteristics of Trilobita, Arachnoidea, Myriapods, and Insecta.
- 6** ~~Topic: Athropods: Insects and Their Relatives~~
Standard: Distinguishes the taxonomic diversity of insects. 6.1 Distinguishes characteristics of orders of insects. 6.2 Differentiates between Apterygota and Pterygota. 6.3 Differentiates between Paleoptera and Neoptera.
- 7** ~~Topic: Athropods: Insects and Their Relatives~~
Standard: Recognizes features providing developmental success to insects. 7.1 Associates specific features that have affected environmental success of a given insect.

- 8** ~~Topic: Integumentary System~~
~~Standard: Distinguishes the histology of the insect integument. 8.1 Identifies basic components of insect integument 8.2 Determines the chemical composition of insect integument 8.3 Explains sclerotization~~
- 9** ~~Topic: Integumentary System~~
~~Standard: Analyzes physical properties of the integument. 9.1 Describes strength, coloration and permeability 9.2 Relates the significance of each of the physical properties in the life of various insects~~
- 10** ~~Topic: Integumentary System~~
~~Standard: Analyzes molting. 10.1 Describes the physiology of molting 10.2 Identifies structures involved in molting 10.3 Records observations of a local insect molting~~
- 11** ~~Topic: Integumentary System~~
~~Standard: Describes external attributes of the integument. 11.1 Investigates and describes insects segmentation in a laboratory setting 11.2 Distinguishes the relationship of plates, grooves, and membranes~~
- 12** ~~Topic: Integumentary System~~
~~Standard: Describes the insect plan. 12.1 Identifies major body segments. 12.2 Identifies major appendages~~
- 13** ~~Topic: Integumentary System~~
~~Standard: Determines adaptive variations of the general insect plan. 13.1 Compares modifications of insect body segments and appendages in terms of structure and adaptation~~
- 14** ~~Topic: Nervous, Glandular, and Muscular Systems~~
~~Standard: Analyzes the structure and function of the insect nervous system. 14.1 Recognizes neurons as the basic unit 14.2 Describes and locates the central, visceral, and peripheral nervous systems 14.3 Explains roles and functioning of the nervous system 14.4 Describes how the nervous system operates to allow the insect to respond to stimuli~~
- 15** ~~Topic: Nervous, Glandular, and Muscular Systems~~
~~Standard: Analyzes the structure and function of the insect glandular system. 15.1 Identifies insect exocrine glands and their function 15.2 Identifies insect endocrine glands and their function~~
- 16** ~~Topic: Nervous, Glandular, and Muscular Systems~~
~~Standard: Analyzes the structure and function of the insect muscular system. 16.1 Distinguishes insect skeletal muscles and groups of muscles 16.2 Distinguishes insect visceral muscles 16.3 Describes the functions of each muscle type and group 16.4 Determines how insect muscles and/or groups operate~~
- 17** ~~Topic: Alimentary and Excretory Systems~~
~~Standard: Relates the structure and function of the insect alimentary system. 17.1 Compares structures and functions of foregut, midgut, and hindgut. 17.2 Describes the digestive and absorptive processes of the alimentary system 17.3 Describes the functional roles of digestive glands 17.4 Identifies modifications of the alimentary system~~
- 18** ~~Topic: Alimentary and Excretory Systems~~
~~Standard: Relates the structure and function of the insect excretory system. 18.1 Recognizes the Malpighian tubule as the basic unit of the excretory system 18.2 Investigates and describes the osmotic process 18.3 Identifies the nitrogenous aspects of excretion 18.4 Explains how the Malpighian tubule functions~~
- 19** ~~Topic: Circulatory and Respiratory Systems~~
~~Standard: Analyzes the structure and function of the insect circulatory system. 19.1 Determines the role of the hemocoel 19.2 Determines the composition of hemolymph 19.3 Describes the structure and function of hemocytes 19.4 Compares structural aspects of blood sinuses, diaphragms, and blood vessels 19.5 Identifies the function of blood sinuses, diaphragms, and blood vessels~~
- 20** ~~Topic: Circulatory and Respiratory Systems~~
~~Standard: Analyzes the structure and function of the insect respiratory. 20.1 Describes the structure and function of the tracheal system 20.2 Describes the respiratory process in insects 20.3 Compares variations in the respiratory system of insects~~
- 21** ~~Topic: Circulatory and Respiratory Systems~~
~~Standard: Analyzes the insect reproductive system. 21.1 Compares male and female insect reproductive systems in terms of morphology 21.2 Compares gamete formation in both male and female insect systems 21.3 Recognizes modifications in the reproductive system of different insects~~
- 22** ~~Topic: Circulatory and Respiratory Systems~~
~~Standard: Explains seminal transfer. 22.1 Determines the method of insect seminal transfer 22.2 Describes the process of fertilization 22.3 Describes sex determination in insects 22.4 Relates the process of parthenogenesis~~

- 23** ~~Topic: Embryology and Postembryonic Development in Insects~~
~~Standard: Explains the embryological process in insects. 23.1 Describes characteristics of cleavage 23.2 Generalizes segmentation, appendage formation and organogenesis 23.3 Investigates and describes eclosion of a local insect 23.4 Distinguishes oviparity and viviparity.~~
- 24** ~~Topic: Embryology and Postembryonic Development in Insects~~
~~Standard: Analyzes postembryonic development. 24.1 Defines growth 24.2 Describes metamorphosis 24.3 Compares types of metamorphosis 24.4 Defines polymorphism 24.5 Describes hormonal control of growth and metamorphosis 24.6 Compares larval types 24.7 Compares pupal types~~
- 25** ~~Topic: Sensory Mechanisms~~
~~Standard: Describes sensory organs of insects. 25.1 Compares mechanoreception, chemoreception, thermoreception, and the receptors of each 25.2 Conducts a standard and/or original experiment involving mechanoreceptors, chemoreceptors, and/or thermoreceptors.~~
- 26** ~~Topic: Sensory Mechanisms~~
~~Standard: Describes insect photoreceptors and vision. 26.1 Compares compound eyes and ocelli 26.2 Defines ommatidia 26.3 Defines mosaic vision 26.4 Describes image formation 26.5 Describes perception of form and pattern 26.6 Describes color vision in insects 26.7 Relates the role of color vision in butterflies.~~
- 27** ~~Topic: Sensory Mechanisms~~
~~Standard: Determines how insects produce sound. 27.1 Defines file and scraper 27.2 Defines tymbal 27.3 Relates the role of sound production in insects~~
- 28** ~~Topic: Insect Evolution~~
~~Standard: Describes the development of insects over time. 28.1 Recognizes the common ancestry of insects, other arthropods, onychophorans, and annelids 28.2 Describes the four major stages in the evolution of insects 28.3 Distinguishes the present day groupings of insects based on Carpenter's evolutionary stages~~
- 29** ~~Topic: Systematics and Insect Classification~~
~~Standard: Categorizes relationships using systematics. 29.1 Applies the binomial system of nomenclature 29.2 Compares the level of similarities of each of the taxonomic categories~~
- 30** ~~Topic: Systematics and Insect Classification~~
~~Standard: Classifies insects. 30.1 Classifies insects as Apterygota or Pterygota 30.2 Distinguishes Paleopteroous endopterygotes insects 30.3 Classifies insects by orders 30.4 Distinguishes major families in major orders 30.5 Classifies insects by families~~
- 31** ~~Topic: Systematics and Insect Classification~~
~~Standard: Analyzes local insects. 31.1 Applies binomial nomenclature when identifying local insects 31.2 Observes and records descriptions of life cycles of local insects 31.3 Describes the habitat and range of local insects 31.4 Determines the food of local insects 31.5 Evaluates the positive and negative impact of local insects~~
- 32** ~~Topic: Applied Entomology~~
~~Standard: Analyzes the negative impact of insects on humans 32.1 Defines economic threshold 32.2 Defines pest 32.3 Identifies insects injurious to plants and identify the mechanism of injury 32.4 Identifies insects injurious to animals and identifies the mechanism of injury 32.5 Identifies insects that are causative agents of disease 32.6 Analyzes the impact of harmful insects on society, economics, politics, and science and technology.~~
- 33** ~~Topic: Applied Entomology~~
~~Standard: Describes insect control methods. 33.1 Describes biological control methods 33.2 Distinguishes nonbiological control methods of control 33.3 Compares types of insecticides 33.4 Identifies regulatory methods of control 33.5 Evaluates the effectiveness of science, technology, and society on insect control.~~
- 34** ~~Topic: Applied Entomology~~
~~Standard: Analyzes the beneficial impact of insects. 34.1 Recognizes economically valuable insect products 34.2 Relates the importance of insects in pollination 34.3 Describes the role of insects in research 34.4 Relates the importance of insects as predators in maintaining homeostasis in an ecosystem 34.5 Recognizes the importance of insects as food for wildlife and human beings in some areas of the world.~~

Course: ~~Environmental Science~~

- 1** ~~Topic: Inquiry, Process and Problem Solving~~

~~**Standard:** Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.~~
- 2** ~~Topic: Inquiry, Process and Problem Solving~~

~~**Standard:** Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.~~
- 3** ~~Topic: Laboratory Safety~~

~~**Standard:** Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.~~
- 4** ~~Topic: Human Population Growth and Cultural Revolutions~~

~~**Standard:** Identifies the influence of human population changes on cultural revolutions. 4.1 Explains the terms carrying capacity and zero population growth in reference to population size. 4.2 Makes population projections using population determiners: mortality, immigration, natality, and emigration. 4.3 Identifies the factors that led to cultural revolutions.~~
- 5** ~~Topic: Advent of Environmental Concerns~~

~~**Standard:** Describes the impact of cultural revolutions on the environment. 5.1 Describes the factors that initiated environmental movements. 5.2 Analyzes the nature and impact of environmental pollution. 5.3 Predicts short and long-term impact of pollution on the environment.~~
- 6** ~~Topic: Measurements, Tools, and Careers~~

~~**Standard:** Identifies the significance of accurate, precise and subjective/objective measurements, use of reliable tools, safety measures, and career training in environmental monitoring. 6.1 Differentiates between accurate and precise measurements. 6.2 Recognizes various types of measurements required in monitoring the environment. 6.3 Recognizes expressions for determining the concentrations of solutions and its applications in monitoring the environment. 6.4 Conducts safe and accurate lab/field work.~~
- 7** ~~Topic: Energy: Fossil Fuels~~

~~**Standard:** Identifies fossil fuels as an energy resource. 7.1 Describes the formation and use of fossil fuels. 7.2 Identifies the chemical equations associated with the combustion of fossil fuels and their by-products. 7.3 Applies the principle of kinetic energy to energy stored in fossil fuels. 7.4 Understands the processes involved in the production of energy as a business enterprise. 7.5 Identifies sulfur cycle in the formation of acid rain.~~
- 8** ~~Topic: Energy: Nuclear~~

~~**Standard:** Identifies sources of nuclear energy. 8.1 Compares nuclear fission and nuclear fusion reactions in the production of energy. 8.2 Compares energy production and waste output in generating nuclear energy.~~
- 9** ~~Topic: Energy: Alternative~~

~~**Standard:** Identifies local and global alternative energy resources. 9.1 Differentiates between renewable and non-renewable energy resources. 9.2 Recognizes the need for tapping energy from local resources as alternatives.~~
- 10** ~~Topic: Energy : Conservation~~

~~**Standard:** Understand the principles of conservation of energy. 10.1 Applies the law of conservation of energy to fuel consumption. 10.2 Identifies the need for the cost effective use of electricity. 10.3 Identifies energy efficient devices. 10.4 Compares the amount of electric energy needed to operate various devices.~~
- 11** ~~Topic: Environmental Problems~~

~~**Standard:** Recognizes major environmental problems 11.1 Identifies the environmental conditions that favor life. 11.2 Describes the factors that contribute to the major environmental problems. 11.3 Explains how ozone is formed in the stratospheric layer and on earth's surface. 11.4 Experimentally determines the effects of acid precipitation on the environment. 11.5 Compares global warming to greenhouse effect and the impact of temperature changes on living things in a lab or field setting.~~
- 12** ~~Topic: Air, Atmosphere, and Air Pollution~~

~~**Standard:** Identifies the impact of pollutants in the atmosphere. 12.1 Recalls the layers of the atmosphere and the composition of air. 12.2 Describes the formation of primary, secondary, and indoor air pollutants. 12.3 Relates pollutants to smog and thermal inversions. 12.4 Investigates the impact of poor air quality on the environment.~~

- 13** **Topic:** Air Pollution Control
Standard: Recognizes various pollution control devices. 13.1 Compares pollution control devices to determine the most effective one. 13.2 Interprets the social, political, and economic influences on air pollution.
- 14** **Topic:** Water and Water Scarcity
Standard: Describes the properties of water and the daily demand for fresh water. 14.1 Identifies sources of local drinking water. 14.2 Explains the hydrological cycle. 14.3 Describes the process of water accumulation as underground water and as aquifers. 14.4 Identifies major areas of water demand and classifies domestic, industrial and agricultural uses of water and their impact on aquatic life. 14.5 Analyzes the quality of fresh, stream, and pond water. 14.6 Relates solvents and microorganisms to water quality and waste water treatment. 14.7 Investigates the chemical properties of water that make it a universal solvent.
- 15** **Topic:** Water Pollution and Conservation
Standard: Identifies major contaminants in water due to natural phenomena and activities nature, homes, industry, and agriculture. 15.1 Describes the process of waste water treatment. 15.2 Describes eutrophication of water by industrial effluents and agricultural runoffs. 15.3 Conducts lab or field tests of water samples from point sources. 15.4 Compares EPA standards for dissolved micro-nutrients in collected water samples. 15.5 Proposes water conservation methods.
- 16** **Topic:** Coastal Water Pollution and Prevention
Standard: Identifies coastal waters as an important resource. 16.1 Describes agents of ocean water pollution as land-based, commercial, and industrial activities. 16.2 Classifies biota of different coastal environments, including estuaries, marshes, tidal pools, and other wetlands. 16.3 Compares and contrasts components of marine water stratification to the components of inland bodies of water. 16.4 Relates the significance of coastal or marine resources to the economic stability.
- 17** **Topic:** Soil Composition and Properties
Standard: Describes the actions of soil forming agents. 17.1 Identifies various processes and activities that promote soil formation. 17.2 Relates particle size to soil texture. 17.3 Relates and moisture content to soils structure. 17.4 Identifies soil as an important resource. 17.5 Recognizes the composition and properties of soil samples and differentiates between soil texture and structure of soil. 17.6 Describes the composition of a soil profile and compares soil samples of varying climates.
- 18** **Topic:** Soil Erosion and Conservation
Standard: Describes the nature, causes, and agents of soil erosion and conservation techniques. 18.1 Identifies types of erosion caused by wind and water. 18.2 Identifies the role of vegetation in preventing soil erosion by wind and water. 18.3 Describes better farming practices and irrigation methods to prevent erosion. 18.4 Investigates the major soil erosion disasters with specific emphasis on their causes. 18.5 Identifies various types of human activities that contribute to desertification and proposes soil conservation methods.
- 19** **Topic:** Waste Disposal and Waste Management
Standard: Identifies types of wastes, their generation, disposal, and management problems. 19.1 Differentiates between biodegradable and non-biodegradable wastes and their disposal methods. 19.2 Describes ways of managing organic wastes, radioactive and non-radioactive industrial wastes. 19.3 Defines and identifies various types and sources of wastes and their impact on health. 19.4 Understands the role of the EPA and other agencies in attaining the national goals of waste management including composting, recycling, re-using, and reclaiming.
- 20** **Topic:** Environmental Governing Standards
Standard: Identifies the processes of developing environmental standards. 20.1 Describes the nation's goal in protecting the environment. 20.2 Demonstrates an understanding of the role of government agencies in setting standards. 20.3 Identifies various laws in maintaining the quality of air, water, soil, food, etc. 20.4 Selects a local problem and enacts the procedures in the making of a law. 20.5 Describes global organizations and proposed standards for attaining international goals. 20.6 Demonstrates an understanding of the social, political, economic, and ethical limitations in implementing national and international standards and laws.
- 21** **Topic:** Dynamic Earth
Standard: Identifies natural activities of the changing Earth. 21.1 Recalls the plate tectonic theory. 21.2 Recalls the layers of the earth and the atmosphere. 21.3 Relates the changes in earth's structure and composition to the internal forces of the earth.
- 22** **Topic:** Weather and Climate
Standard: Identifies the factors that help predict weather conditions. 22.1 Differentiates between weather and climate. 22.2 Investigates the factors (such as temperature, pressure) that help predict weather. 22.3 Identifies tools to measure change in weather conditions. 22.4 Describes origin of air masses and factors that contribute to changes in weather. 22.5 Recognizes that certain human activities release greenhouse gases, such as methane, ozone, CFCs, etc., and are said to have contributed to global climate changes.
- 23** **Topic:** Natural Disasters
Standard: Identifies various natural disasters and their role in the pollution of air, water, and soil. 23.1 Identifies possible causes for natural disasters. 23.2 Relates natural disasters to the types of pollution.

- 24** **Topic:** Meteorology and its Applications to the Environment.
Standard: Describes the process of compiling weather data for forecasting. 24.1 Interprets symbols, contours, and temperatures on a weather map. 24.2 Recognizes precipitation and cloud symbols on weather maps/station models. 24.3 Conducts an experiment to study the relationship between temperature, pressure, humidity, and relative humidity. 24.4 Makes weather predictions through field data. 24.5 Compares annual local rainfall with the annual accumulations in other areas.
- 25** **Topic:** Interactions in a Biosystem
Standard: Recognizes the complex diversity of biota and their interactions in a biological system. 25.1 Recalls the biotic and abiotic factor in the ecosystem. 25.2 Demonstrates an understanding of the use of models to relate energy flow and cycling of abiotic factors, such as energy and water. 25.3 Identifies the interactions between biotic and abiotic factors in the selected areas of a field. 25.4 Explains the role of limiting factors and the principle of tolerance in an ecosystem.
- 26** **Topic:** Succession
Standard: Describes the process of succession in various environmental setting, such as a lake, an old field, etc. 26.1 Identifies the various factors in the physical environment promote changes in populations. 26.2 Identifies the stages that may be required for an ecosystem to reach the final (climax) stage. 26.3 Evaluates the role of human activities on succession.
- 27** **Topic:** Biomes
Standard: Identifies the global and local distribution of biomes in relation to climatic conditions. 27.1 Investigates the geographical distribution of plants and animals. 27.2 Compares and contrasts the plants and animals in biomes. 27.3 Investigates the interactions that occur in an ecosystem. 27.4 Analyzes the significance of stratification in forests.
- 28** **Topic:** Biodiversity and its Balance in Nature
Standard: Analyzes the impact of human activities on biodiversity and factors that effect the balance of biosystems. 28.1 Identifies the factors that effect the balance of nature. 28.2 Identifies causes that lead to extinction and reduction of species. 28.3 Evaluates extinct or endangered species (both plant and animal) in the local community. 28.4 Identifies causes for species extinction in the local community.
- 29** **Topic:** Farming and its Impact
Standard: Identifies various farming practices, including nutrients and their applications. 29.1 Describes types of land use. 29.2 Compares traditional and modern day industrial farming. 29.3 Evaluates the role of micro organisms in agriculture, such as soil formation, fertility, and recycling carbon, oxygen, phosphorus, iron, nitrogen, and sulfur. 29.4 Describes known effects of industrial chemical herbicides, and pesticides. 29.5 Investigates factors that effect crop yield.
- 30** **Topic:** Food Demand and Food Supply
Standard: Identifies global food needs and the methods of meeting the food demand. 30.1 Differentiates between the Agricultural Revolution and the Green Revolution. 30.2 Demonstrates an understanding of the proper soil preparation, selection and growth of seasonal, ornamental and food producing plants. 30.3 Describes integrated farming practices that promote sustainability and economic growth. 30.4 Identifies the contributions of the major food processing industries. 30.5 Describes the role of the government in food production and storage.
- 31** **Topic:** Food Preservation and Food Storage
Standard: Investigates food preservation and storage methods. 31.1 Recognizes the factors that contribute to food spoilage and food poisoning. 31.2 Compares traditional and modern food storing, packing, and transporting methods. 31.3 Differentiates between food additives and food preservatives and their use in feeding the world populations. 31.4 Identifies chemical and mechanical aids for safe food storage, such as pull-off dates, temperature control, and various food additives. 31.5 Investigates the use of food additives and preservatives authorized by the Food and Drug Administration (F.D.A)
- 32** **Topic:** Packaging and Transport of Food
Standard: Identifies various materials used in storing and transporting. 32.1 Describes the processes involved in making plastic, paper, glass, tin and aluminum foil used in packaging. 32.2 Compares and contrasts the types of materials used to store food. 32.3 Compares and contrasts the types of materials used to transport food. 32.4 Identifies the six categories of plastics and the role of recycling centers in minimizing wastes. 32.5 Classifies packaging materials by their use and recycling codes. 32.6 Classifies materials used in food packaging and transport as biodegradable and non biodegradable.
- 33** **Topic:** Chemical Pollutants
Standard: Identifies the nature and impact of various chemical pollutants on the environment and human health. 33.1 Identifies the sources of chemical pollutants and their manufacturing processes. 33.2 Identifies the names and chemical formulas of chemical pollutants by the use of labels that are commonly used in homes, industry and agriculture. 33.3 Evaluates pollutants according to the nature of the emissions and effluents in air and water. 33.4 Classifies chemical pollutants as hazardous, mutagenic, biodegradable and nonbiodegradable. 33.5 Investigates the impact of chemical pollutants on human health.

34

~~Topic: Biotechnology and Biotechnological Applications~~

~~Standard: Describes the processes and applications of biotechnology. 34.1 Describes the genetic code. 34.2 Differentiates between classical applied genetics and molecular applied genetics. 34.3 Identifies the process of gene manipulations. 34.4 Demonstrates an understanding of gene manipulation techniques. 34.5 Describes the laboratory procedures of rDNA technology used for genetic variations. 34.6 Recognizes bioremediation as a type of biotechnological procedure used in toxic and hazardous material clean up. 34.7 Describes various applications of biotechnology and the role it will play on future health and environmental clean up. 34.8 Compares the areas of biotechnological applications including gene therapy.~~

35

~~Topic: Pollution & human health~~

~~Standard: Identifies environmental pollutants on human health. 35.1 Recalls health facts, including: a. A disease producing organism is a pathogen; b. An uncontrolled spread of disease is an epidemic; c. Most respiratory diseases and disorders are linked to air pollution. 35.2 Describes the immune system and its function in fighting diseases. 35.3 Defines medical terminology as they apply to human disorders and the immune system. 35.4 Demonstrates an understanding of specific factors on bacterial cultures in a lab setting. 35.5 Recognizes disease control measures. 35.6 Recognizes various diseases/disorders associated with air and water pollutants.~~

Course: ~~Geology~~

1

~~Topic: Inquiry, Process and Problem Solving~~

~~Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.~~

2

~~Topic: Inquiry, Process and Problem Solving~~

~~Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.~~

3

~~Topic: Laboratory Safety~~

~~Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.~~

4

~~Topic: Introduction to Geology~~

~~Standard: Selects rocks and landforms as two key topics. 4.1 Selects recognizable steps in the scientific method that pertain to the investigation of a given geological situation. 4.2 Sequences events in the Big Bang Theory. 4.3 Classifies a mass as a rock when it presents an aggregate of materials. 4.4 Classifies an element or a compound arranged in a regular pattern with a definite chemical composition and definite physical properties as a mineral.~~

5

~~Topic: The geologic time table~~

~~Standard: Identifies the force of erosion as an explanation for the occurrence of certain earth features such as Stone Mt. or Grand Canyon. 5.1 Determines the process capable of building layers of sedimentary rocks. 5.2 Determines the relative ages of sequentially deposited sedimentary rock layers.~~

6

~~Topic: The geologic time table~~

~~Standard: Identifies the principles of relative dating techniques. 6.1 Selects the appropriate absolute dating techniques for dating specimens. 6.2 Presented with marine deposited sedimentary rock dated as 3.5 billion years and containing single cells of bacteria and blue green algae matches these rocks with the Pre-Cambrian Era. 6.3 Presented with swamp deposited sedimentary rock dated as 300 million years old and containing amphibian remains as the most complex life form, matches these rocks with the Paleozoic Era. 6.4 Presented with sedimentary sandstone rocks dated as 150 million years old and containing dinosaur bones, matches these rocks with the Mesozoic Era. 6.5 Presented with glacially deposited sedimentary rocks dated as 30,000 years old and containing mammoth remains, matches these rocks with the Cenozoic Era.~~

7

~~Topic: Biogeochemical cycles~~

~~Standard: Classifies specific examples as gaseous or sedimentary cycle types. 7.1 Identifies the absence of a gas as a characteristic of a sedimentary cycle. 7.2 Identifies the presence of a gas as a characteristic of a gaseous cycle. 7.3 Correlates the presence of a few years to a few hundred years rapid turnover rate with a gaseous cycle. 7.4 Correlates the presence of thousands of years to millions of years slow turnover rate with a sedimentary cycle.~~

8

~~Topic: Biogeochemical cycles~~

~~Standard: Indicates the major biological, geological and chemical components in the water cycle. 8.1 Indicates the major biological, geological and chemical components in the oxygen-carbon dioxide cycle. 8.2 Indicates the major biological, geological and chemical components in the nitrogen cycle. 8.3 Indicates the major biological, geological and chemical components in the phosphorus cycle.~~

- 9 **Topic:** Biogeochemical cycles
Standard: Assesses the social, economic and political impact of acid rain. 9.1 Determines the effects of pollutants on living things. 9.2 Assesses the impact of hydroelectric dam construction projects in Georgia and the southeastern states.
- 10 **Topic:** Forces affecting landform structures
Standard: Recognizes varied geological landforms from photos or maps. 10.1 Identifies and describes the effects of physical weathering. 10.2 Identifies and describes the effects of chemical weathering. 10.3 Identifies and describes the importance of each soil component (bedrock, humus, moisture and air). 10.4 Determines the economic importance of soil.
- 11 **Topic:** Changes in the earth's crust
Standard: Summarizes the evidence supporting continental drift. 11.1 Defines a geological plate as a broad piece of the earth's crust. 11.2 Determines possible relative motions of adjacent plates. 11.3 Classifies plate boundary occurrences. 11.4 Identifies a high correlation between volcanic belts and plate boundaries. 11.5 Identifies a high correlation between mid-oceanic ridges and submarine volcanoes. 11.6 Predicts the circumpacific and Mediterranean belts as zones of major earthquake activity.
- 12 **Topic:** Geologic development of Georgia
Standard: Identifies the sequence of events that led to the formation of Georgia's Ridge and Valley, Blue Ridge, Piedmont and Coastal Plains Provinces. 12.1 Identifies the characteristics of the Ridge and Valley Province. 12.2 Identifies the characteristics of the Blue Ridge Province. 12.3 Identifies the characteristics of the Piedmont Province. 12.4 Identifies the characteristics of the Coastal Plains Province.
- 13 **Topic:** Georgia's geologic resources
Standard: Classifies geologic resources as renewable or nonrenewable. 13.1 Locates various geologic resources on a map of Georgia. 13.2 Identifies the possible substitution products for dwindling geologic resources. 13.3 Evaluates the potential for recycling and conservation of resources. 13.4 Evaluates the potential for urban waste reclamation. 13.5 Assesses the societal, economic and political impact of improper management of nonrenewable resources.
- 14 **Topic:** Future trends in geology
Standard: Describes land surface exploration methods. 14.1 Describes ocean basin exploration methods. 14.2 Evaluates the mining of space bodies. 14.3 Assesses the societal, economic and political considerations for the mining of space bodies. 14.4 Identifies essential skills required for a career in geology.

Course: ~~Human Anatomy and Physiology~~

- 1 **Topic:** Inquiry, Process and Problem Solving
Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.
- 2 **Topic:** Inquiry, Process and Problem Solving
Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.
- 3 **Topic:** Laboratory Safety
Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.
- 4 **Topic:** Introduction to the structure and function of the human body.
Standard: Analyzes organization of the human body using appropriate anatomical terminology. 4.1 Distinguishes between the terms anatomy and physiology. 4.2 Describes the levels of body organization. 4.3 Assesses the relationships between organs and organ systems. 4.4 Describes the anatomical positions and body regions when comparing the relationships of body organs and structures. 4.5 Identifies mechanisms of homeostasis.

5

Topic: Chemistry of Life

Standard: Illustrates the relationships between chemical and physical processes. 5.1 Reviews the structure of the atom and the types of bonding that form compounds. 5.2 Identifies compounds and elements necessary for maintaining life. 5.3 Identifies the structural units for carbohydrates, lipids, proteins and nucleic acids. 5.4 Evaluates the components of chemical reactions. 5.5 Identifies the types of synthesis reactions.

6

Topic: Cell Structures and Functions

Standard: Compares the structures and functions of the cell. 6.1 Compares and contrasts the methods of cell reproduction. 6.2 Examines the mechanisms that control transport of materials through the plasma membrane. 6.3 Illustrates how enzymes regulate cell activity and how DNA controls enzyme production. 6.4 Explains the interactions between organelles and how each organelle is related to cell function.

7

Topic: Histology: Tissue Types

Standard: Analyzes the general characteristics and functions of major tissue types. 7.1 Differentiates among the three types of muscle tissue based upon their structure and function. 7.2 Describes the basis for classifying connective tissue. 7.3 Characterizes a neuron as the functional unit of nervous tissue. 7.4 Classifies epithelial tissue based on location and functional characteristics.

8

Topic: Integumentary system

Standard: Lists and explains the structure and function of the components of the integumentary system. 8.1 Identifies factors contributing to the coloration of the skin. 8.2 Explains how the skin regulates the temperature of the body. 8.3 Describes the accessory organs of the skin and their functions. 8.4 Describes common integumentary system disorders in terms of origin, manifestation, and treatment.

9

Topic: Skeletal System: Bones and Joints

Standard: Explains the functions of the skeletal system and the classification and function of joints. 9.1 Identifies major bones of the axial and appendicular skeletons. 9.2 Examines the macroscopic and microscopic structure of a typical long bone. 9.3 States functions and locations of red and yellow bone marrow. 9.4 Discusses the formation of endochondral and intramembranous bone and bone remodeling. 9.5 Distinguishes between the male and female skeletons. 9.6 Describes skeletal changes associated with disease, disorders, injury, age, and stress.

10

Topic: Muscular System

Standard: Compares the structure, location, and function of smooth, cardiac, and skeletal muscle. 10.1 Identifies several skeletal muscles and the action of each to produce movement. 10.2 Demonstrates different types of muscular movements and contractions. 10.3 Analyzes the chemical and electrical events which occur in muscle contraction. 10.4 Determines changes which occur in muscular exercise. 10.5 Analyzes factors that contribute to healthy muscles. 10.6 Analyzes the impact of medical technology on muscle physiology and disease.

11

Topic: Nervous System

Standard: Relates the sensory coordination and regulatory functions of the nervous system. 11.1 Explains the divisions of the nervous system and their activity in response to sensory input. 11.2 Describes the cells of the nervous system. 11.3 Distinguishes between resting and action membrane potentials. 11.4 Differentiates between afferent and efferent fibers. 11.5 Identifies disorders of the nervous system.

12

Topic: Senses

Standard: Analyzes the physiology of various receptors associated with the somatic and special senses. 12.1 Explains the structure and function of various sense organs. 12.2 Distinguishes the chemical, electrical, and mechanical nature of sense receptors. 12.3 Compares the neurons associated with special sense organs. 12.4 Compares the wave principles associated with optics and sound. 12.5 Explains disorders of sense organs which do not function properly and the role of technology in compensating for those malfunctions.

13

Topic: Endocrine System

Standard: Describes the location, structure, and function of the endocrine glands. 13.1 Differentiates between endocrine and exocrine glands. 13.2 illustrates the location of endocrine glands. 13.3 Describes the function of each endocrine gland in terms of the chemical physiology. 13.4 Lists the various hormones produced by each endocrine gland and the response each hormone generates. 13.5 Analyzes the role of hormones as regulators. 13.6 Describes the chemical process of entry and physiological effects of steroid and nonsteroid hormones on target cells. 13.7 Identifies common disorders or diseases of the endocrine system.

14

Topic: Cardiovascular System: Heart and Blood Vessels

Standard: Describes the means by which the heart and blood vessels work together to provide the metabolic requirements of body cells. 14.1 Describes the structure, function, and location of the parts of the heart. 14.2 Interprets cardiac physiology in terms of the cardiac cycle. 14.3 Compares the structure and function of arteries, arterioles, capillaries, venules and veins. 14.4 Differentiates between pulmonary and systemic circuits. 14.5 Describes factors which affect blood pressure and regulate blood flow. 14.6 Analyzes the social and economic impact of medical technology on cardiovascular disorders.

- 15** ~~Topic: Cardiovascular System: Blood~~
~~Standard: Analyzes the composition and functions of blood. 15.1 Differentiates between the cellular components of blood in terms of morphology, function, and origin. 15.2 Analyzes the composition and the role of blood plasma. 15.3 Relates the functions of blood to homeostasis. 15.4 Explains the basis for blood typing. 15.5 Describes common blood disorders in terms of origin, manifestation, and treatment.~~
- 16** ~~Topic: Lymphatic System and Immunity~~
~~Standard: Describes the structure and function of the lymphatic system and its relationship to the circulatory system. 16.1 Analyzes the role of the lymphatic system in maintaining homeostasis. 16.2 Compares types of immunity and immune responses. 16.3 Describes common lymphatic disorders, their origin, manifestation, and treatment.~~
- 17** ~~Topic: Respiratory System~~
~~Standard: Evaluates the primary functions of the respiratory organs and how they are related to their structure. 17.1 Describes the physiology and mechanics of respiration. (a) physical inspiration, expiration (b) chemical neural and chemical regulators, homeostasis 17.2 Describes common respiratory disorders in terms of origin, manifestation, and treatment.~~
- 18** ~~Topic: Digestive System~~
~~Standard: Explains the process of digestion and absorption as it relates to each organ and gland associated with the alimentary canal. 18.1 Reviews the locations of organs of the digestive system. 18.2 Describes what happens physically and chemically to food as it passes through the digestive system. 18.3 Explains how digestion and absorption might be accomplished when damage has occurred to part of the digestive system, i.e. removal of part of the stomach.~~
- 19** ~~Topic: Nutrition and Metabolism~~
~~Standard: Identifies dietary requirements and their role in maintaining human health. 19.1 Differentiates between food and nutrition. 19.2 Describes sources and functions of macronutrients and micronutrients. 19.3 Relates the chemical aspects of enzymes to the breakdown of organic compounds. 19.4 Describes the production of energy through biological oxidation. 19.5 Distinguishes between metabolic rate and basal metabolic rate. 19.6 Analyzes the anabolic and catabolic activities.~~
- 20** ~~Topic: Urinary System~~
~~Standard: Examines the role of the urinary system as the elimination of nitrogenous wastes and the maintenance of fluid balance. 20.1 Describes the structure and operation of a nephron and its relationship to the kidney. 20.2 Relates the functions and locations of each major structure of the urinary system. 20.3 Describes the formation, composition, and elimination of urine. 20.4 Analyzes the homeostatic nature of the urinary system. 20.5 Describes common urinary system disorders in terms of origin, manifestation, and treatment.~~
- 21** ~~Topic: Reproductive System~~
~~Standard: Identifies the structure, location, and function of the major components of the male and female reproductive systems. 21.1 Relates the process of meiosis to the formation of gametes. 21.2 Describes the progression in the development of a fertilized egg. 21.3 Explains the terms zygote, embryo, and fetus. 21.4 Distinguishes the conditions required for ovulation, fertilization, and menstruation. 21.5 Analyzes the effects of male and female hormones during and after puberty. 21.6 Describes common reproductive disorders in terms of origin, manifestation, and treatment.~~

Course: ~~Meteorology~~

- 1** ~~Topic: Inquiry, Process and Problem Solving~~
~~Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.~~
- 2** ~~Topic: Inquiry, Process and Problem Solving~~
~~Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.~~
- 3** ~~Topic: Laboratory Safety~~
~~Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.~~

4

Topic: History of Meteorology

Standard: Describes ways humans have attempted to explain, predict, and control the weather throughout time by myth, magic and ritual. 4.1 Relates ways in which humans historically and currently protect themselves during various weather conditions. 4.2 Analyzes ways in which humans have taken advantage of various weather conditions. 4.3 Distinguishes principles and procedures that separate meteorology from myth. 4.4 Identifies historic and current contributions to the development of meteorological science, i.e., Invention of barometers (Galileo Torricelli). Invention of thermometers and scales. Development of gas laws (Boyle, Charles). Development of latent heat theory. Discovery of the spectrum (Herschel). Discovery of the electrical nature of lightning (Franklin). Development of weather maps. Satellite technology.

5

Topic: Radiation

Standard: Analyzes radiation and its effects on weather and climate. 5.1 Classifies the components of the electromagnetic spectrum. 5.2 Recognizes that the sun emits the entire electromagnetic spectrum. 5.3 Describes the effects of the types and intensity of radiation on the earth. 5.4 Defines the term solar constant. 5.5 Evaluates the effects of scattering, absorption, and reflection of solar radiation. 5.6 Describes terrestrial radiation.

6

Topic: The Atmosphere

Standard: Analyzes the composition of the earth's atmosphere. 6.1 Identifies the atmosphere as a component of the earth. 6.2 Describes the atmosphere as a continuous gaseous envelopment of the earth. 6.3 Classifies air as matter because it occupies space and has mass. 6.4 Classifies air as a mixture. 6.5 Lists and compares the percentage by volume of the main gases present in the atmosphere. 6.6 Describes methods for determining the composition of the atmosphere.

7

Topic: The Atmosphere

Standard: Describes the structure of the atmosphere. 7.1 Identifies the major levels of the atmosphere. 7.2 Describes the characteristics of the major layers of the atmosphere, e.g. troposphere, tropopause, stratosphere, ozone, mesosphere, etc. 7.3 Evaluates the importance of atmospheric structure to the development of life on earth. 7.4 Compares ways for obtaining information about the layers of the atmosphere.

8

Topic: The Atmosphere

Standard: Explains the relationship between air and pressure. 8.1 Determines, in a laboratory setting, that air exerts pressure. 8.2 Measures air pressure. 8.3 Compares the pressure of moist air versus dry air. 8.4 Infers the relationship of air pressure and altitude. 8.5 Interprets pressure data from weather maps.

9

Topic: The Atmosphere

Standard: Analyzes optical phenomena associated with the atmosphere. 9.1 Describes atmospheric conditions which result in red sunsets and sunrises. 9.2 Explains why the sky appears blue during the day and black at night. 9.3 Investigates the refraction and reflection of light which results in the appearance of a rainbow. 9.4 Explains the formation of glories, rings, coronas, halos, crepuscular rays, sun dogs and sun pillars. 9.5 Investigates optical phenomena caused by ice particles compared to those caused by water droplets. 9.6 Relates the optical principles associated with a mirage.

10

Topic: Heat Transfer in the Atmosphere

Standard: Describes the effects of heating and cooling of the atmosphere. 10.1 Accurately measures temperature using a thermometer. 10.2 Differentiates between heat and temperature. 10.3 Determines the relationship between temperature and pressure. 10.4 Investigates the relationship of vertical air movements to temperature, pressure, and density. 10.5 Recognizes the source of wind as a result of differences in the temperature of air. 10.6 Defines adiabatic lapse rates. 10.7 Analyzes the relationship between adiabatic lapse rates and climate conditions. 10.8 Investigates the effects of land and water heating. 10.9 Describes the formation of temperature inversions. 10.10 Recognizes the sun as the source of heat for weather. 10.11 Analyzes the causes and effects of unequal heating of the earth's surface, e.g. angle of the sun's rays, cloud cover, color and texture of the earth's surface, etc. 10.12 Defines and demonstrates heat transfer by radiation, convection, and conduction. 10.13 Evaluates human attempts to change heat transfer patterns in the atmosphere. 10.14 Interprets temperature data from weather maps and satellite images. 10.15 Draws isotherms on weather maps.

Course: Microbiology

1

Topic: Inquiry, Process and Problem Solving

Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.

2

Topic: Inquiry, Process and Problem Solving

Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.

- 3** ~~Topic: Laboratory Safety~~
~~Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.~~
- 4** ~~Topic: Historical Microbiology~~
~~Standard: Recognizes the impact of the invention of the microscope to the field of microbiology. 4.1 Describes the contributions of Robert Hooke and Antoni Van Leeuwenhoek.~~
- 5** ~~Topic: Historical Microbiology~~
~~Standard: Discriminates between abiogenesis and biogenesis. 5.1 Defines spontaneous generation 5.2 Investigates, in a laboratory setting, how Louis Pasteur disproved the theory of spontaneous generation.~~
- 6** ~~Topic: Historical Microbiology~~
~~Standard: Identifies the nature of contagious disease, the germ theory. 6.1 Describes how Robert Koch's work on anthrax proved a microorganism was the cause of disease 6.2 Lists Koch's postulates and shows their application to his work with tuberculosis 6.3 Analyzes the societal and economic impact of contributions of the following men to microbiology: John Snow, Pasteur, Edward Jenner, Joseph Lister, and Alexander Fleming.~~
- 7** ~~Topic: Growth and Identification of Bacteria~~
~~Standard: Applies proper microscopic technique when preparing microscope slides. 7.1 Identifies parts of the microscope 7.2 Demonstrates the proper function of each part of the microscope when focusing a slide 7.3 Prepares a wet mount in a laboratory setting 7.4 Fixes and stains slides using simple staining methods 7.5 Fixes and stains slides using differential staining methods.~~
- 8** ~~Topic: Growth and Identification of Bacteria~~
~~Standard: Identifies and controls variables in order to maintain pure bacterial cultures. 8.1 Distinguishes growth requirements of microorganisms 8.2 Differentiates aerobes and anaerobes, both facultative and obligative 8.3 Prepares broth and agar media 8.4 Inoculates aseptically broth and agar media 8.5 Isolates a bacterial colony to establish a pure culture.~~
- 9** ~~Topic: Growth and Identification of Bacteria~~
~~Standard: Evaluates different aseptic techniques. 9.1 Explains the use of a pressure cooker or autoclave in sterilizing cultures 9.2 Distinguishes filtration, incineration, and dry heat sterilization 9.3 Employs aseptic handling techniques to accomplish sterile transfers.~~
- 10** ~~Topic: Controlling Microbial Growth~~
~~Standard: Assesses the effectiveness of physical and chemical agents on controlling bacterial growth. 10.1 Determines the effects of certain variables on bacterial growth 10.2 Investigates the effectiveness of household antiseptics and disinfectants in controlling bacterial growth 10.3 Determines control of bacterial growth by antibiotics.~~
- 11** ~~Topic: Archeobacteria/Prokaryotes/Eukaryotes~~
~~Standard: Compares and contrasts cellular differences that are used in the classification of microbes. 11.1 Describes the classification group archaeobacteria 11.2 Identifies prokaryotic cell structures 11.3 Identifies eukaryotic cell structures.~~
- 12** ~~Topic: Archeobacteria/Prokaryotes/Eukaryotes~~
~~Standard: Compares and contrasts prokaryotic and eukaryotic. 12.1 Classifies bacteria, actinomycetes, Rickettsiae, spirochetes, and blue-green algae as prokaryotic organisms 12.2 Identifies three different shapes associated with bacteria 12.3 Identifies motility structures 12.4 Compares and contrasts endospores and capsules 12.5 Identifies common blue-green algae 12.6 Compares and contrasts green algae and blue-green algae 12.7 Distinguishes molds, yeasts, and mushrooms 12.8 Differentiates four types of protozoans 12.9 Assesses the economic importance of some prokaryotes.~~
- 13** ~~Topic: Viruses~~
~~Standard: Distinguishes the characteristics of a virus. 13.1 Compares a viral cell to a bacterial cell and eukaryotic cell 13.2 Describes the structure of a phage virus 13.3 Explains the basis for classification of viruses in terms of host specificity 13.4 Describes the life cycle of a virus.~~
- 14** ~~Topic: Viruses~~
~~Standard: Analyzes the societal and economic impact of viruses. 14.1 Classifies polio, influenza, smallpox, measles, rabies, tumor viruses, common cold, hepatitis, and aids as diseases whose causative agent is a virus 14.2 Describes the means of transmission, symptoms, prevention, and treatment of these common viral diseases 14.3 Analyzes the economic importance of transduction 14.4 Describes the role of interference 14.5 Assesses the societal and economic importance of viruses.~~
- 15** ~~Topic: Pathogenic Microbiology~~
~~Standard: Identifies disease terminology. 15.1 Defines epidemic, quarantine, and immunization 15.2 Describes hospital procedures for dealing with infectious diseases.~~

- 16** ~~Topic: Pathogenic Microbiology~~
~~Standard: Analyzes common bacterial diseases.~~
- 17** ~~Topic: Food and Dairy Microbiology~~
~~Standard: Analyzes major industrial processes involving foods. 17.1 Explains the process of pasteurization of milk and its effect on the number of microbes. 17.2 Identifies common examples of fermentation. 17.3 Investigates at least one example of fermentation.~~
- 18** ~~Topic: Food and Dairy Microbiology~~
~~Standard: Relates methods of food processing and storage to microbial growth. 18.1 Analyzes food spoilage in terms of causes, processing, and storage consideration. 18.2 Estimates the number of microbes in fresh foods using serial dilutions and plate counts. 18.3 Investigates methods of food preservation. 18.4 Compares home canning to industrial canning. 18.5 Identifies the 3 major genera responsible for food poisoning. 18.6 Distinguishes microbial problems in the slaughter and preservation of fresh meat. 18.7 Analyzes the impact of microbial food processing technology on the quality of life today.~~
- 19** ~~Topic: Soil and Water Microbiology~~
~~Standard: Evaluates the role of microorganisms in agriculture. 19.1 Identifies microorganisms as the prime geochemical agents in the formation of soils when considering soil formation. 19.2 Investigates the beneficial effects of microbes in agriculture. 19.3 Describes the role of microorganisms in the cycle of elements between an organic state and an inorganic state. 19.4 Analyzes the harmful effects of microbes in agriculture.~~
- 20** ~~Topic: Soil and Water Microbiology~~
~~Standard: Relates microorganisms to water quality and waste water treatment. 20.1 Recognizes the necessity of water to the existence of life as the universal solvent upon which all life is dependent. 20.2 Identifies organic and inorganic contaminants in water. 20.3 Defines potable water and identify drinking water standards. 20.4 Investigates tests to insure the quality of water. 20.5 Distinguishes the steps in water purification to insure that is safe microbiologically and acceptable for domestic use. 20.6 Identifies sources of water pollution in terms of natural, domestic, and industrial contributors. 20.7 Investigates different sewage treatment systems used in urban and rural communities.~~

Course: ~~Oceanography~~

- 1** ~~Topic: Inquiry, Process and Problem Solving~~
~~Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.~~
- 2** ~~Topic: Inquiry, Process and Problem Solving~~
~~Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.~~
- 3** ~~Topic: Laboratory Safety~~
~~Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.~~
- 4** ~~Topic: Chemical Oceanography~~
~~Standard: Performs experiments analyzing the components of sea water. 4.1 Calculates parts per thousand of salts in a given sample of sea water. 4.2 Determines the pH and dissolved oxygen in a given sample of sea water. 4.3 Prepares charts, graphs and forms conclusions based on experimental data.~~
- 5** ~~Topic: Chemical Oceanography~~
~~Standard: Performs successful experiments on the precipitation of carbonates and evaporites in a specific sample of sea water. 5.1 Recognizes the presence of phosphate and manganese nodules on the ocean floor. 5.2 Relates the importance of phosphate and manganese nodules. 5.3 Predicts where phosphate and manganese nodules may or may not be found.~~
- 6** ~~Topic: Chemical Oceanography~~
~~Standard: Compares and contrasts the nitrogen, phosphorus, and silicon cycles.~~
- 7** ~~Topic: Chemical Oceanography~~
~~Standard: Defines the mineral deposits of the oceans. 7.1 Identifies the chemical resources of deep ocean floor vents. 7.2 Assesses the political ramifications of the locations of the chemical resources in the oceans.~~

- 8** **Topic:** Physical Oceanography
Standard: Compares the densities of prepared samples of ocean and fresh water. 8.1 Performs experiments on the temperature and salinity of ocean water. 8.2 Demonstrates the movement of light and sound through water. 8.3 Determines the order in which the colors of the spectrum are absorbed in ocean water. 8.4 Compares and contrasts colligative properties of fresh water versus salt water. 8.5 Forms conclusions on the formation of fresh and salt water.
- 9** **Topic:** Physical Oceanography
Standard: Demonstrates the Coriolis effect and its relation to the movement of air and water on the earth. 9.1 Recognizes major atmospheric wind patterns. 9.2 Distinguishes the effects that land masses have on the atmosphere. 9.3 Explains the daily modifications land masses have on atmospheric circulation. 9.4 Demonstrates the water cycle.
- 10** **Topic:** Physical Oceanography
Standard: Performs experiments that demonstrate surface currents. 10.1 Performs experiments that explain and demonstrate vertical currents. 10.2 Identifies the various kinds of ocean currents. 10.3 Locates on a world map the direction and flow of the major ocean currents.
- 11** **Topic:** Physical Oceanography
Standard: Demonstrates the characteristics of a wave. 9.2 Determines how waves are generated. 11.1 Compares and contrasts the various kinds of waves. 11.2 Defines fetch, seiche, swell and tsunami. 11.3 Demonstrates the effect that storms and the seasons have on the nature of waves.
- 12** **Topic:** Physical Oceanography
Standard: Identifies the forces that cause tides. 12.1 Calculates the ranges through which tides are measured. 12.2 Identifies tidal bore, neap tide, spring tide and tidal range. 12.3 Predicts high and low tides using tide tables. 12.4 Graphs tidal data. 12.5 Relates tidal bore and the generation of electrical power.
- 13** **Topic:** Marine Oceanography
Standard: Defines beach, sand and shoreline. 13.1 Classifies beaches. 13.2 Demonstrates the formation of beach features. 13.3 Demonstrates beach erosion. 13.4 Interprets the profile of a typical beach. 13.5 Describes human efforts to preserve beaches. 13.6 Explains the formation of estuaries. 13.7 Prepares a model showing coastal features. 13.8 Locates and identifies, on a map or a globe, the major landmasses and oceans. 13.9 Contrasts the formation of various types of oceans. 13.91 Classifies the various types of reefs. 13.92 Relates how reefs affect the local economic development. 13.93 Compares the typical beach sediments. 13.94 Investigates the sorting and porosity of ocean sediments. 13.95 Compares sediments in a low-energy beach with those of a high-energy beach. 13.96 Identifies ocean floor geologic features. 13.97 Describes ocean floor mapping processes. 13.98 Applies the theory of sea floor spreading to the development of topographic features.
- 14** **Topic:** Marine Oceanography
Standard: Distinguishes the major characteristics of marine biozones. 14.1 Determines the physical factors of a marine environment. 14.2 Relates chemical factors to the marine environment. 14.3 Evaluates the importance of energy transfer in the marine environment. 14.4 Illustrates energy flow through a marine food chain. 14.5 Compares and contrasts the adaptations of various marine organisms to the environment. 14.6 Evaluates man's influence on the marine environment.

Course: Physical Science

- 1** **Topic:** Inquiry, Process and Problem Solving
Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.
- 2** **Topic:** Inquiry, Process and Problem Solving
Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.
- 3** **Topic:** Inquiry, Process and Problem Solving
Standard: Learns and uses on a regular basic standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.

- 4** **Topic:** Matter: Structure and Properties
Standard: Compares and contrasts matter and its characteristics related to its state (solids, liquids, and gases). 4.1 Identifies and classifies examples of matter in the learner's environment as molecules, atoms or ions. 4.2 Compares and contrasts the terms atoms, molecules, and ions and provide examples of each. 4.3 Identifies matter in its various forms including pure substances, heterogeneous and homogeneous mixtures and solution. 4.4 Describes solutions in terms of solvent, solute, and relative solubility. 4.5 Identifies the characteristics of water that make it the universal solvent.
- 5** **Topic:** Matter: Structure and Properties
Standard: Quantifies mass, weight, volume, density, conductivity, and temperature as physical properties of objects in the learner's environment. 5.1 Measures and records in appropriate units, the quantifiable physical properties identified. 5.2 Distinguishes physical from chemical properties.
- 6** **Topic:** Matter: Structure and Properties
Standard: Identifies chemical or physical changes conceptually in a laboratory setting. 6.1 Differentiates chemical from physical changes in the following laboratory investigations: combustion, fermentation, melting, dissolving, metabolism, boiling, and electrolysis.
- 7** **Topic:** Atomic Theory and Patterns of Reactivity in the Periodic Table
Standard: Describes the basic structure of the atom as protons, neutrons and electrons in specific arrangements 7.1 Identifies relative location, size and charge of subatomic particles. 7.2 Relates the relative number of protons and electrons to chemical charge and reactivity. 7.3 Defines radioactivity and describe the properties of radioactive elements and isotopes. Relates their importance to everyday life as in medicine, pollution, industry and electrical power.
- 8** **Topic:** Atomic Theory and Patterns of Reactivity in the Periodic Table
Standard: Identifies the symbol, atomic number and mass of each of the first 20 elements in the periodic table. 8.1 Compares trends of chemical properties of periods and groups in the periodic chart.
- 9** **Topic:** Atomic Theory and Patterns of Reactivity in the Periodic Table
Standard: Applies the law of definite proportions to predict mole quantities of chemicals that combine. 9.1 Predicts whether two elements will chemically combine based on their position in the periodic chart. 9.2 Applies rules for writing formulas of simple chemical compounds. 9.3 Applies rules for naming simple chemical compounds. 9.4 Classifies compounds as ionic or covalent.
- 10** **Topic:** Chemical Reactions
Standard: Classifies common chemical reaction types as syntheses, decomposition, or single or double displacement. 10.1 Distinguishes chemical reactions as endothermic and exothermic. 10.2 Writes balanced chemical equations giving names of reactants and products.
- 11** **Topic:** Organic and Biochemistry
Standard: Names and identifies the structure of simple groups of organic compounds. 11.1 Describes the importance of organic and biochemical compounds to everyday life.
- 12** **Topic:** Energy
Standard: Analyze different types of energy in terms of sources, limits and uses, and environmental impact. 12.1 Describes some sources and uses of energy such as chemical, thermonuclear, photoelectric, and electromagnetic, etc. 12.2 Describes the law of conservation of energy. 12.3 Compares the effectiveness of various methods of energy conversion. 12.4 Identifies and analyzes the nature of heat transfer in the learner's environment and describes and classifies heat transfer as conduction, convection and radiation. 12.5 Experimentally compares the relative role of conductors and insulators in heat conductivity.
- 13** **Topic:** Interaction of Force and Motion
Standard: Identifies gravity as a force that is dependent upon mass and the distance between objects. 13.1 Distinguishes among mechanical, atomic, gravitational, and electromagnetic forces. 13.2 Identifies and measures everyday forces such as gravity, rolling and sliding frictions, and other mechanical forces using common laboratory devices.
- 14** **Topic:** Interaction of Force and Motion
Standard: Measures and compares relationships among speed, velocity and acceleration. 14.1 Describes experimentally the effect of unbalanced forces in overcoming inertia, including the effect of sliding, static and rolling friction.
- 15** **Topic:** Work and Power
Standard: Measures and/or calculates work and power using several examples from the learner's environment. 15.1 Calculates the work done by simple machines and compares the force or direction of force applied. 15.2 Calculates mechanical advantage and efficiency of simple machines. 15.3 Identifies compound machines as combinations of simple machines and describes how the work is done.

16

~~Topic: Waves and Energy Transfer~~

~~Standard: Relates frequency and energy of the electromagnetic spectrum. 16.1 Uses wave and particle theory to describe transmission, absorption, reflection, and refraction of light in the visible spectrum. 16.2 Experimentally develops how light interacts with lenses, mirrors, prisms, lasers and optical fibers. 16.3 Relates color to frequency of light. 16.4 Relates frequencies of the electromagnetic spectrum outside the visible range to technological advances (e.g. microwave, radiowave). 16.5 Describes and varies properties of sound by changing temperatures or medium.~~

17

~~Topic: Electricity and Magnetism~~

~~Standard: Generates an imbalance of electrical charge and experiment with attraction and repulsion of objects. 17.1 Demonstrates production of electrical charge in a chemical reaction (e.g. simple cell). 17.2 Evaluates different methods of generating electricity such as electric induction or a simple, piezoelectric, thermoelectric or photoelectric cell. 17.3 Builds series and parallel circuits to perform specific tasks. 17.4 Measures and/or calculates current, voltage, and resistance at various points in series or parallel circuits. 17.5 Illustrates the interactions of electricity and magnetism by using electricity to create a magnetic field and magnetic induction to create an electric field. 17.6 Describes the interplay of electric and magnetic forces as the basis for electric motors, generators, radio, television, computers, and other modern technologies.~~

Course: ~~Physics~~

1

~~Topic: Science Process Skills and Laboratory Safety~~

~~Standard: Demonstrates proficiency in use of science process skills in laboratory and/or field activities that involve observation, classification, communication, metric measurement, prediction, inference, identifying variables, formulating hypotheses, controlling variables, making operational definitions, designing investigations, experimenting, collecting qualitative and quantitative data, constructing data tables, graphing, analyzing and interpreting data and/or drawing conclusions. 1.1 Produces written reports of laboratory and/or field activities in accepted formats and uses precise language for presentations of procedure, tables of data, graphs, analytical methods, results and analyses of error. 1.2 Conducts safe and accurate laboratory work. 1.3 Demonstrates proficiency in the proper use of laboratory equipment. 1.4 Identifies safety equipment and demonstrates its proper use.~~

2

~~Topic: Basic Mechanics~~

~~Standard: Collects time and distance data on objects in motion such as toy cars, air track, ball rolling down an incline, etc. 2.1 Distinguishes between vector and scalar quantities. 2.2 Investigates experimentally and solves problems that relate to time, distance, displacement, speed, velocity, and acceleration. 2.3 Resolves problems that involve motion vectors for direction and size. 2.4 Performs laboratory investigations of free fall motion. 2.5 Explores applications of a microprocessor for the analysis of laboratory data and simulation of mechanical phenomena. 2.6 Constructs and analyzes graphs of various types of motion.~~

3

~~Topic: Newton's Laws~~

~~Standard: Explains and apply Newton's three laws of motion. 3.1 States and demonstrates the relationship between unbalanced forces and acceleration. 3.2 Explains Newton's Law of Universal Gravitation. 3.3 Investigates experimentally and solves problems that relate gravitational forces, mass, distance, the Universal Gravitation constant and acceleration due to gravity. 3.4 Makes and analyzes graphs showing direct inverse, exponential relationships, and other variables.~~

4

~~Topic: Forces (Mechanical)~~

~~Standard: Resolves problems involving force vectors for the direction and size of the equilibrant force. 4.1 Investigates experimentally and solves problems that involve friction forces and the coefficients of static and sliding friction. 4.2 Investigates experimentally and solves problems that involve a system of torque producing forces acting on an object in equilibrium.~~

5

~~Topic: Motion~~

~~Standard: Analyzes the factors that influence centripetal force when it acts on a body moving in a horizontal or vertical circle. 5.1 Demonstrates the relationship among and solves problems that involve time, angular displacement, torque, rotational inertia, angular velocity, and angular acceleration for bodies in circular and rotary motion. 5.2 Investigates experimentally and solves problems involving the motion of a simple pendulum.~~

6

~~Topic: Work, Power~~

~~Standard: Investigates experimentally and solves problems relating to work, power, momentum, and impulse. 6.1 Observes and describes the conservation of momentum for elastic and inelastic collisions. 6.2 Investigates experimentally and solves problems relating to rotary work and power, angular momentum, and impulse. 6.3 Differentiates between potential and kinetic energy. 6.4 Calculates the potential and kinetic energy of a body at rest or in motion. 6.5 Identifies simple machines found in the workplace, such as doorknobs, eggbeaters, pencil sharpeners, faucets, pulley systems, etc.~~

7

~~Topic: Applications of Basic Mechanics~~

~~Standard: Analyzes developments of the science and technology of mechanics that affect the quality of life, such as weather satellites, the space program, robots, etc. 7.1 Evaluates the impact of technological developments of mechanics on societal beliefs, economic factors and political action. 7.2 Examines evidence that the demand of society for more and better products and services is driving technological development.~~

8

Topic: Phases of Matter

Standard: Performs calculations and laboratory investigations that relate to Hooke's Law, Young's Modulus, and tensile strength. 8.1 Observes the effects of pressure, surface tension, and capillary action in a liquid and relate it to natural phenomena, such as water rising in trees, insects on water, soap bubbles, etc. 8.2 Develops gas laws demonstrating the relationship of volume, temperature, and pressure of gas in the laboratory and solves gas law problems using ratio and proportions.

9

Topic: Information Retrieval

Standard: Demonstrates the ability to retrieve information from standard publications of physical constants such as C.R.C. or Lange's tables. 9.1 Develops a table of physical constants in the laboratory.

10

Topic: Thermodynamics

Standard: Relates the effects of thermal energy to kinetic molecular theory. 10.1 Distinguishes between heat and temperature. 10.2 Investigates experimentally and calculate the quantity of heat needed to produce a specified temperature change in a given substance.

11

Topic: Energy: Heat and Energy Conservation

Standard: Determines the heat gain/loss and specific heat of an object in the laboratory using a calorimeter. 11.1 Explains phase changes based upon laboratory data and graphs. 11.2 Relates laws of thermodynamics to the heating/cooling of a building. 11.3 Relates potential and kinetic energy to their heat equivalents (measures the heat produced by an object falling a given distance). 11.4 Compares and contrasts efficiencies of various types of engines (e.g., gasoline, diesel and steam).

12

Topic: Energy: Waves

Standard: Identifies and diagrams quantities relating to wave velocity, wavelength, and frequency. 12.1 Describes types of wave phenomena and modes of propagation, (e.g., electromagnetic and mechanical, longitudinal, and transverse). 12.2 Describes reflection, refraction, diffraction, and interference. 12.3 Describes standing waves with respect to nodes and antinodes. 12.4 Observes and illustrates wave phenomena using various types of equipment, such as ripple tank, slinky, soft rope, signal generator or oscilloscope.

13

Topic: Energy: Sound

Standard: Investigates loudness, sound intensity, and frequency using graphs and calculations. 13.1 Makes calculations of sound wave velocity, wavelength, frequency, and period. 13.2 Demonstrates and solves problems of apparent frequency changes due to the Doppler Effect. 13.3 Calculates and verifies the time for an echo. 13.4 Demonstrates the descriptive terms that can be applied to sound waves on a musical instrument such as pitch, amplitude, loudness, and quality. 13.5 Explains the relationship of the speed of sound to temperature and density of a medium. 13.6 Makes drawings to illustrate interference of sound waves to produce harmonics and resonance in various types of musical instruments (stringed, open and closed pipes, and percussion).

14

Topic: Energy: Light

Standard: Labels the eight sections of a chart of the electromagnetic spectrum. 14.1 Makes calculations relating the speed of light to distance and time. 14.2 Describes the dual nature of light. 14.3 Investigates with laboratory activities and calculations the inverse square relationship between light intensity and distance from the light source. 14.4 Makes calculations that relate intensity, flux, and illumination (normal and inclined). 14.5 Investigates the measurement of light intensity using a photometer. 14.6 Investigates reflection with plane and spherical (concave and convex) mirrors in the laboratory. 14.7 Investigates refraction of light in relation to the speed of light in a medium, index of refraction, and angles of incidence and refraction (Snell's Law). 14.8 Constructs ray diagrams and makes calculations relating to focal length, image distance, object distance, and image magnification for curved mirrors and lenses. 14.9 Conducts laboratory investigations and calculations of the wavelength of light using a diffraction grating and light source. 14.10 Investigates polarized light using various polarizing filters and substances. 14.11 Demonstrates dispersion of white light into a color spectrum and the addition of primary colors to form white light. 14.12 Demonstrates the subtraction of primary and secondary colors of light from white light by resonance absorption in pigments.

15

Topic: Energy: Waves Mechanics Applications

Standard: Analyzes the use of technology of the laser, microwave, and fiber optics by governments, industry, medicine, art, and entertainment in terms of political and economic competition. 15.1 Evaluates development of the science and technology of wave mechanics that affect the quality of life.

16

Topic: Electricity

Standard: Investigates electrostatic attraction/repulsion and charge transfer in the laboratory. 16.1 Relates principles of electrostatic forces, charge, distance and field intensity by making calculations.

17

Topic: Energy: Electricity, Direct Current

Standard: Infer Ohm's Law through laboratory investigation and making calculations. 17.1 Investigates resistance and current flow in series and parallel circuits and branches in the laboratory and perform related calculations. 17.2 Draws diagrams of simple electric circuits and uses electronic components to build simple circuits. 17.3 Relates electric potential to cells in series and parallel. 17.4 Determines the value of an unknown resistor through laboratory investigation. 17.5 Relates power expended in a circuit to resistance and current. 17.6 Analyzes complex circuits using Ohm's Law and Kirchoff's Law.

- 18** **Topic:** Energy: Magnetism
Standard: Demonstrates the N-S conventions in diagrams describing magnets and magnetic flux lines. 18.1 Quantitatively relate magnetic flux density near a straight conductor to current flow and distance from the conductor. 18.2 Uses the "left-hand" rule to describe the magnetic field for straight conductors and solenoids. 18.3 Calculates the strength of an electromagnet related to current flow and number of turns. 18.4 Describes the operation of an AC transformer and a DC induction coil and quantifies the relationship of primary and secondary voltages to numbers of turns.
- 19** **Topic:** Energy: Electricity, Alternating Current
Standard: Analyzes effective voltage, effective current, phased current, inductance, power angle, and impedance as they relate to alternating current circuits.
- 20** **Topic:** Energy: Applications of Electricity (STS)
Standard: Evaluates the impact of technological developments of high technology electronics, such as computers, calculators, integrated circuit silicon chips, superconductors, magnetic resonance imaging (MRI), Maglev trains, etc. on societal beliefs, economic factors, and political action. 20.1 Analyzes development of the science and technology of high technology electronics that affect the quality of life. 20.2 Appraises evidence that the demand of society and government for more and better high technology electronics is driving technological research.
- 21** **Topic:** Energy: Particle Theory
Standard: Distinguishes major aspects of quantum theory. 21.1 Analyzes the development of the quantum theory beginning with the Bohr Model, including the relationship of spectra and atomic structure. 21.2 Calculates the relationship between frequency and energy of lightwaves. 21.3 Explains the photoelectric effect and uses it to find the work function for a metal.
- 22** **Topic:** Atomic Structure
Standard: Explains the roles of some fundamental particles of the atom, such as the mesons, quarks, tachyons, and baryons. 22.1 Balances selected nuclear equations with respect to mass and charge. 22.2 Calculates the half-life of selected radioactive substances. 22.3 Identifies three types of radiation and explains transmutation by beta and alpha decay and the role of gamma radiation. 22.4 Distinguishes between natural and artificial radioactivity and identifies positrons and neutrinos. 22.5 Diagrams the cyclotron and describes its operation. 22.6 Describes linear acceleration in terms of potential difference. 22.7 Differentiates fission and fusion and analyzes their present and potential roles in nuclear reactors.
- 23** **Topic:** Energy: Nuclear (STS)
Standard: Evaluates the impact of technological developments of particle physics, (nuclear power plants, nuclear weapons, medical radiation, etc.) on societal beliefs, economic factors, and political action. 23.1 Analyzes the development of the science and technology of particle physics that affect the quality of life. 23.2 Describes areas of current research in particle physics, such as particle accelerators, cosmology, relativity, superconductivity, nuclear reactors, and the social, economic, and political pressures on this research. 23.3 Analyzes a situation such as the use of nuclear weapons as deterrents to war, as an example where the maintenance and protection of society requires philosophical advancement along with scientific and technological advancement.
- 24** **Topic:** Reference and Research Skills
Standard: Analyzes a scientific question to determine specific topic, subtopics, and amount of information needed. 24.1 Formulates a precise problem. 24.2 Identifies criteria and alternative approaches to solving the problem. 24.3 Identifies multiple types of sources (e.g., scientific journals, newspapers, directories, audiovisuals, government publications and yearbooks, computer data bases, online resources, and other electronic media) for information on a specific topic. 24.4 Uses appropriate and available retrieval systems (e.g., periodical index, computer resources, glossary, appendix, bibliography, and graphic data) to locate sources. 24.5 Distinguishes between essential and nonessential information on a topic. 24.6 Distinguishes between fact and opinion. 24.7 Distinguishes between informational, persuasive, and artistic uses of language in sources. 24.8 Determines the need for currency of data as a criteria in evaluating information. 24.9 Quotes, paraphrases, or summarizes information without plagiarizing. 24.10 Compares and synthesizes information obtained from multiple types of sources.

Course: Principles of Technology I

- 1** **Topic:** Inquiry, Process and Problem Solving
Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.
- 2** **Topic:** Inquiry, Process and Problem Solving
Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.

- 3** **Topic:** Laboratory Safety
Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.
- 4** **Topic:** Forces (Mechanical systems)
Standard: Describes what "force" is. 4.1 Gives examples of complex technological devices where force must be controlled, measured or applied. 4.2 Describes what force, pressure, have in common. Describe the results of balanced and unbalanced forces. 4.3 Briefly defines the following: scalar, vector, weight, mass and torque. 4.4 Solves torque problems, given force and lever arm information. P 2.1, 2.4, 2.5, 3.1, 3.3, 3.4, 4.2, 6.5, 14.1
- 5** **Topic:** Forces (Fluid systems)
Standard: Differentiates between hydraulic and pneumatic systems. 5.1 Defines buoyant force and pressure. 5.2 Finds pressure, force or area, using the formula, $p=F/A$, given any two of the quantities in the formula. 5.3 Describes the difference between absolute and gage pressure. 5.4 Explains how pressure in a fluid depends on depth of fluid. 5.5 Explains how manometers are used to measure pressures. P 2.1, 2.5, 2.6, 3.3, 3.4
- 6** **Topic:** Forces (Electrical systems)
Standard: Differentiates between AC and DC current. 6.1 Identifies the most common source of DC voltage. 6.2 Describes how frequency and hertz relate to AC current. 6.3 Names at least three types of voltmeters. PS 17.1, 17.2, 17.3, 17.4, 17.6 P 17.1, 17.2, 17.3
- 7** **Topic:** Forces (Thermal systems)
Standard: Identifies the direction of movement of heat energy in a thermal system when temperature information is known. 7.1 Defines temperature. 7.2 Describes the relationship between heat energy and molecular motion. including how heat energy moves through a system. 7.3 Describes how a thermocouple thermometer measures temperature. PS 12.1, 12.4, P 2.3, 2.5, 6.3, 6.4
- 8** **Topic:** Work (Mechanical systems)
Standard: Describes what's meant by work 8.1 Defines work done by a force in a mechanical system 8.2 Explains the relationship between work done on an object, force applied and the distance an object moves. 8.3 Solves work problems., given force and distance. 8.4 Explains how efficiency related to input work and output work. 8.5 Defines work done by torque. PS 4.2, 6.2, 6.5, 15.1, 15.2, 15.3 P 2.1, 2.3, 2.5
- 9** **Topic:** Work (Fluid systems)
Standard: Resolves problems involving work in fluid systems. 9.1 Describes how open and close fluid systems are different. 9.2 Describes what is meant by work done in a fluid system. 9.3 Explains the relationship between work and pressure difference in a fluid system, as given in the equation, $WORK = PRESSURE DIFFERENCE \times FLUID VOLUME MOVED$. 9.4 Solves work problems given pressure and volume information.
- 10** **Topic:** Work (Electrical systems)
Standard: Describes work in electrical systems in terms of the equation: $WORK = VOLTAGE \times ELECTRICAL CHARGE MOVED$ 10.1 Identifies a basic unit of electrical charge as the coulomb. 10.2 Solves electrical work problems, given voltage and charge information. 10.3 Explains how efficiency relates to input work and output work in an electrical systems.
- 11** **Topic:** Rate (Mechanical systems)
Standard: Describes rate in mechanical systems. 11.1 Distinguishes between linear motion and rotational motion. 11.2 Uses the equation, $v = l/t$, to describe a linear rate or speed as the distance an object travels along a line in a unit of time. 11.3 Calculates average speed for nonuniform motion over a distance. 11.4 Describes linear acceleration as linear speed per unit time. 11.5 Describes an angular rate or speed as angular distance traveled per unit of time. 11.6 Calculates linear and angular rates by using the correct rate equations. PS 12.1, 12.3 P 2.1, 2.2, 2.3, 2.5, 2.6, 3.1, 3.4, 5.1, 6.5
- 12** **Topic:** Rate (Fluid systems)
Standard: Describes a volume-flow rate as volume of fluid moved per unit time. 12.1 Describes a mass-flow rate as mass of fluid moved per unit time. 12.2 Explains the meaning of the fluid rate equations. P 2.2, 6.5
- 13** **Topic:** Rate (Electrical systems)
Standard: Describes charge flow rate and quantity of charge moved per unit time. 13.1 Explains the meaning of rate in electrical systems. 13.2 Distinguishes between DC and AC current. 13.3 Distinguishes between frequency and period. PS 17.1, 17.2, 17.3, 17.4, 17.6 P 12.4, 17.1, 17.2, 17.5, 21.3
- 14** **Topic:** Rate (Thermal systems)
Standard: Describes heat-flow as heat energy moved per unit time. 14.1 Defines rate units for thermal systems. 14.2 Explains the meaning of the equation for thermal system rate. 14.3 Defines heat capacity and specific heat. 14.4 Explains the difference between sensible and latent heat. 14.5 Measures heat rate in a thermal system. PS 12.2, 12.4, 12.5 P 2.3, 2.5, 3.4, 6.3, 6.4

- 15** **Topic:** Resistance (Mechanical systems)
Standard: Describes what's meant by resistance in general. 15.1 Identifies sources of resistance in mechanical systems. 15.2 Distinguishes between static and kinetic friction. 15.3 Describes kinetic friction as a resistance between moving surfaces. 15.4 Explains the relationship between frictional force, the coefficient of friction and the force pressing two surfaces together. 15.5 Describes drag force as resistance to objects moving through fluids. 15.6 Shows that a drag force obeys the unifying principle of a "force" divided by a rate. 15.7 Measures frictional forces in real applications. PS 14.1 P 2.1, 2.5, 3.1, 3.4, 4.1, 6.5
- 16** **Topic:** Resistance (Fluid systems)
Standard: Describes resistance in fluid systems. 16.1 Distinguishes between streamlined and turbulent flow. 16.2 Identifies the sources of resistance for a fluid moving through a pipe. 16.3 Identifies the effects of resistance in a fluid flowing through a pipe. 16.4 Explains how fluid resistance in a pipe depends on pipe area, pipe length and type of fluid. 16.5 Describes how to reduce fluid resistance in a system. P 4.1
- 17** **Topic:** Resistance (Electrical systems)
Standard: Describes resistance in electrical systems. 17.1 Shows that electrical resistance obeys the unifying principle of "force" divided by a rate. 17.2 Uses a graph to explain the relationship between resistance, voltage and current (Ohm's law). 17.3 Shows how resistance in a wire depends on the length of the wire, cross-sectional area of wire, and the material the wire is made of. 17.4 Defines resistivity. 17.5 Explains how wire resistance in electrical systems is similar to pipe resistance in fluid systems. 17.6 Finds total resistance of two resistors in parallel and series hookups. 17.7 Distinguishes between conductors, semiconductors and insulators. PS 17.3, 17.4, 17.6, P 17.1, 17.2, 17.4, 17.6
- 18** **Topic:** Resistance (Thermal systems)
Standard: Describes resistance in a thermal system. 18.1 Identifies the effects of resistance in a thermal system. 18.2 Defines thermal conductivity. 18.3 Explains the relationship between resistance, temperature difference and heat-flow rate. 18.4 Explains the meaning of the R-factor as a measure of relative thermal resistance or insulation. 18.5 Measures thermal resistance in the lab. PS 12.2, 12.4, 12.5 P 2.5, 3.4
- 19** **Topic:** Energy (Mechanical and fluid systems I)
Standard: Describes what is meant by "potential energy" and "kinetic energy". 19.1 Describes the relationship between potential energy, kinetic energy and heat energy in the conservation of energy law. 19.2 Describes the relationship between work and energy. 19.3 Distinguishes between gravitational potential energy and elastic potential energy. 19.4 Calculates gravitational potential energy. 19.5 Calculates potential energy. 19.6 Calculates spring constant. 19.7 Calculates fluid potential energy. 19.8 Measures potential energy. PS 12.2, 12.3 P 2.1, 2.4, 2.5, 2.6, 3.2, 3.3, 3.4, 5.2, 6.1, 6.2, 6.3, 6.4, 6.5
- 20** **Topic:** Energy (Mechanical and fluid systems II)
Standard: Distinguishes between linear kinetic energy and rotational energy. 20.1 Calculates linear kinetic energy. 20.2 Describes what is meant by the moment of inertia (I) of rotating bodies. 20.3 Calculates rotational kinetic energy. 20.4 Uses the law of conservation of energy to describe how one form of energy is changed into another form. 20.5 Measures kinetic energy. PS 12.1, 12.2, 12.3, 15.3 P 5.1, 6.3, 6.4
- 21** **Topic:** Energy (Electrical systems)
Standard: Describes the nature of potential energy in an electrical system. 21.1 Describes a capacitor. Explain how a capacitor works. 21.2 Defines capacitance. 21.3 Finds the electrical energy stored in a capacitor. 21.4 Describes an inductor and how an inductor works. 21.5 Defines inductance. 21.6 Calculates energy stored in an inductor. 21.7 Describes the relationship between work and electrical energy. 21.8 Measures electrical energy stored in a capacitor. 21.9 Measures electrical energy stored in an inductor. PS 17.2, 17.6 P 17.2
- 22** **Topic:** Energy (Thermal systems)
Standard: Describes the relationship between thermal energy and work. 22.1 Defines the mechanical equivalent of heat. 22.2 Finds how much heat energy is transferred between two objects of different temperatures. 22.3 Describes three ways to transfer heat energy. 22.4 Describes how heat energy changes states-- from solids to liquids, to gases, and back again. 22.5 Measures the transfer of heat energy. PS 12.2, 12.3, 12.4, 12.5 P 2.3, 2.5, 3.4
- 23** **Topic:** Waves and Vibrations (Characteristics of Waves)
Standard: Describes wave motion in general. 23.1 Describes how waves transmit (move) energy. 23.2 Describes a harmonic wave (sine wave). 23.3 Defines the wavelength, frequency, period, amplitude, and phase of a harmonic wave. 23.4 Defines wave speed for a traveling harmonic wave. 23.5 States what's meant by the phase difference between two harmonic waves. 23.6 Measures the characteristics of a wave. 23.7 Classifies waves as longitudinal or transverse. PS 16.4, 16.5 P 12.1, 12.3, 12.4, 13.1, 13.2, 13.3, 13.4, 13.5, 14.1, 15.1,
- 24** **Topic:** Waves and Vibrations (Applications of Waves and Vibrations)
Standard: Describes what is meant by interference of waves. 24.1 Defines constructive and destructive interference. 24.2 Identifies examples of wave interference. 24.3 Defines natural frequency of an object. 24.4 Defines resonance. 24.5 Identifies examples of wave resonance. PS 16.4 P 12.1, 13.1, 13.4, 13.5, 13.6

- 25** **Topic:** Radiation (Electromagnetic)
Standard: Describes what is meant by "radiation". 25.1 Describes what is meant by " electromagnetic (EM) spectrum". 25.2 Identifies four characteristics of EM radiation (wavelength, speed, frequency and energy). 25.3 Describes the speed of EM radiation in terms of wave frequency and wavelength. 25.4 Describes a photon. 25.5 Solves problems for speed and energy of EM radiation. 25.6 Describes the wavelength limits, frequency limits and color content of the visible EM spectrum. 25.7 Compares the characteristics of infrared and microwave radiation to light (visible spectrum). 25.8 Compares the characteristics of ultraviolet and X-ray radiation to light (visible spectrum) PS 16.1, 16.3, 16.4, P 12.1, 14.1, 14.3, 14.4, 14.5, 14.9, 14.11, 14.12
- 26** **Topic:** Radiation (Nuclear)
Standard: Defines "nuclear decay". 26.1 Identifies the three main components of nuclear radiation. 26.2 Describes what alpha particles, beta particles and gamma rays are by giving their approximate mass and electrical charge 26.3 Compares the relative hazards of alphas, betas, and gammas by identifying what it takes to "stop" them. 26.4 Defines "element", "isotope", "nuclide", "atomic number" and "mass number". 26.5 Explains the meaning of the symbols used to identify difference nuclides. 26.6 Describes what is meant by "fission" and "fusion". CH 7.1, 7.2 P 22.1, 22.2, 22.3 22.4, 22.5, 22.6, 22.7
- 27** **Topic:** Light and Optical Systems (Ray Optics)
Standard: Describes how light can be represented by light rays. 27.1 Explains what is meant by the "reflection " of light. 27.2 Uses light rays in a drawing to show how light is reflected from plane (flat) mirrors. 27.3 Uses light rays in a drawing to show how light is reflected from spherical mirrors. 27.4 Explains what is meant by the "curvature" and "focal length" of a mirror. 27.5 Explains what is meant by the "refraction" of light. 27.6 Defines what is meant by the "index of refraction". 27.7 Uses light rays in a drawing to show how light is refracted at an optional boundary between air and water or air and glass. 27.8 Uses light rays in a drawing to show how lenses bend and focus light. 27.9 Explains what is meant by the size and focal length of a lens. 27.91 Uses light to trace light from an object to a lens and on to an image formed by the lens. 27.91 Distinguishes between convex and concave lenses. P 12.2, 14.5, 14.7, 14.8, 16.1, 16.2, 16.3
- 28** **Topic:** Light and Optical Systems (Wave Optics)
Standard: Describes the difference between "shadows" caused by light rays and by light waves. 28.1 Explains how light "interferes" with itself when waves overlap at a point. 28.2 Distinguishes between "constructive" and "destructive" interference. 28.3 Describes what is meant by "interference fringes." 28.4 Identifies workplace applications where technicians use "interference of light". 28.5 Explains what is meant by the terms: diffraction and collimated light. 28.6 Explains why light spreads as it travels. 28.7 Explains what is meant by a diffraction grating. 28.8 Explains what a grating spectrometer does. PS 16.1, 16.2
- 29** **Topic:** Light and Optical Systems (Laser Light)
Standard: Identifies the three main components of a laser. 29.1 Draws a simple block diagram of a laser. 29.2 Lists four ways to put energy into a laser. 29.3 Lists three main types of lasers. 29.4 Identifies, by name or symbol, five important lasers. 29.5 Lists three important characteristics of laser light. 29.6 Describes what is meant by "coherent light." 29.7 Defines "radiant power" and "power density." 29.8 Explains why lasers can produce extremely high power densities on targets. PS 14.5, 16.1, 16.2, 16.3
- 30** **Topic:** Light and Optical Systems (Optical Systems)
Standard: Describes how the human eye forms an image of light. 30.1 Uses light rays to show why an eye is "nearsighted." 30.2 Uses light rays to show why an eye is "farsighted." 30.3 Shows how lenses are used to correct for nearsighted or farsighted vision. 30.4 Describes how a camera forms an image on film. 30.5 Describes what is meant by the "f-number" of a camera lens. 30.6 Describes how a simple "beam-expander" works. 30.7 Describes an optical system containing lasers and fiber optics that can be used in hospital operating rooms. 30.8 Describes an optical laser ranging system that can project a laser beam onto the moon and detect the return signal. 30.9 Describes a laser system that can be used for welding. PS 14.10, 16.1, 16.2, 16.3, 16.4

Course: Science, Technology and Society

- 1** **Topic:** Inquiry, Process and Problem Solving
Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.
- 2** **Topic:** Inquiry, Process and Problem Solving
Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.
- 3** **Topic:** Laboratory Safety
Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1 Learns and uses safety procedures specific to an investigation or research activity.

- 4** **Topic:** Environment
Standard: Describes the nature and extent of the environment. 4.1 Defines environmental terms: ecosphere, ecosystem, community, population, organism, tissue, cell, molecule, atom and show relationships from broad to specific. 4.2 Describes major examples of the most broad environmental terms. 4.3 Identifies the most important abiotic and biotic factors in the local environment.
- 5** **Topic:** Environment
Standard: Analyzes ecosystem structure in terms of the Law of Conservation of Matter and the Laws of Thermodynamics. 5.1 States of the Law of Conservation of Matter. 5.2 Analyzes the law in terms of chemical change. 5.3 Analyzes the law in terms of limited amounts of matter in ecosystems. 5.4 States the First Law of Thermodynamics. 5.5 Identifies examples of energy changes within different levels of the environment. 5.6 States the Second Law of Thermodynamics. 5.7 Identifies examples of energy loss in nature systems. 5.8 Identifies examples of increasing entropy in natural systems. 5.9 Explains apparent exceptions to increasing entropy in natural systems, such as living organisms, crystal structure, photosynthesis, etc.
- 6** **Topic:** Environment
Standard: Interprets the relationships among the various environmental factors. 6.1 Describes the sun as the initial energy source for ALL activities in the earth's ecosystems. 6.2 Traces the pathway of energy through food chains and food webs using at least two local ecosystems as examples. 6.3 Describes the cycling of matter through the environment using as examples: carbon dioxide, oxygen, water, nitrogen and phosphorus.
- 7** **Topic:** Environment
Standard: Analyzes natural factors that contribute to change in ecosystems. 7.1 Generalizes the impact of physical factors, such as weathering, erosion, climatic change, etc., on ecosystems. 7.2 Assesses the state of succession for at least two local ecosystems. 7.3 Predicts the effects of various natural events, such as fire, disease, etc. on natural succession. 7.4 Relates natural variation within populations to ideas of natural selection and evolution. 7.5 Relates mutations due to certain natural causes, such as radiation, chemicals, etc., to natural selection and evolution.
- 8** **Topic:** Environment
Standard: Analyzes natural factors that tend to promote stability in ecosystems. 8.1 Defines negative feedback. 8.2 Models examples of negative feedback within various levels of the environment. 8.3 Defines "limiting factor" by interpreting the effects of specific examples.
- 9** **Topic:** Environment
Standard: Assesses the influence of human activities on the environment. 9.1 Predicts possible effects of continued disruption of the ozone layer. 9.2 Describes eutrophication of lakes and streams due to sewage effluents, agricultural runoff and industrial wastes. 9.3 Describes known effects of certain chemicals, such as pesticides, herbicides, industrial chemicals, etc. 9.4 Evaluates the effects of species extinction and/or reduction. 9.5 Evaluates effects of hazardous waste dumps. 9.6 Evaluates effects of the use of radioactive materials.
- 10** **Topic:** Environment
Standard: Explains the roles of various governmental agencies charged with environmental protection. 10.1 Develops a list of major international, national, state, and local environmental protection agencies, giving full name and addresses of the main offices. 10.2 Describes the types of situations for which a listed agency has responsibility. 10.3 Develops a list of major private groups concerned with environmental protection, giving full names and addresses of the main offices. 10.4 Describes the roles/functions of the private agencies.
- 11** **Topic:** Environment
Standard: Assesses major legislation regarding environmental protection. 11.1 States the major focus of environmental state and federal legislation in the areas of energy, water, air, mineral resources, waste management, wildlife and land use. 11.2 Evaluates the costs of environmental protection and the lack of environmental protection. 11.3 Analyzes the difficulties in generating environmental protection laws with regard to special interest groups. 11.4 Analyzes methods used to protect the environment while still protecting individual rights. 11.5 Explains the procedures for influencing legislation. 11.6 Lists names and addresses for local, state and national legislators.
- 12** **Topic:** Natural Resources
Standard: Analyzes the major needs for resources required by industrialized, technological societies. 12.1 Identifies the major resources required by industrialized, technological societies. 12.2 Locates on a world map, the major stores of available resources. 12.3 Distinguishes between strategic and non-strategic resources.
- 13** **Topic:** Natural Resources
Standard: Explains the roles of agencies dealing with resource location, management, and conservation. 13.1 Develops a list of major international, national, state and local agencies dealing with resource location, management and conservation which gives full names and addresses of the main offices. 13.2 Describes the responsibilities and assigned tasks of each listed agency.

- 14** **Topic:** Natural Resources
Standard: Assesses the various political factors involved in acquisition and management of resources. 14.1 Analyzes historic attempts of the United States and other nations to colonize, protect and/or dominate other lands in terms of needs for resources. 14.2 Describes the attitude of early United States settlers toward the need for resource management and conservation. 14.3 Associates the geographic location of major resources with the current socioeconomic and political characteristics of the areas. 14.4 Analyzes current world conflicts for evidence of desires to control natural resources.
- 15** **Topic:** Natural Resources
Standard: Predicts future resource supplies. 15.1 Analyzes studies of rates of resource use. 15.2 Evaluates current efforts to locate new supplies or alternative resources. 15.3 Compares costs of obtaining resources now and in the future. 15.4 Predicts future world relations in terms of access to natural resources.
- 16** **Topic:** Pollution
Standard: Analyzes the nature and extent of environmental pollution. 16.1 Identifies major pollutants found in air, water and soil. 16.2 Predicts the short term/long term impacts of pollutants on specific organisms. 16.3 Predicts the short term/long term impacts of pollutants on environmental balance. 16.4 Assesses the currently accepted standards for limitations of the pollutants from 16.1. 16.5 Evaluates the major societal and/or technological causes for each pollutant from 16.1. 16.6 Analyzes the social, economic and political pressures (pro and con) related to reduction of the pollutants from 16.1. 16.7 Predicts long term impacts of pollutants on government spending and budgets.
- 17** **Topic:** Pollution
Standard: Assesses the need for private, as well as governmental involvement in the solution of pollution problems. 17.1 Develops a list of major international, national, state and local agencies that deal with pollution prevention or control, which gives full names and addresses of the main offices. 17.2 Describes the responsibilities of the agencies from 17.1. 17.3 Develops a list of major private groups concerned with pollution prevention or control, which gives names and addresses of the main offices. 17.4 Describes the functions of the private agencies from 17.3. 17.5 Assesses public awareness of environmental problems. 17.6 Describes the ways in which individual citizens and groups of citizens may affect the solutions of pollution problems.
- 18** **Topic:** Pollution
Standard: Analyzes efforts to control environmental pollution. 18.1 Evaluates currently accepted standards for control and/or solutions of the major forms of pollution. 18.2 Describes various methods of prevention and/or control of pollution. 18.3 Evaluates alternative methods for prevention/control of pollution in terms of cost, time, manpower, long term/short term effects, etc.
- 19** **Topic:** Human Population Changes
Standard: Explains the general growth pattern of a natural population. 19.1 Graphs sample data to determine the S-shaped curve typical of the growth of a natural population. 19.2 Identifies the variables that influence the shape of different parts of the curve. 19.3 Suggests limiting factors which might alter the structure of the curve. 19.4 Defines "carrying capacity". 19.5 Analyzes carrying capacity in terms of how it can change for a given ecosystem.
- 20** **Topic:** Human Population Changes
Standard: Recognizes differences between so-called "more developed" countries and "less developed" countries. 20.1 Compares data related to "more developed" with data related to "less developed" countries. 20.2 Describes the effects of characteristics noted from the data analysis on everyday lifestyles. 20.3 Locates on a world map several examples of the two types of countries.
- 21** **Topic:** Human Population Changes
Standard: Analyzes how the human population has changed and is currently changing. 21.1 Graphs the world population at intervals for the last 2000 years. 21.2 Relates major changes in world populations to the occurrence of technological revolutions. 21.3 Identifies five factors affecting the growth of a population (birth/death rates, migration, fertility, age structure, average age of mother during first birth). 21.4 Compares the doubling time for various countries. 21.5 Predicts the world population by A.D. 2000 and A.D. 2100. 21.6 Defines zero population growth. 21.7 Predicts the effect of zero population growth on the growth curve. 21.8 Predicts when zero population growth might be reached in "more developed" and "less developed" countries.
- 22** **Topic:** Human Population Changes
Standard: Analyzes differing views in relation to alleviating population problems in "less developed" countries through understanding of and tolerance for individual differences. 22.1 Describes some steps that have been taken to deal with population problems in less developed countries, such as economic, family planning, raising marriage age, abortion, changing women's roles, etc. 22.2 Evaluates the social, economic, environmental and political consequences of the listed methods. 22.3 Appraises the value of a "hands-off" approach to population management.
- 23** **Topic:** Human Population Changes
Standard: Appraises the need for population control in the United States. 23.1 Compares the reasons for control/non-control of population in the United States. 23.2 Suggests potential social, economic, environmental and political problems which may arise with each approach to population control/non-control. 23.3 Evaluates protection of individual rights versus protection of human welfare.

- 24** **Topic:** Human Population Changes
Standard: Analyzes the population in Georgia. 24.1 Interprets the population distribution in Georgia in terms of cause and effect. 24.2 Analyzes the social, economic, environmental and political impact of continued population growth in various areas of the state. 24.3 Suggests ways to solve the problems arising from overcrowding in certain areas of the state.
- 25** **Topic:** Human Population Changes
Standard: Analyzes the impact of medical technology on human population growth. 25.1 Traces the developments of modern medicine in terms of its impact on human growth and genetics. 25.2 Describes the nature and potential uses of genetic engineering, cloning, and "test tube" babies. 25.3 Describes how radiation medicine technology affects the quality of life. 25.4 Assesses the personal, social, economic and political impact of medical technology.
- 26** **Topic:** Impact of Technological Advances
Standard: Analyzes the interrelationship of science, technology and society in terms of personal, societal, economic and political needs and impact on values and beliefs. 26.1 Defines the scope of each area of knowledge, that is, science, technology, and society. 26.2 Describes the scientific, social and technological aspects of the topics studied thus far in the course, environment, resources, pollution and human population growth.
- 27** **Topic:** Impact of Technological Advances
Standard: Analyzes the social, economic and political implications of space technology. 27.1 Analyzes examples of instances when generally held beliefs, superstitions, and fears put restrictions on the progress of science, such as highlighted in the cases of Copernicus and Galileo. 27.2 Analyzes examples of societal beliefs that science and technology can solve any national or world problem. 27.3 Analyzes examples of knowledge produced through science and technology changing the thought structures of society. 27.4 Analyzes the space program as an example of national political strength being enhanced by, if not dependent on, scientific and technological development. 27.5 Analyzes an example of when government competes with other segments of society for control of science and technology. 27.6 Describes space programs as instances of governments using developments of science and technology to compete for power and prestige in the world. 27.7 Analyzes an example of government directing research and development according to perceptions of what society needs and wants. 27.8 Evaluates the demand of society for more and better products and services driving technological development.
- 28** **Topic:** Impact of Technological Advances
Standard: Analyzes the social, economic and political implications of technology of wave mechanics. 28.1 Evaluates the economic impact of photovoltaic, microwave, laser and fiber optic technologies. 28.2 Describes how photovoltaic, microwave, laser and fiber optic technologies affect the quality of life. 28.3 Assesses the social, economic and political impact of more extensive, faster means of communications. 28.4 Describes how government has used the laser in a world competing for power and prestige. 28.5 Describes how industry and government have directed photovoltaic, microwave, laser and fiber optic research according to perceptions of what society needs and wants.
- 29** **Topic:** Impact of Technological Advances
Standard: Analyzes the social, economic and political implications of silicon chip technology. 29.1 Evaluates the next generation of supercomputers as an example of where the national economy is dependent on continuing scientific and technological research and development. 29.2 Analyzes high technology electronics as an example of where national political strength is enhanced by, if not dependent on, scientific and technological development. 29.3 Evaluates the impact of silicon chip technology on the quality of life. 29.4 Analyzes the demand by society for more and better high technology electronics products and services and how this drives technological development. 29.5 Surveys current uses for computerization and, based on research data, predict new uses in the near future.
- 30** **Topic:** Impact of Technological Advances
Standard: Analyzes the social, economic and political implications of nuclear energy. 30.1 Analyzes the social, economic and political impact of societal fears on proliferation of nuclear power plants and progress of nuclear technology. 30.2 Evaluates the use of nuclear weapons as deterrents to war and as an example of where the maintenance and protection of society requires philosophical advancement along with scientific and technological advancement. 30.3 Evaluates the release of radiation from nuclear power plants as an example of where efforts to meet the needs of society through research and development can have negative as well as positive results.
- 31** **Topic:** Impact of Technological Advances
Standard: Analyzes the social, economic and political need for research in science and technology. 31.1 Reviews cases of basic and applied research while supporting the need for both types of research. 31.2 Describes the impact of The Department of Defense contracts to universities in terms of dependency on government funding for research and political control over the research that can be done. 31.3 Describes areas of current research in physics, based on their social, economic and/or political impact. 31.4 Assesses the impact of government funded research in science and technology, such as nuclear fusion research, on the gross national product. 31.5 Analyzes areas of current research in physics based on their social, economic and/or political impact.
- 32** **Topic:** Local Studies
Standard: Delineates several current and future problems faced by local authorities and developers while proposing viable solutions for those problems. 32.1 Surveys local resources for information regarding problems face by local planners and developers. 32.2 Analyzes the data collected to distinguish between short-term and long-term problems. 32.3 Assesses current public awareness of the identified problems by consulting with local authorities, newspapers and various citizens. 32.4 Compares various options for solutions) of the problems. 32.5 Describes the most practical solution for each of the problems.

Course: ~~Zoology~~

- 1** ~~Topic: Inquiry, Process and Problem Solving~~

~~Standard: Uses science process skills in laboratory or field investigations, including observation, classification, communication, metric measurement, prediction, inference, collecting and analyzing data. 1.1 Designs and conducts a scientific experiment that identifies the problem, distinguishes manipulated, responding and controlled variables, collects, analyzes and communicates data, and makes valid inferences and conclusions. 1.2 Evaluates procedures, data and conclusions to determine the scientific validity of research.~~
- 2** ~~Topic: Inquiry, Process and Problem Solving~~

~~Standard: Uses traditional reference materials to explore background and historical information regarding a scientific concept. 2.1 Uses current technologies such as CD-ROM, Internet and on-line data search to explore current research related to a science concept.~~
- 3** ~~Topic: Inquiry, Process and Problem Solving~~

~~Standard: Learns and uses on a regular basis standard safety practices for laboratory or field investigations. 3.1. Learns and uses safety procedures specific to an investigation or research activity.~~
- 4** ~~Topic: Classification: System~~

~~Standard: Uses the classification system of animals to distinguish various groups and their members. 4.1. Describes the history, need for, and function of a classification system in biology. 4.2. Recalls the hierarchy of classification groups. 4.3. Identifies the methods used in establishing relationships between animals in order to classify. 4.4. Compares the Linnaean System of binomial nomenclature with the modern classification system. 4.5. Uses field guides and taxonomic keys to identify and classify animals.~~
- 5** ~~Topic: Review of Cellular/ Chemical Basis of Life~~

~~Standard: Identifies the structures within the cell and their functions in the life processes. 5.1. States the Cell Theory and its implications for animals. 5.2. Describes the life processes that occur in cells. 5.3 Identifies the cellular organelles and their functions. 5.4. Describes the various levels of organization among organisms including unicellular, colonial, and multicellular.~~
- 6** ~~Topic: Review of Continuity of Life~~

~~Standard: Analyzes the chemical and genetic processes involved in animal reproduction. 6.1 Describes the chemical structure of DNA and RNA and the functions of each. 6.2 Relates the chemical biochemical processes that occur in the cell during replication transcription, and translation. 6.3 Compares the processes of mitosis and meiosis in animals.~~
- 7** ~~Topic: Diversity~~

~~Standard: Examines the chromosomal and environmental mechanisms that result in speciation. 7.1. Investigates chromosomal karyotyping as a method for identifying species through chromosomal number and banding patterns. 7.2. Identifies chromosomal changes that produce new species (speciation). 7.3. Determines the possible results of crossing different species of animals. 7.4. Defines the processes of natural selection, population genetics, neo-Darwinism, and the punctuated equilibrium model. 7.5. Compares the effects of the Hardy-Weinberg Theorem versus selection pressure on populations, including a bottleneck event, founder effect, and genetic drift.~~
- 8** ~~Topic: Invertebrates: Sponges to Worms~~

~~Standard: Examines the characteristics of the lower Invertebrates. 8.1. Distinguishes between asymmetrical and symmetrical body arrangements. 8.2 Classifies invertebrates from sponges to worms according to their diploblastic or triploblastic embryonic tissue layers. 8.3. Describes the anatomy and physiology of sponges and cnidarians. 8.4. Discusses the characteristics of the three flatworm classes. 8.5. Identifies the major characteristics of roundworms and annelids. 8.6 Compares the triploblastic embryological tissue layers and the acoelomate, pseudocoelomate, and coelomate body cavities of the different phyla of worms. 8.7. Describes the sexual and asexual reproduction in the life cycles of sponges, cnidarians, and various worms.~~
- 9** ~~Topic: Invertebrates: Echinoderms and Mollusks~~

~~Standard: Describes the nature of echinoderms and mollusks. 9.1. Examines the anatomy and function of the water vascular system in echinoderms. 9.2. Discusses the characteristics of echinoderms. 9.3. Describes the structure and function of the body parts of mollusks. 9.4. Compares the protostome and the deuterostome embryo development. 9.5. Identifies the major classes of mollusks according to their important anatomical features. 9.6 Relates the importance of body symmetry to the development of the nervous system (e.g. bilateral symmetry leads to cephalization.)~~
- 10** ~~Topic: Invertebrates: Arthropods~~

~~Standard: Examines the most complex invertebrates, the arthropods. 10.1 Describes the characteristics of arthropods. 10.2. Identifies important traits and examples of each major class of arthropods. 10.3. States the basis of classification of several important orders of insects. 10.4. Explains the reasons for the success of the phylum arthropoda.~~

- 11** **Topic:** ~~Lower Chordates~~
Standard: ~~Identifies the characteristics of all chordates and the lower chordates. 11.1. Distinguishes the chordates from the invertebrates. 11.2. Describes the characteristics of all chordates. 11.3. Identifies the characteristics of the urochordates and cephalochordates.~~
- 12** **Topic:** ~~The Vertebrates~~
Standard: ~~Distinguishes the subphylum vertebrata and its classes. 12.1. Identifies the characteristics of all vertebrates. 12.2. Lists the seven classes of vertebrates. 12.3. Compares the vertebrates to the invertebrates.~~
- 13** **Topic:** ~~The Fish~~
Standard: ~~Describes the characteristics of the major classes of fish. 13.1. Identifies the external and internal anatomy of a bony fish. 13.2. Describes the breeding and reproduction of various types of fish. 13.3. Analyzes the significance of a bony skeleton as compared with a cartilagenous skeleton. 13.4. Explains the countercurrent exchange mechanism as an efficient gas exchange between blood and water. 13.5. Discusses osmoregulation by freshwater and marine fishes.~~
- 14** **Topic:** ~~The Amphibians~~
Standard: ~~Examines the amphibians. 14.1. Describes the general anatomy and physiology of larval and adult amphibians. 14.2. Distinguishes between exothermic and endothermic animals. 14.3. Compares the three living orders of amphibians. 14.4. Discusses the breeding and reproduction of various amphibians.~~
- 15** **Topic:** ~~The Reptiles~~
Standard: ~~Examines the reptiles. 15.1. Distinguishes the four living orders of reptiles. 15.2. Describes the common traits of reptiles.~~
- 16** **Topic:** ~~The Birds~~
Standard: ~~Examines the birds. 16.1. Identifies the characteristics of birds that distinguish them from other vertebrates. 16.2. Describes the characteristics of birds that are shared with reptiles. 16.3. Relates the structure of feathers to their function as insulators and adaptations for flight. 16.4. Discusses the adaptations of flying birds for aviation. 16.5. Relates the structure of a bird's beak to its diet. 16.6. Describes reproductive behavior in birds.~~
- 17** **Topic:** ~~The Mammals~~
Standard: ~~Examines the mammals. 17.1. Identifies the characteristics of mammals. 17.2. Analyzes the adaptations for various mammalian orders to their habitats and diets. 17.3. Lists the major orders of mammals with examples of each. 17.4. Compares the reproduction in monotremes, marsupials, and placental mammals. 17.5. Gives examples of mammalian behaviors.~~
- 18** **Topic:** ~~Comparative Anatomy~~
Standard: ~~Compares the anatomy and physiology of invertebrates, lower vertebrates, and higher vertebrates. 18.1. Describes the importance of bilateral symmetry in the process of cephalization. 18.2. Discusses the development of the nervous system from fish to mammals. 18.3. Analyzes the importance of the changes in the vertebrate respiratory and circulatory system with respect to the nutritional requirements and the development of a complex nervous system. 18.4. Compares the reproduction and care of offspring in the invertebrates, lower vertebrates, and higher vertebrates. 18.5. Discusses the development of adaptations in vertebrates that lead to ability to survive in a land habitat.~~