Academic Biology

4200

February 2009

ACADEMIC BIOLOGY - 4200

Course Description:	**This academic course is designed to develop an awareness of life concepts and their relationships to the individual as well as facts of a biological nature that will be practical in everyday living. From the molecular level, to the structure and functions of organisms, biology will be presented in a way which permits the student to understand the living world and their role in it, to solve problems and prepare for future studies. Critical and creative thinking skills will be developed. Biological information will be presented in detail going beyond the scope of the book. Laboratory experience is required of all students.**
Grade Level:	10^{th}, 11^{th}, or 12th
Length of Course:	Frequency: 7 periods per 6 day cycle Duration: 42 minutes Length: full year course Credits: 1
Prerequisites:	Successful completion of Earth and Space Science
Textbook:	Biology: The Study of Life, 7^{th} edition
Expected Level of Achievement	Students will be expected to maintain a 70% or better. They will be required to attend class prepared to learn. The final grade is determined as per school policy and scale: 93-100% = A 85 – 92% = B 77 – 84% = C 70 – 76% = D Below 70% = F

Northern York County School District Curriculum

Course Name:	Academic Biology - 4200
Content:	The Nature of Life
Key Learning(s):	Life Characteristics and Life Processes
Essential Question(s):	How do we distinguish living from non-living things? How do the eight life processes maintain homeostasis in organisms? What role do the life processes play in metabolism?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.2.10B 3.1.10E 3.2.10C	Apply process knowledge and organize technological phenomena in varied ways Describe patterns of change in nature, physical and man made systems Apply the elements of scientific inquiry to	The students will describe how the existence and life functions of all living things demonstrate both unity and diversity. The students will define the terms biology and organism. The students will list nice general characteristics that distinguish living things from non-living things. The students will name and define the eight life processes by which the life of an organism is maintained. The students will learn to distinguish between homeostasis and metabolism. The students will categorize the diversity of life.	Notebook Oral presentation and explanation ABC's of Biology Written quizzes Performance-based. Written objective test Provide a writing sample Learning Activity "Life Processes" Class participation	Textbook Instructor generated handouts Supplemental tests Lab equipment Learning Activity "Asking Questions about Biology" CD-Rom Discovery Learning Flashcards

3.2.10A	solve problems Apply knowledge and understanding about the nature of scientific and technological knowledge		Critical and creative thinking laboratory “Looking Closely at Living things”	

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Course Name:	Academic Biology
Content:	Biology As A Science
Key Learning(s):	The Scientific Method and Tools of the Biologist
Essential Question(s):	How is the scientific method used to find answers to questions and to solve problems? Why are instruments necessary for scientific research? What are the parts of a compound light & microscope and what is the function of each part?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.1.10B 3.2.10C 3.7.10A	Describe concepts of models as a way to predict and understand science and technology Apply the elements of scientific inquiry to solve problems Identify a safety use of a variety of tools and materials to	The students will describe and demonstrate the use of instrumentation. The students will interpret scientific observation and measurement through controlled experiments The students will demonstrate biological tools utilized in scientific investigation. The students will learn the steps of a scientific investigation. The students will explain what is meant by a controlled experiment. The students will conduct a multiple step experiment. The students will organize experimental information. The students will develop scientific observation and measurement through controlled experiments.	Section reviews Chapter reviews Notebooks Critical and creative thinking Evaluating first hand observations Lab practical Skills application Written quiz Microscope demonstration	Compound light microscope Mystery box Textbook Learning Activity “Asking questions about Biology” Lab equipment Instructor handouts

	solve problems and answer questions 3.2.10D Identify and apply the technological design process to solve problems 3.7.10B Apply instruments and apparatus to examine a variety of objects and processes		Oral presentation ABC's of Biology Performance-based	

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Course Name:	Academic Biology
Content:	Cellular Anatomy
Key Learning(s):	Cells and Cell Structure
Essential Question(s):	What is the fundamental structural unit of life? What organelles are common to plant and animal cells? How do Eukaryotic cells differ from Prokaryotic cells? What is osmosis? What is diffusion? What is the cell theory? What is the unique organization within the cell that enables the activities necessary for life to continue?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.3.10A 3.3.10B 3.3.10C	Explain the relationship between structure and function at the molecular and cellular levels Explain cell functions and processes in terms of chemical reactions and energy changes Describe and explain the chemical	The students will understand and explain the cell theory and its importance. The students will relate the structure of the cell membrane and its role in maintaining homeostasis. The students will acquire a working relationship of cellular anatomy. The students will determine the effects of variation to basic life functions. The students will compare prokaryotic cells and Eukaryotic cells. The students will describe the structure and functions of cell organelles. The students will compare the structures of an animal and plant cell.	Notebook Class participation Test: Cytology Model Identification ABC's of Biology Mini Lab: Observing plant and animal cells Critical and creative thinking: relating parts and wholes Lab: Inside plant and animals cells Lab practical	Textbook Cell drawing Lab materials Lab slides Compound light microscope CD-Rom Instructor Handouts Learning Activity "A tour of the Animal Cell" Lab Manual: "Observing Cork Cells and Onion

3.3.10D	structural basis of living organisms Explain the structural and functional similarities and differences found among living things	The students will develop a basic understanding of the study of cells. The students will discuss selective permeability of cell membranes. The students will describe active and passive transport. The students will understand the effects of osmosis on cells. The students will explain the effects of osmosis and diffusion. The students will discuss the theory of evolution and creationism in helping to understand the origin of the 1st cell.	Lab report Test: Provide a writing sample on Cytology Drawing cells: Identify organelles Skills Development	Cells" Enrichment Activity "How plant and animal cells differ"

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Course Name:	Academic Biology
Content:	Basic Chemistry
Key Learning(s):	The Atomic Theory of Matter, Chemical Bonding and Chemical Reactions
Essential Question(s):	What are Atoms, Elements and Compounds? How do we balance chemical reactions? Why are Covalent and Ionic Bonds Important? What changes occur when a chemical reaction takes place?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.10A 3.3.10B	Explain concepts about the structure and properties of matter Describe and explain the chemical and structural basis of living organisms	The students will learn to explain the structure of an atom. The students will learn to describe that atoms are composed of sub-atomic structures whose properties are measurable. The students will develop a basic understanding of chemicals and their basic properties. The students will learn to balance chemical equations. The students will learn to identify chemical elements found in living things. The students will learn to explain the formation of covalent and ionic bonds. The students will learn to identify reactants and products in chemical equations. The students will develop a working definition of matter. The students will define and compare acids and bases and give examples of each.	Class discussion Lab work Written quiz Whiteboard demonstration Group work: evaluating chemical equations Critical and creative thinking Performance-based	Textbook Lab equipment Enrichment Activity Discovery Learning CD-Rom: Atoms CD-Rom: Bonding Instructor Handouts

Northern York County School District Curriculum

Course Name:	Academic Biology
Content:	Chemistry of Living Things
Key Learning(s):	Organic and Inorganic Compounds
Essential Question(s):	What are the varieties of organic compounds that make up living things? Why is carbon so important in Biological molecules? How are organic molecules synthesized? What are Carbohydrates? What are Lipids? What are Proteins? Why are enzymes important to cell chemistry?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.10A	Explain concepts about the structure and properties of matter	The students will learn to distinguish between organic and inorganic compounds. The students will learn to explain differences and similarities of the four major types of organic compounds found in living cells.	Skills development: Synthesis of organic compounds Lab(s): Building molecular models	Instruction handouts Textbook CD-Rom: DNA-The Molecule of Life
3.3.10B	Describe and explain the chemical and structural basis of living organisms	The students will explain why organic compounds are larger and more complex than inorganic compounds. The students will explain the relationship between dehydration synthesis and hydrolysis. The students will describe the basic chemical make up of carbohydrates, fats, proteins, and nucleic acids.	Performance-based Class participation Drawing organic compounds Written test objective	CD-Rom: Enzymes Molecular Model Kits Lab materials Flashcards
3.3.10A	Explain the structural and functional similarities and differences	The students will describe how fat is formed by dehydration synthesis.	Written test essay Completion of exercises and problems	Lab manual CD-Rom: Enzymes

	found among living things	The students will explain the relationship between saturated and unsaturated fat.	Notebook	
3.2.10A	Apply knowledge and understanding about the nature of scientific and technological knowledge	The students will learn to compare the structures of DNA and RNA. The students will describe where the two types of nucleic acids are found and give the functions of these acids. The students will illustrate the general molecular structure of an amino acid.	Chapter review Discovery learning: Enzyme Action Enrichment Activity: Dehydration Synthesis and Hydrolysis Lab practical using Molecular Model Kits	
3.1.10B	Describe concepts of models as a way to predict and understand science and technology	The students will learn to distinguish between a polypeptide and a protein. The students will learn the functions of enzymes in living cells. The students will describe the lock-and-key model. The students will learn how enzymes work. The students will have a classroom discussion on the importance of enzymes.	Skills Application ABC's of Biology	

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Course Name:	Academic Biology
Content:	Cellular Respiration
Key Learning(s):	The uses of energy and the mechanism by which energy is used during cellular respiration
Essential Question(s):	Why is energy important for living things? What is the role of ATP during energy transfer? What are the chemical pathways involved with aerobic and anaerobic respiration? Why must oxidation-reduction reactions be coupled? What is the relationship between organic molecules and energy flow?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.3.10B 3.3.10C	Describe the relationship between the structure of organic molecules and the function they serve in living organisms Explain cell processes in terms of chemical reactions and energy changes	The students will learn to describe how living things use energy to carry out life functions. The students will distinguish between aerobic and anaerobic respiration. The students will predict which sugar will produce the fastest respiration in yeast. The students will discuss the function of electron carriers in cell respiration. The students will learn to explain the rule of ATP and hydrogen acceptors in energy transfers. The students will determine why cell respiration is important to living things. The students will learn to describe the overall scheme of glycolsis. The students will explain the process of fermentation.	Chapter review Chapter objective test Test – Writing Sample Busy Bee Competition ABC's of Biology Notebook Compare/Contrast Matrix Respiration- Goldfish Lab Class discussion Learning Activity – The Energy Cycle Lab: Oxidation-	Textbook Instructor worksheet Lab materials Videotape: Chemical Pathways Discovery Learning Activity CD-Rom: Cellular Respiration Open-Ended Lab: Determine the energy content in foods Lab Manual – Yeast Respiration

		The students will learn the Krebs Cycle. The students will identify how the electron transport chain operates in an organism's body. The students will relate fatigue to oxygen debt.	Reduction Whiteboard demonstration Oral presentation Performance-based	Flashcards

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Course Name:	Academic Biology
Content:	Classification of Living Things
Key Learning(s):	Taxonomy and the Diversity of Life
Essential Question(s):	Why are classification systems important? What are the six kingdoms all living things may be classified into? What is the naming system used in modern biology? What are the relationships between groups of organisms?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.3.10A	Identify and characterize major life forms to their placement in existing classification groups	The students will name the six kingdoms and describe the characteristics of each. The students will learn binomial nomenclature and apply it to the modern classification system. The students will demonstrate knowledge of the modern classification system.	Section review Chapter test Lab investigation: "Classifying organisms" Naming organisms lab	Lab equipment Worksheets Textbooks Phylogenic tree
3.3.10A	Describe organizing schemes of classification keys	The students will learn to describe the types of evidence now used to determine relationships between groups of organisms. The students will identify six kingdoms and describe the characteristics of each.	Class discussion Instructor handouts Notebook	Learning Activity: Sorting the Animals Mini Lab: A taxing situation
3.3.10A	Identify and characterize major life forms by kingdom, phyla, class and order	The students will learn how the theory of evolution has affected taxonomy. The students will learn all classification categories.	Lab: Classifying Leaves Field Investigation Oral Presentation	Transparencies Lab manual

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Course Name:	Academic Biology
Content:	Plant Nutrition
Key Learning(s):	Photosynthetic Pigments and the Chemistry of Photosynthesis
Essential Question(s):	What role does light play in photosynthesis? What are the light-dependent reactions of photosynthesis? What are the light-independent reactions of photosynthesis? What are the factors affecting photosynthesis?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.3.10B 3.3.10B	Explain cell processes in terms of chemical reactions and energy changes Describe the relationship between the structure of organic molecules and the function they serve in living organisms	The students will learn to describe the experiments that provided the basic facts about the process of photosynthesis. The students will explain what happens when light is absorbed by a pigment. The students will list the characteristics of chlorophyll. The students will draw a chloroplast and label its parts. The students will learn the chemical sequence for photosynthesis. The students will compare photosynthesis with cell respiration. The students will describe light-dependent reactions with light-independent reactions. The students will learn the factors affection photosynthesis. The students will explain the advantage of C4 photosynthesis.	Notebook Compare/contrast matrix Class discussion Learning Activity: Do plants need light? Written Chapter test Section Review Skills Development Chapter Review Written Essay Test	Videotape: Photosynthesis Transparency Study Guide Textbook Instructor Handouts CD-Rom: Light and Dark Reactions Lab Manual Lab Materials Discovery Learning Activity Mini Labs: Breaking out of Prism

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Course Name:	Academic Biology
Content:	Homeostasis and the Organization of the Animal Body
Key Learning(s):	Human System Anatomy and Physiology
Essential Question(s):	How is the animal body organized? What is anatomy and physiology? How do animals maintain internal constancy? What is the relationship between structure and function? What are the principal systems of the human body, what are the composed of and how do they function?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.3.10A	Explain the structural and functional similarities and differences found among living things	The students will learn to identify the major structures and functions of the human body and their role in the maintenance of homeostasis. The students will develop an understanding of the interrelationship between the systems of the human body. The students will learn to describe the structure and function of the major organs of the human body. The students will learn to understand that humans are not unique in their performance of the functions necessary to maintain life.	Discussions Written chapter test Section review Notebook Class drawing (each system) Group work Lab dissections Skills development Compare/contrast matrix Oral presentation Written essay test	Textbook Lab materials Study guide Instructor handouts Discovery learning activity Mini Labs: Nutrition, Transport, Blood/Immunity, Gas Exchange, Excretion, Locomotion, nervous regulation, chemical regulation Learning Activity CD-ROMs Worksheets Flashcards

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Course Name:	Academic Biology
Content:	Animal Reproduction and Development
Key Learning(s):	Mitosis, Meiosis and Developmental Biology
Essential Question(s):	What are the two types of Reproduction? How does the Human Reproductive System work? What is Embryonic Development? What are the two basic processes involved in cell division?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.3.10C 3.3.10C	Describe how genetic information is inherited and expressed Distinguish different reproductive patterns in living things	The students will learn to compare and contrast the function of mitosis and meiosis. The students will explain what happens during each stage of mitosis. The students will learn to compare the processes of asexual and sexual reproduction. The students will explain the process of cytokinesis. The students will describe the process of binary fission, budding and regeneration. The students will explain the importance of meiosis. The students will understand haploid and diploid cells. The students will state the advantages of sexual reproduction.	Lab Report Writing Sample Objective Test Test-Writing Sample Chapter Quiz ABC's of Biology Completion of diagrams Skills development Section Reviews Chapter Reviews Notebook	Textbook Lab Manual Mini Lab: "Mitosis and Meosis" "Changing Hormone Levels" Videotape: "Miracle of Life" Instructor Handouts Transparencies CD-Rom Lab Materials Flashcards

		The students will explain conjugation in organisms. The students will compare cogenesis with spermatogenesis. The students will illustrate the relationship between eggs, methods of fertilization and stages of embryonic development. The students will describe the development of plant and animal embryos. The students will explain the hormonal interactions in the human male and female reproductive systems. The students will explain vegetative reproduction. The students will describe the adaptations of reptiles, birds, nonplacental animals, and placental mammals for reproduction on land.	Oral Presentation and explanation Learning Activity – "Regeneration" Critical and creative thinking skills Enrichment Activity	Mitosis Models Meiosis Models

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Course Name:	Academic Biology
Content:	Genetics
Key Learning(s):	Mendelian, Modern and Applied Genetics
Essential Question(s):	What is the structure of DNA? How do we solve genetics problems? How are genes and protein related? How is genetic information passed from one generation to the next? Why is the study of Heredity important? What is the sequencing of protein synthesis and why is it important?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.3.12C	Explain gene inheritance and expression at the molecular level	The students will learn to use the rules of probability to solve genetics problems. The students will explain Mendel's Laws in terms of meiosis and chromosomes.	Problem Solving Worksheets Probability Lab ABC's of Biology	Study Guide Lab Materials Instructor Handouts Discovery Learning Activity
3.1.12C	Assess and apply patterns	The students will use punnett squares to work out possible genetics results.	Notebook	CD-ROMs
3.1.12D	Analyze and apply measurement scales when collecting data	The students will state the rules of inheritance that form the basis of Mendelian Genetics. The students will learn to correlate patterns of inheritance.	Oral presentation and explanation Performance-based Assessment Class participation	Textbook Enrichment Activity: "Probability in Genetics" Lab Equipment
3.1.12C	Assess patterns in nature using mathematical formulas	The students will state the roles of X are Y chromosomes in determining gender.	Group presentation Written objective test Test-writing sample	Genetics Model Board Transparencies

3.1.12E	Analyze how model systems have changes overtime	The students will define linkage groups and crossing over. The students will learn to describe multiple gene inheritance. The students will complete sex-linked crosses. The students will learn to describe the three chemical parts of a DNA nucleotide. The students will explain how DNA replicates. The students will compare the structures and functions of mRNA, tRNA, rRNA. The students will list sources of Genetic Variation. The students will describe various genetic mutations. The students will compare genetic disorders. The students will understand how proteins are synthesized.	Critical and Creative thinking Skill application Chapter review Lab: “You and Your Genes” Lab: “Sex-Linked Crosses”	

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Course Name:	Academic Biology
Content:	Ecology
Key Learning(s):	Human Ecology, Land Biomes and Organization in the Biosphere
Essential Question(s):	Where are the biomes of the earth and what role do they play in the organization of the biosphere? What are the interactions between organisms and their environment? Why is the flow of energy and continual cycling of materials important to the ecosystem? What is symbiosis? How do ecosystems work? How is life on land distributed?
Grade Level:	

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
4.6.10A	Explain the significance of diversity in ecosystems	The students will compare the interdependency of organisms and their environment.	Chapter objective test	Lab materials
			Test provide a writing sample	Textbook
		The students will describe the feeding relationships in		Instructor handouts
4.6.40A	Explain energy flow in a food chain	an ecosystem in terms of food chains and food webs.	Section review	CD-Rom: Making a mini habitat
		The students will learn the abiotic factors in the environment.	Chapter review	
4.6.10A	Explain the biotic and the a biotic components of an ecosystem and their interaction	The students will describe how light, temperature, and precipitation varies with position on the earth's surface.	Group work	Videotape: "Observing a Food Chain"
			Completion of exercises and problems	Learning activities
		The students will compare the interdependency of organisms and their environment.	Worksheets "The Biosphere"	CD-Rom: Food chains and food webs
		The students will list symbiotic relationships in an ecosystem in terms of food chains and food webs.	Lab Report	Videotapes: "The Nitrogen Cycle"
4.6.10A	Identify the major biomes	The students will develop a basic understanding of the	Performance-Based	

	and explain their similarities and differences Explain how cycles affect the balance in an ecosystem Analyze how ecosystems change over time Explain the significance of diversity in ecosystems	components that form and maintain an ecosystem. The students will critique human influence on the balance of nature. The students will explain the role that specific organisms have in their ecosystem. The students will compare adaptations among species. The students will describe the flow of energy in ecosystems referencing pyramids of energy and biomass. The students will discuss biogeochemical cycles. The students will develop an understanding of succession. The students will review all types of biomes. The students will discuss Human Ecology.	Graphic organizing flow chart Critical and creative thinking Oral presentation Skills application Notebook ABC's of biology Lab work Class discussion	"Ecological Succession" Mini Labs – Living Environment Circles of Materials Changes in Ecosystems Enrichment Activity Discovery Learning Flashcards
4.6.10B 4.6.10C 4.7.10A				

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Course Name:	Academic Biology
Content:	Biology Laboratory
Key Learning(s):	Critical and Creative thinking skills while utilizing Micro techniques
Essential Question(s):	What are the basic analytical and technological skills biologist should know how to utilize?
Grade Level:	10th

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.7.10A 3.7.10B	Apply advanced tool and equipment to solve problems Apply approximate instruments to examine a variety of objects and processes	The students will acquire knowledge of lab safety procedures and use of equipment. The students will distinguish between controls and variables in an experiment. The students will identify parts of the compound light microscope and their functions and form. The students will develop microscope slide techniques. The students will develop the ability to use and read measurement instruments. The students will develop a basic understanding of the internal/external anatomical structure of plants and animals. The students will develop on understanding in graphic organization. The students will use molecular model kits to construct molecules and compounds.	Lab practical Lab drawings Oral presentation Microscope demonstration and study Performance-based Notebook Handouts Demonstration and supervised dissection of lab specimens Data collection Flashcards	Lab manual Lab materials and equipment Textbook Mini labs Learning activities Supplemental texts CD-ROMs Videotapes Flashcards Discovery learning

		The students will create drawings illustrating key concepts. The students will emphasize key concepts through anatomical and physiological lab work.		