SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: Science 2	**Length of Course:** 30 cycles
Grade Level(s): 11	**Periods Per Cycle:** 6
Units of Credit: 1	**Length of Period:** 43 minutes
Classification: Elective	**Total Instructional Time:** 129 hours

Course Description

This course will focus on the areas specific to biology and the ecology of living things. In addition, this course will include the impact of humans on the environment and available natural resources. Prerequisite: Completion of a Biology course and a score of basic or below basic on the Biology Keystone Exam

Instructional Strategies, Learning Practices, Activities, and Experiences

Teacher Demonstration	Practice Exams and Essays	Class Discussion
Posted Objectives and Agenda	Formal Assessments	Flexible Groups
Textbook Reading	Critical Thinking	Inquiry Labs
Homework	Bell Ringers	

Assessments

Chapter Examinations	End of Marking Period Cumulative Exam	Study Guides
Lab Reports	Directed Reading Packets	

Materials/Resources

Modern Biology, Holt, Rinehart, and Winston, 2006	PowerPoint Lectures	Laboratory Resources and Equipment
Environmental Science, Holt, Rinehart, and Winston, 2008	Note Packets	Laboratory Experiments

Adopted: 5/19/14
Revised:

Basic Biological Principles	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.	BIO.A.1.1 Explain the characteristics common to all organisms
Compare cellular structures and their functions in prokaryotic and eukaryotic cells.	BIO.A.1.2 Describe relationships between structure and function at biological levels of organization.
Describe and interpret relationships between structure and function at various levels of biological organization.	CC.3.5.9-10.C Follow precisely a complex multistep procedure when carrying our experiments, taking measurements, or performing technical tasks.

Chemical Basis of Life	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).	BIO.A.2.1 Describe how the unique properties of water support life on Earth.
Explain how carbon is uniquely suited to form biological macromolecules.	BIO.A.2.2 Describe and interpret relationships between structure and function at various levels of biochemical organization
Describe how biological macromolecules form from monomers. Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.	CC.3.5.9-10.E Analyze the structure of the relationships among key terms
Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction. Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.	BIO.A.2.3 Explain how enzymes regulate biochemical reactions within a cell.

Bioenergetics	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations.	BIO.A.3.1 Identify and describe the cell structures involved in processing energy.
Compare the basic transformation of energy during photosynthesis and cellular respiration.	BIO.A.3.2 Identify and describe how organisms obtain and transform energy for their life processes.
Describe the role of ATP in biochemical reactions.	CC.3.5.9-10.B Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Homeostasis and Transport	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.	BIO.A.4.1 Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.
Compare the mechanisms that transport materials across the plasma membrane (i.e. passive transport-diffusion, osmosis, facilitated diffusion; and active transport – pumps, endocytosis, exocytosis) Describe how membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.	CC.3.5.9-10.C Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).	BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments.

Cell Growth and Reproduction	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Describe the events that occur during the cell cycle: interphase, nuclear division (i.e., mitosis or meiosis), cytokinesis.	BIO.B.1.1 Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis
Compare the processes and outcomes of mitotic and meiotic nuclear divisions.	CC.3.5.9-10E Analyze the structure of the relationships among concepts in a text, including relationships among key terms.
Describe how the process of DN replication results in the transmission and/or conservation of genetic information. Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.	BIO.B.1.2 Explain how genetic information is inherited

Genetics	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Describe and/or predict observed patterns of inheritance (i.e., dominant, recessive, co-dominance, incomplete dominance, sex-linked, polygenic, and multiple alleles).	BIO.B.2.1 Compare Mendelian and non-Mendelian patterns of inheritance.
Describe processes that can alter composition or number of chromosomes (i.e., crossing-over, nondisjunction, duplication, translocation, deletion, insertion, and inversion).	CC.3.5.9-10.H Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
Describe how the processes of transcription and translation are similar in all organisms. Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins.	BIO.B.2.2 Explain the process of protein synthesis (i.e. transcription, translation, and protein modification).
Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g. silent, nonsense, frame-shift).	BIO.B.2.3 Explain how genetic information is expressed.
Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).	BIO.B.2.4 Apply scientific thinking, processes, tools, and technologies in the study of genetics.

Theory of Evolution	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Explain how natural selection can impact allele frequencies of a population. Describe the factors that can contribute to the development of new species (e.g., isolating mechanisms, genetic drift, founder effect, migration) Explain how genetic mutations may result in genotypic and phenotypic variations within a population.	BIO.B.3.1 Explain the mechanisms of evolution.
Interpret evidence supporting the theory of evolution (i.e., fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).	BIO.B.3.2 Analyze the sources of evidence for biological evolution.
Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation	BIO.B.3.3 Apply scientific thinking, processes, tools, and technologies in the study of the theory of evolution.

The Environment and Society	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Apply and explain scientific concepts to societal issues using case studies (e.g., sea level change, deforestation, environmental health, energy use).	S11.A.1.2 Identify and analyze the scientific or technological challenges of societal issues; propose possible solutions and discuss implications. C.3.5.11-12.H Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
Describe how changes in physical and biological indicators (e.g., soil, plants, or animals) or water systems reflect changes in these systems. Compare the rate of use of natural resources and their impact on sustainability. Explain the changes in society and the environment over time	S11.A.1.3 Describe and interpret patterns of change in natural and human-made systems.

Energy Transfer	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Identify the levels of organization in an ecosystem (e.g., individual organism, population, community, ecosystem, biosphere). Compare and contrast the structural and functional similarities and differences among living things (e.g., classify consumers as herbivores, omnivores, carnivores, decomposers) and their feeding relationships. Explain energy transfer in an ecosystem (e.g., photosynthesis and cellular respiration).	S11.B.1.1 Explain structure and function at multiple levels of organization. CC.3.5.11-12.E Analyze the structure of the relationships among key terms.

Organization of Life	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Explain the significance of diversity in ecosystems. Differentiate between the biotic (e.g., plant, animal and microbial communities) and abiotic (e.g., soil, air, temperature, humidity, and water) components of an ecosystem and their interactions. Describe how living organisms affect the survival of one another (e.g., predation, competition, parasitism, mutualism, commensalism). Explain the similarities and differences in terrestrial (e.g., tropical rain forest, temperate rain forest, temperate deciduous forest, taiga, tundra, desert, temperate grasslands, chaparral, and savanna) and aquatic biomes (wetlands, lakes/ponds, rivers/streams, estuaries, open ocean). Predict how limiting factors (e.g., physical, biological, chemical) can affect organisms.	S11.B.3.1 Explain the characteristics of and interactions within an ecosystem. CC.3.5.11-12.E Analyze the structure of the relationships among key terms CC.3.6.11-12.F Conduct short as well as more sustained research projects to answer a question or solve a problem.
Explain how cyclical patterns in population dynamics affect natural systems. Show how biological diversity is an indicator of a healthy environment. Describe how natural processes (e.g., seasonal change, catastrophic events, succession, habitat alterations) impact the environment over time.	S11.B.3.2 Analyze patterns of change in natural or human-made systems over time.
Describe how different human-made systems use renewable and nonrenewable resources (e.g., energy, transportation, genetically engineered organisms, organic food).	S11.B.3.3 Explain how human-made systems impact the management and distribution of natural resources.

Renewable and Nonrenewable Energy	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Explain the environmental impacts of energy use by various economic sectors (e.g., mining, logging, transportation) on environmental systems. Identify the practical use of alternative sources of energy (e.g., wind, solar, biomass) to address environmental problems (e.g., air quality, erosion, resource depletion). Compare and contrast advantages and disadvantages of renewable energy (e.g., wind, solar, biomass, tidal, geothermal) and nonrenewable energy (e.g., coal, oil, natural gas)	S11.C.2.2 Demonstrate different ways of obtaining, transforming, and distributing energy and their different environmental consequences. CC.3.6.11-12.I Write routinely over extended time frames and shorter time frames for a range of discipline-specific tasks, purposes and audiences.

Human Impact on Water and other Resources	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Evaluate the impact of obtaining and using natural resources for the production of energy and materials (e.g., resource renewal, pollution, deforestation).	S11.D.1.2 Analyze how human-made systems impact the management and distribution of natural resources.
Explain factors that affect water quality and flow through a water system (e.g., nutrient loading, turbidity, rate of flow, rate of deposition, biological diversity)	S11.D.1.3 Explain the significance and consequence of water as a resource to living things and the shaping of land. CC.3.5.11-12.B Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

Atmosphere and Climate Change	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Describe how changes in concentrations of minor components (e.g., oxygen gas, carbon dioxide, ozone, dust, pollution) in Earth's atmosphere are linked to climate change.	S11.D.2.1 Analyze how the transfer of energy and substances between Earth's atmosphere and its surface influences regional or global weather or climate.
Compare the transmission, reflection and radiation of solar energy to and by the Earth's surface under different environmental conditions (e.g., greenhouse effect, reduction of ozone layer, increased global cloud cover).	CC.3.5.11-12.B Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.