POCONO MOUNTAIN SCHOOL DISTRICT

COURSE: Life Science	GRADE(S): 8
UNIT 1: Basic Science Principles	

PA ACADEMIC and PSSA STANDARDS

S8.A.1 1 Explain, interpret, and apply scientific, environmental, or technological knowledge presented in a variety of formats (e.g., visuals, scenarios, graphs).
Reference: 3.2.7.A, 3.2.7.B

S8.A.1.2 Identify and explain the impacts of applying scientific, environmental, or technological knowledge to address solutions to practical problems.
Reference: 3.2.7.C, 3.8.7.A, 3.8.7.B, 4.3.7.A

S8.A.1.3 Identify and analyze evidence that certain variables may have caused measurable changes in natural or human-made systems.
Reference: 3.1.7.E, 4.7.7.C, 4.8.7.C

S8.A.2.1 Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems.
Reference: 3.2.7.B, 3.2.7.D, 3.1.7.C, 3.1.7.D

S8.A.2.2 Apply appropriate instruments for a specific purpose and describe the information the instrument can provide.
Reference: 3.3.7.A, 3.7.7.B, 3.1.7.D

KEY CONCEPTS TO BE INTEGRATED THROUGHOUT THE COURSE

A .Scientific Methodology

- Scientific methodology involves observing and asking questions, making inferences and forming hypotheses, doing controlled experiments, collecting and analyzing data, and drawing conclusions.
- An experiment should have only one variable, or factor being tested, and a control, or the same experiment without the control.

B. Scientific Measurement

- The common language of measurement in science is the metric system.
- The meter (m) is the basic unit of length in the metric system and is equal to 39.4 inches.
- The amount of space an object takes up is called its volume. The liter (L) is the basic unit of volume in the metric system. The volumes of liquids and gases are measured in liter and milliliters.
- The kilogram (kg) is the basic unit of mass in the metric system. Mass is a measure of the amount of matter in an object. Weight is a measurement of the force
- Temperature is measured according to the Celsius scale

C. Tools of Life Science

- The microscope is a science tool that produces an enlarged image of an object. The invention of the microscope enabled people to learn about cells.
- Compound microscopes have more than one lens. A compound microscope can make an object appear 2000 times larger than it is.
- The Electron microscope uses a beam of tiny particles called electrons instead of using light to magnify images of objects. Electron microscopes can magnify objects hundreds of thousands of times.
- X-rays are blocked by bone but pass easily through skin and muscle. X-rays are often used for taking pictures of bones inside an organism.
- CAT (Computerized Axial Tomography) or CAT scan produces cross-sectional pictures of an object.
- MRI (Magnetic resonance imaging) is an imaging technique used primarily in medical settings to produce high quality images of the inside of the human body

POCONO MOUNTAIN SCHOOL DISTRICT

OBJECTIVES / ESSENTIAL KNOWLEDGE

1. Identify the steps of the Scientific Method and describe how it is applied in order to gain new knowledge.
   - The steps of the Scientific Method include asking a question or recognizing a problem, forming a hypothesis, testing the hypothesis with an experiment, recording and analyzing data, and drawing a conclusion.
   - A hypothesis is a tentative answer to a question. In order to be useful, it must be testable with an experiment.
   - An experiment must contain a control, which is a known or standard, and a variable, the changing part of the experiment which is being tested.
   - A good experiment tests only one variable at a time. An independent variable is that which is being manipulated by the researcher. The dependent variable is what changes as a consequence.
   - A theory is developed if repeated experimentation supports the result. A theory is a well-tested, well-supported result or the best possible explanation based on the data available.
2. Identify and follow the steps of a controlled experiment and communicate the conclusion formed by writing a proper lab report, including a graph of the data collected.

ACTIVITIES:

1. Explain and utilize the steps of the scientific method in conducting controlled experiments
2. Identify and utilize scientific tools for investigative purposes

RESOURCES:

Globe Fearon (Polar Bear) Book
Prentice Hall Science Explorer Series (Thin Books)
Frog Book

ASSESSMENTS:

Observation checklists
Interviews and dialogue
Group projects
Individual projects
Worksheets
Model creation
Writing responses
Lab participation
Lab reports
Journal entries
Presentations
Quizzes
Tests

REMEDIATION:

Small group instruction
Individualized teacher support
Web-based reinforcement activities
Peer tutoring
Chunking of information

ENRICHMENT:

Research Opportunities
Independent Investigations
Case Study
Individualized teacher support
Small group enrichment instruction

POCONO MOUNTAIN SCHOOL DISTRICT

COURSE: Life Science	GRADE(S): 8
UNIT 2: Characteristics of and Chemical Basis for Life (Cells)	

PA ACADEMIC and PSSA STANDARDS

Organisms and Cells Content Standards:

 3.1.B.A1. Describe the common characteristics of life. Compare and contrast the cellular structures and degrees of complexity of prokaryotic and eukaryotic organisms. Explain that some structures in eukaryotic cells developed from early prokaryotic cells (e.g., mitochondria, chloroplasts).

 3.1.B.A2. Identify the initial reactants, final products, and general purposes of photosynthesis and cellular respiration. Describe the relationship between photosynthesis and cellular respiration in photosynthetic organisms. Identify and explain various macromolecules (such as ATP).

 3.1.B.A3. Explain how all organisms begin their life cycles as a single cell and that in multicellular organisms, successive generations of embryonic cells form by cell division.

 3.1.B.A4. Summarize the stages of the cell cycle. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. Compare and contrast a virus and a cell. Relate the stages of viral cycles to the cell cycle.

 3.1.B.A5. Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc). Explain the role of water in cell metabolism. Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane.

 3.1.B.A6. Explain how cells differentiate in multicellular organisms.

 3.1.B.A7. Analyze the importance of carbon to the structure of biological macromolecules. Compare and contrast the functions and structures of proteins, lipids, carbohydrates, and nucleic acids. Explain the consequences of extreme changes in pH and temperature on cell proteins.

 3.1.B.A8. *CHANGE AND CONSTANCY* Recognize that systems within cells and multicellular organisms interact to maintain homeostasis. *PATTERNS* Demonstrate the repeating patterns that occur in biological polymers. *SYSTEMS* Describe how the unique properties of water support life.

Genetics Content Standards:

 3.1.B.B1. Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in **DNA** molecules. Explain the basic process of **DNA** replication. Describe the basic processes of transcription and translation. Explain how crossing over, jumping genes, and deletion and duplication of genes results in genetic variation. Explain how **mutations** can alter genetic information and the possible consequences on resultant cells.

 3.1.B.B2. Describe how the process of meiosis results in the information of haploid gametes and analyze the importance of meiosis in sexual reproduction. Compare and contrast the function of mitosis and meiosis. Illustrate that the sorting and recombining of genes in sexual reproduction results in a great variety of possible gene combinations in offspring.

 3.1.B.B3. Describe the basic structure of DNA, including the role of hydrogen bonding. Explain how the process of DNA replication results in the transmission and conservation of the genetic

Evolution Content Standards:

 3.1.B.C1. Describe species as reproductively distinct groups of organisms. Analyze the role that geographic isolation can play in speciation. Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population. Describe how the degree of kinship between species can be inferred from the similarity in their DNA sequences.

 3.1.B.C2. Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of single celled organisms evolved. Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed. Describe how mutations in sex cells may be passed on to successive generations and that the resulting phenotype may help, harm, or have little or no effect on the offspring's success in its environment. Describe the relationship between environmental changes and changes in the gene pool of a population.

 3.1.B.C3. *CONSTANCY AND CHANGE* Compare and contrast various theories of evolution. Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution. *PATTERNS* Discuss the implications of a universal genetic code for evolution.

KEYSTONE ASSESSMENT ANCHORS

Module A CELLS and CELL PROCESSES

BIO.A.1 - Basic Biological Principles

 A.1.1. Explain the characteristics common to all organisms.
 A.1.2. Describe relationships between structure and function at biological levels of organization.

BIO.A.2 - The Chemical Basis for Life

 A.2.1. Describe how the unique properties of water support life on Earth.
 A.2. 2. Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules).
 A.2. 3. Explain how enzymes regulate biochemical reactions within a cell.

BIO. A.3 - Cells and Cell Processes

 A.3.1. Identify and describe the cell structures involved in processing energy.
 A.3.2. Identify and describe how organisms obtain and transform energy for their life processes.

BIO.A.4 - Homeostasis and Transport

 A.4. 1. Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.

Module B CONTINUITY and UNITY of LIFE

BIO.B.1 - Cell Growth and Reproduction

 B.1. 1. Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis.
 B.1. 2. Explain how genetic information is inherited.

BIO.B.2 - Genetics

 B.2.1. Compare Mendelian and non-Mendelian patterns of inheritance.
 B.2.2. Explain the process of protein synthesis (i.e., transcription, translation, and protein modification).
 B.2.3. Explain how genetic information is expressed.
 B.2.4. Apply scientific thinking, processes, tools, and technologies in the study of genetics.

BIO.B.3 - Theory of Evolution

 B.3. 1. Explain the mechanisms of evolution.
 B.3. 2. Analyze the sources of evidence for biological evolution.
 B.3. 3. Apply scientific thinking, processes, tools, and technologies in the study of the theory of evolution.

BIO.B.4 - Ecology

- B.4. 1. Describe ecological levels of organization in the biosphere.
- B.4. 2. Describe interactions and relationships in an ecosystem.

KEY CONCEPTS

1. Organisms share common characteristics of life.
2. New cells arise from the division of pre-existing cells.
3. Hereditary information in genes is inherited and expressed.
4. Evolution is the result of many random processes selecting for the survival and reproduction of a population.
5. Life emerges due to the chemical organization of matter into cells.
6. Cells have organized structures and systems necessary to support chemical reactions needed to maintain the living condition.
7. Structure is related to function at all biological levels of organization.
8. Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.
9. Eukaryotic cells can differentiate and organize making it possible for multicellularity.
10. Organisms obtain and use energy to carry out their life processes.
11. Organisms on Earth interact and depend in a variety of ways on other living and nonliving things in their environments.
12. DNA segments contain information for the production of proteins necessary for growth and function of cells.

OBJECTIVES / ESSENTIAL KNOWLEDGE

1. Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.
   - Living things are distinguished from nonliving things on the basis of eight characteristics: response to the environment, growth and development, reproduction, homeostasis, complex chemistry, contain cells, obtain and use energy, and, as a species, change over time.
   - Four underlying principles form the basis of biology. They are cell theory, gene theory, homeostasis, and evolution.
   - Many living things interact with one another in some way. The interactions are often necessary for their survival.
   - The great diversity of life on Earth today is the result of 4 billion years of evolution. During that time, living things evolved from simple, single-celled organisms to complex, multicellular life forms.
2. Cell Theory
   - The cell theory states that all living things are made up of cells.
   - Cells are the basic units of structure and function in living things.
   - Living cells come only from other living cells.
3. Biochemistry
   - Example and functions of lipids, proteins, carbohydrates, and nucleic acids.
   - Examples and functions in the organelles of cells.
   - Atomic structures
   - Compare and contrast ionic and covalent bonds.
   - Mitochondria and chloroplast and their relationship with photosynthesis and respiration.
4. Cell Structure and Function
   - The structures within the cell function in storing and releasing energy, building and repairing cell parts, getting rid of waste materials, responding to the environment and reproducing
   - The cell wall gives protection and support to plant cells
   - The cell membrane regulates the movement of materials into and out of the cell
   - The nucleus directs the cell's activities
   - Chromosomes are found in the nucleus and are made of the nucleic acids DNA and RNA
   - The endoplasmic reticulum is the site of the manufacture and transport of proteins.

- Ribosomes are the protein factories for the cell and are found on the endoplasmic reticulum.
- Mitochondria are the "powerhouses" of the cell and the site of cellular respiration in plant and animal cells.
- Vacuoles store food, water, and wastes
- Lysosomes have a digestive function
- Chloroplasts capture the energy from the sun and use it to make food for the plant cell
- In many-celled organisms, cells are often organized into tissues, organs, and organ systems.

5. Cell Processes

- The sum of all the activities that occur in a living cell is called metabolism
- In aerobic respiration, energy is released from food with the help of oxygen. In anaerobic respiration, energy is released without oxygen.
- Food, oxygen, water and other materials enter and leave the cell by a process called diffusion
- Water passes through the cell membrane by a type of diffusion called osmosis which is a form of passive transport.
- The role of active transport for the movement of larger molecules through the cell membrane via pinocytosis and phagocytosis.
- In mitosis, the nucleus divides to form two identical nuclei. Mitosis occurs in four continuous steps, or phases—prophase, metaphase, anaphase and telophase.
- DNA is copied via a process known as replication.
- Mutations in DNA result in variations in genetic variety.
- Cell division in animal cells and plant cells is similar, but plant cells do not have centrioles and animal cells do not form cell walls
- Mitosis is involved in asexual reproduction and results in offspring identical to the parent
- Meiosis is the process that occurs in the formation of sex cells by which the number of chromosomes is reduced by half. The process produces genetically unique cells and takes place only at certain times in the organism's life cycle.
- Meiosis is involved in sexual reproduction and results in offspring that are unique

ACTIVITIES:

1. Describe the characteristics of life.
2. Compare and contrast plant and animal cells and the organelles found within them.
3. Analyze and create an analogy for cells and factories
4. Compare and contrast the equations for photosynthesis and cellular respiration.
5. Describe the role of osmosis and diffusion in cellular transport
6. Describe the role of macromolecules and their function in biochemical reactions.
7. Identify the building blocks (monomers) of organic compounds

RESOURCES:

Globe Fearon (Polar Bear) Book
Prentice Hall Science Explorer Series (Thin Books)
Frog Book

ASSESSMENTS:

Observation checklists
Interviews and dialogue
Group projects
Individual projects
Worksheets
Model creation
Writing responses
Lab participation
Lab reports
Journal entries
Presentations
Quizzes
Tests

REMEDIATION:

Small group instruction
Individualized teacher support
Web-based reinforcement activities
Peer tutoring
Chunking of information

ENRICHMENT:

Research Opportunities
Independent Investigations
Case Study
Individualized teacher support
Small group enrichment instruction

POCONO MOUNTAIN SCHOOL DISTRICT

COURSE: Life Science	GRADE(S): 8
UNIT 3: DNA and Heredity	

PA ACADEMIC STANDARDS

Organisms and Cells Content Standards:

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 3.1.B.A4. Summarize the stages of the cell cycle. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. Compare and contrast a virus and a cell. Relate the stages of viral cycles to the cell cycle.

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 3.1.B.A8. *CHANGE AND CONSTANCY* Recognize that systems within cells and multicellular organisms interact to maintain homeostasis. *PATTERNS* Demonstrate the repeating patterns that occur in biological polymers. *SYSTEMS* Describe how the unique properties of water support life.

Genetics Content Standards:

 3.1.B.B1. Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in **DNA** molecules. Explain the basic process of **DNA** replication. Describe the basic processes of transcription and translation. Explain how crossing over, jumping genes, and deletion and duplication of genes results in genetic variation. Explain how **mutations** can alter genetic information and the possible consequences on resultant cells.

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 3.1.B.B3. Describe the basic structure of DNA, including the role of hydrogen bonding. Explain how the process of DNA replication results in the transmission and conservation of the genetic

Evolution Content Standards:

 3.1.B.C1. Describe species as reproductively distinct groups of organisms. Analyze the role that geographic isolation can play in speciation. Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population. Describe how the degree of kinship between species can be inferred from the similarity in their DNA sequences.

 3.1.B.C2. Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of single celled organisms evolved. Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed. Describe how mutations in sex cells may be passed on to successive generations and that the resulting phenotype may help, harm, or have little or no effect on the offspring's success in its environment. Describe the relationship between environmental changes and changes in the gene pool of a population.

 3.1.B.C3. *CONSTANCY AND CHANGE* Compare and contrast various theories of evolution. Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution. *PATTERNS* Discuss the implications of a universal genetic code for evolution.

KEYSTONE ASSESSMENT ANCHORS

Module A CELLS and CELL PROCESSES

BIO.A.1 - Basic Biological Principles
- A.1.1. Explain the characteristics common to all organisms.
- A.1.2. Describe relationships between structure and function at biological levels of organization.

BIO.A.2 - The Chemical Basis for Life
- A.2.1. Describe how the unique properties of water support life on Earth.
- A.2. 2. Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules).
- A.2. 3. Explain how enzymes regulate biochemical reactions within a cell.

BIO. A.3 - Cells and Cell Processes
- A.3.1. Identify and describe the cell structures involved in processing energy.
- A.3.2. Identify and describe how organisms obtain and transform energy for their life processes.

BIO.A.4 - Homeostasis and Transport
- A.4. 1. Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.

Module B CONTINUITY and UNITY of LIFE

BIO.B.1 - Cell Growth and Reproduction
- B.1. 1. Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis.
- B.1. 2. Explain how genetic information is inherited.

BIO.B.2 - Genetics
- B.2.1. Compare Mendelian and non-Mendelian patterns of inheritance.
- B.2.2. Explain the process of protein synthesis (i.e., transcription, translation, and protein modification).
- B.2.3. Explain how genetic information is expressed.
- B.2.4. Apply scientific thinking, processes, tools, and technologies in the study of genetics.

BIO.B.3 - Theory of Evolution
- B.3. 1. Explain the mechanisms of evolution.
- B.3. 2. Analyze the sources of evidence for biological evolution.
- B.3. 3. Apply scientific thinking, processes, tools, and technologies in the study of the theory of evolution.

BIO.B.4 - Ecology

- B.4. 1. Describe ecological levels of organization in the biosphere.
- B.4. 2. Describe interactions and relationships in an ecosystem.

KEY CONCEPTS

1. Organisms share common characteristics of life.
2. New cells arise from the division of pre-existing cells.
3. Hereditary information in genes is inherited and expressed.
4. Evolution is the result of many random processes selecting for the survival and reproduction of a population.
5. Life emerges due to the chemical organization of matter into cells.
6. Cells have organized structures and systems necessary to support chemical reactions needed to maintain the living condition.
7. Structure is related to function at all biological levels of organization.
8. Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.
9. Eukaryotic cells can differentiate and organize making it possible for multicellularity.
10. Organisms obtain and use energy to carry out their life processes.
11. Organisms on Earth interact and depend in a variety of ways on other living and nonliving things in their environments.
12. DNA segments contain information for the production of proteins necessary for growth and function of cells.

OBJECTIVES / ESSENTIAL KNOWLEDGE

1. Inheriting Traits
   - Heredity is the passing of physical traits from one generation to the next.
   - Genetics is the study of how traits are inherited.
   - The traits that an organism is born with are called inherited traits. An organism's traits are controlled by the alleles in inherits from its parents. Some alleles can be dominant or recessive
2. Mendelian Genetics
   - Mendel was the first to trace one trait through several generations
   - Gregor Mendel 's conclusions led to the principals of heredity
   - Hybrids receive different genetic information from each parent
   - Genetics involve a dominant and recessive factor
   - Punnett squares can be used to predict the results of a cross
3. Human Genes and Mutations
   - Errors can occur when DNA is copied
   - Mistakes in meiosis can result in an unequal number of chromosomes in sex cells
   - Recessive genes control many human genetic disorders
   - Pedigrees charts help reveal patterns of the inheritance of a trait in a family
4. Genetic Engineering
   - Genetic engineering uses biological and chemical methods to change genes
   - Recombinant DNA is one method of genetic engineering to make useful chemicals, including hormones. It combines genetic material from different sources
   - Gene transfer shows promise for correcting many human genetic disorders, cancer, and other diseases
   - Breakthroughs in genetic engineering are allowing scientists to do many things such as producing plants that are resistant to disease
   - Selective breeding, cloning, and genetic engineering are three methods for developing organisms with desirable traits
   - In artificial selection, people choose the traits they want future generations to have by choosing which organisms will reproduce

ACTIVITIES:	**ASSESSMENTS:**
1. Describe how DNA replication results in the transmission and/or conservation of the genetic information. 2. Explain the structural relationships between DNA, genes, and chromosomes. 3. Explain the unified process of protein synthesis. 4. Use Punnett Squares to successfully predict the outcome of	Observation checklists Interviews and dialogue Group projects Individual projects Worksheets Model creation Writing responses Lab participation

monohybrid crosses. 4. Describe how genetic mutations alter DNA sequence and may or may not affect phenotype. 5. Describe and/or predict observed patterns of inheritance. 6. Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture. **RESOURCES:** Globe Fearon (Polar Bear) Book Prentice Hall Science Explorer Series (Thin Books) Frog Book	Lab reports Journal entries Presentations Quizzes Tests **REMEDIATION:** Small group instruction Individualized teacher support Web-based reinforcement activities Peer tutoring Chunking of information **ENRICHMENT:** Research Opportunities Independent Investigations Case Study Individualized teacher support Small group enrichment instruction

POCONO MOUNTAIN SCHOOL DISTRICT

COURSE: Life Science	GRADE(S): 8
UNIT 4: Evolution	

PA ACADEMIC STANDARDS

Organisms and Cells Content Standards:

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 3.1.B.A4. Summarize the stages of the cell cycle. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. Compare and contrast a virus and a cell. Relate the stages of viral cycles to the cell cycle.

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 3.1.B.A6. Explain how cells differentiate in multicellular organisms.

 3.1.B.A7. Analyze the importance of carbon to the structure of biological macromolecules. Compare and contrast the functions and structures of proteins, lipids, carbohydrates, and nucleic acids. Explain the consequences of extreme changes in pH and temperature on cell proteins.

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KEYSTONE ASSESSMENT ANCHORS

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Module B CONTINUITY and UNITY of LIFE

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- B.3. 2. Analyze the sources of evidence for biological evolution.
- B.3. 3. Apply scientific thinking, processes, tools, and technologies in the study of the theory of evolution.

BIO.B.4 - Ecology

- B.4. 1. Describe ecological levels of organization in the biosphere.
- B.4. 2. Describe interactions and relationships in an ecosystem.

KEY CONCEPTS

1. Organisms share common characteristics of life.
2. New cells arise from the division of pre-existing cells.
3. Hereditary information in genes is inherited and expressed.
4. Evolution is the result of many random processes selecting for the survival and reproduction of a population.
5. Life emerges due to the chemical organization of matter into cells.
6. Cells have organized structures and systems necessary to support chemical reactions needed to maintain the living condition.
7. Structure is related to function at all biological levels of organization.
8. Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.
9. Eukaryotic cells can differentiate and organize making it possible for multicellularity.
10. Organisms obtain and use energy to carry out their life processes.
11. Organisms on Earth interact and depend in a variety of ways on other living and nonliving things in their environments.
12. DNA segments contain information for the production of proteins necessary for growth and function of cells.

OBJECTIVES / ESSENTIAL KNOWLEDGE

1. Early Models of Evolution
   - Evolution is change in the characteristics of a species over time
   - A species is a group of organisms that share similar characteristics and can reproduce among themselves to produce fertile offspring.
2. Natural Selection
   - Darwin proposed evolution by natural selection, a process by which organisms best suited to their environments are most likely to survive and reproduce
   - Organisms have more offspring than can survive, individuals of species vary, and many of these variations are passed to offspring
   - Variations are differences in traits between members of the same species
   - Adaptations are variations that help an organism survive or reproduce in its environment
   - An adaptation is any behavior or physical characteristic that helps an individual survive and reproduce in its environment
   - A mutation is a change in an organisms DNA
3. Evidence to support the theory of Evolution
   - Fossils, patterns of early development and similar body structures all provide evidence that organisms have changed over time
   - Scientists have combined the evidence from DNA, protein structure, fossils, early development and body structure to determine the evolutionary relationships among species
   - A new species can form when a group of individuals remains separated from the rest of its species long enough to evolve different traits
   - A branching tree is a diagram that shows how scientists think different groups of organisms are related.
   - Examine recent discoveries that support the theory of evolution.

ACTIVITIES:

1. Explain the process of evolution and its contributing factors, including natural selection.
2. Explain how scientists infer evolutionary relationships amongst organisms.
3. Describe how most fossils form.
4. Explain how scientists determine a fossil's relative age.

RESOURCES:

Globe Fearon (Polar Bear) Book
Prentice Hall Science Explorer Series (Thin Books)

ASSESSMENTS:

Observation checklists
Group projects
Individual projects
Worksheets
Model creation
Writing responses
Lab participation
Lab reports
Journal entries
Presentations
Quizzes
Tests

Frog Book	**REMEDIATION:** Small group instruction Individualized teacher support Web-based reinforcement activities Peer tutoring Chunking of information **ENRICHMENT:** Research Opportunities Independent Investigations Case Study Individualized teacher support Small group enrichment instruction

POCONO MOUNTAIN SCHOOL DISTRICT

COURSE: Life Science	GRADE(S): 8
UNIT 5: Classification of Life and Simple Organisms	

PA ACADEMIC STANDARDS

Organisms and Cells Content Standards:

 3.1.B.A1. Describe the common characteristics of life. Compare and contrast the cellular structures and degrees of complexity of prokaryotic and eukaryotic organisms. Explain that some structures in eukaryotic cells developed from early prokaryotic cells (e.g., mitochondria, chloroplasts).

 3.1.B.A2. Identify the initial reactants, final products, and general purposes of photosynthesis and cellular respiration. Describe the relationship between photosynthesis and cellular respiration in photosynthetic organisms. Identify and explain various macromolecules (such as ATP).

 3.1.B.A3. Explain how all organisms begin their life cycles as a single cell and that in multicellular organisms, successive generations of embryonic cells form by cell division.

 3.1.B.A4. Summarize the stages of the cell cycle. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. Compare and contrast a virus and a cell. Relate the stages of viral cycles to the cell cycle.

 3.1.B.A5. Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc). Explain the role of water in cell metabolism. Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane.

 3.1.B.A6. Explain how cells differentiate in multicellular organisms.

 3.1.B.A7. Analyze the importance of carbon to the structure of biological macromolecules. Compare and contrast the functions and structures of proteins, lipids, carbohydrates, and nucleic acids. Explain the consequences of extreme changes in pH and temperature on cell proteins.

 3.1.B.A8. *CHANGE AND CONSTANCY* Recognize that systems within cells and multicellular organisms interact to maintain homeostasis. *PATTERNS* Demonstrate the repeating patterns that occur in biological polymers. *SYSTEMS* Describe how the unique properties of water support life.

Genetics Content Standards:

 3.1.B.B1. Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in **DNA** molecules. Explain the basic process of **DNA** replication. Describe the basic processes of transcription and translation. Explain how crossing over, jumping genes, and deletion and duplication of genes results in genetic variation. Explain how **mutations** can alter genetic information and the possible consequences on resultant cells.

 3.1.B.B2. Describe how the process of meiosis results in the information of haploid gametes and analyze the importance of meiosis in sexual reproduction. Compare and contrast the function of mitosis and meiosis. Illustrate that the sorting and recombining of genes in sexual reproduction results in a great variety of possible gene combinations in offspring.

 3.1.B.B3. Describe the basic structure of DNA, including the role of hydrogen bonding. Explain how the process of DNA replication results in the transmission and conservation of the genetic

Evolution Content Standards:

3.1.B.C1. Describe species as reproductively distinct groups of organisms. Analyze the role that geographic isolation can play in speciation. Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population. Describe how the degree of kinship between species can be inferred from the similarity in their DNA sequences.

3.1.B.C2. Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of single celled organisms evolved. Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed. Describe how mutations in sex cells may be passed on to successive generations and that the resulting phenotype may help, harm, or have little or no effect on the offspring's success in its environment. Describe the relationship between environmental changes and changes in the gene pool of a population.

3.1.B.C3. *CONSTANCY AND CHANGE* Compare and contrast various theories of evolution. Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution. *PATTERNS* Discuss the implications of a universal genetic code for evolution.

KEYSTONE ASSESSMENT ANCHORS

Module A CELLS and CELL PROCESSES

BIO.A.1 - Basic Biological Principles
- A.1.1. Explain the characteristics common to all organisms.
- A.1.2. Describe relationships between structure and function at biological levels of organization.

BIO.A.2 - The Chemical Basis for Life
- A.2.1. Describe how the unique properties of water support life on Earth.
- A.2. 2. Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules).
- A.2. 3. Explain how enzymes regulate biochemical reactions within a cell.

BIO. A.3 - Cells and Cell Processes
- A.3.1. Identify and describe the cell structures involved in processing energy.
- A.3.2. Identify and describe how organisms obtain and transform energy for their life processes.

BIO.A.4 - Homeostasis and Transport
- A.4. 1. Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.

Module B CONTINUITY and UNITY of LIFE

BIO.B.1 - Cell Growth and Reproduction
- B.1. 1. Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis.
- B.1. 2. Explain how genetic information is inherited.

BIO.B.2 - Genetics
- B.2.1. Compare Mendelian and non-Mendelian patterns of inheritance.
- B.2.2. Explain the process of protein synthesis (i.e., transcription, translation, and protein modification).
- B.2.3. Explain how genetic information is expressed.
- B.2.4. Apply scientific thinking, processes, tools, and technologies in the study of genetics.

BIO.B.3 - Theory of Evolution
- B.3. 1. Explain the mechanisms of evolution.
- B.3. 2. Analyze the sources of evidence for biological evolution.
- B.3. 3. Apply scientific thinking, processes, tools, and technologies in the study of the theory of evolution.

POCONO MOUNTAIN SCHOOL DISTRICT

BIO.B.4 - Ecology
• B.4. 1. Describe ecological levels of organization in the biosphere.
• B.4. 2. Describe interactions and relationships in an ecosystem.

KEY CONCEPTS

1. Organisms share common characteristics of life.
2. New cells arise from the division of pre-existing cells.
3. Hereditary information in genes is inherited and expressed.
4. Evolution is the result of many random processes selecting for the survival and reproduction of a population.
5. Life emerges due to the chemical organization of matter into cells.
6. Cells have organized structures and systems necessary to support chemical reactions needed to maintain the living condition.
7. Structure is related to function at all biological levels of organization.
8. Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.
9. Eukaryotic cells can differentiate and organize making it possible for multicellularity.
10. Organisms obtain and use energy to carry out their life processes.
11. Organisms on Earth interact and depend in a variety of ways on other living and nonliving things in their environments.
12. 12. DNA segments contain information for the production of proteins necessary for growth and function of cells.

OBJECTIVES / ESSENTIAL KNOWLEDGE

1. Classification
   - Linnaeus developed the first widely accepted method of classification based on similar structures
   - Classification is a way of organizing information about living things
   - Taxonomy is the science of classifying living things
2. Binomial Nomenclature
   - Binomial nomenclature is the two-name system that scientists use today. It consists of the genus name (a group of similar species) and another identifying name (can describe a feature of the organism, identify a place or honor an individual)
3. Dichotomous/Taxonomic Keys
   - A dichotomous key is used to identify organisms. The key is made up of a series of statements about visible traits. Each statement can be considered a question that can be answered yes or no. The answers lead you to new statements until you have identified the organism
   - A taxonomic key consists of a series of paired statements that describe the physical characteristics of different organisms
4. Kingdoms of Life
   - Most scientists follow the six-kingdom classification system
   - Organisms can be classified as either archaebacteria, eubacteria, protists, fungi, plants or animals
5. Kingdom Archaebacteria
   - Archaebacteria, also called Archaea, are single celled organisms that do not have a true nucleus
   - Archaea make up the largest portion of all living things on Earth and can be found in the most extreme/harsh environments
6. Kingdom Eubacteria
   - Eubacteria are single-celled organisms that do not have a true nucleus and can live nearly everywhere in the world
   - The Eubacteria are grouped by their shape (spherical, spiral, and rod-shaped)
   - Eubacteria can be helpful in the making of many foods, decomposing dead matter and adding nitrogen to the soil.
   - Eubacteria can be harmful by causing diseases and food to spoil
7. Viruses
   - Non-living carriers or various diseases, such as the common cold

POCONO MOUNTAIN SCHOOL DISTRICT

ACTIVITIES:	**ASSESSMENTS:**
1. Explain how living organisms are classified. 2. Utilize a dichotomous key to identify an unknown organism. 3. Compare and contrast the organisms that belong to the (six) different kingdoms of life. 4. Compare and contrast archaebacteria, eubacteria, and viruses. **RESOURCES:** Globe Fearon (Polar Bear) Book Prentice Hall Science Explorer Series (Thin Books) Frog Book	Observation checklists Interviews and dialogue Group projects Individual projects Worksheets Model creation Writing responses Lab participation Lab reports Journal entries Presentations Quizzes Tests **REMEDIATION:** Small group instruction Individualized teacher support Web-based reinforcement activities Peer tutoring Chunking of information **ENRICHMENT:** Research Opportunities Independent Investigations Case Study Individualized teacher support Small group enrichment instruction

POCONO MOUNTAIN SCHOOL DISTRICT

COURSE: Life Science	GRADE(S): 8
UNIT 6: Ecology of Plants and Animals	

PA ACADEMIC STANDARDS

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12. 12. DNA segments contain information for the production of proteins necessary for growth and function of cells.

OBJECTIVES / ESSENTIAL KNOWLEDGE

1. Describe and compare structural and functional similarities and differences that characterize diverse living things. *Reference: S8.B.1.1, PA3.3.7.A, 3.3.7.B, 4.6.7.A, 4.7.7.B*

- Describe the structures of living things that help them function effectively in specific ways (e.g., adaptations, characteristics).
- Compare similarities and differences in internal structures of organisms (e.g., invertebrate/vertebrate, vascular/nonvascular, single-celled/multi-celled) and external structures (e.g., appendages, body segments, type of covering, size, shape).
- Apply knowledge of characteristic structures to identify or categorize organisms (i.e., plants, animals, fungi, bacteria, and protista).
- Identify the levels of organization from cell to organism and describe how specific structures (parts), which underlie larger systems, enable the system to function as a whole.
- Explain how inherited structures or behaviors help organisms survive and reproduce in different environments.
- Explain how different adaptations in individuals of the same species may affect survivability or reproduction success.

2. Explain the relationships among and between organisms in different ecosystems and their abiotic and biotic components. *Reference: S8.B.3.1, PA 4.4.7.B, 4.6.7.A, 4.1.7.C, 4.1.7.D*

- Explain the flow of energy through an ecosystem (e.g., food chains, food webs).
- Identify major biomes and describe abiotic and biotic components (e.g., abiotic: different soil types, air, water sunlight; biotic: soil microbes, decomposers).
- Explain relationships among organisms (e.g., producers/consumers, predator/prey) in an ecosystem.

3. Identify evidence of change to infer and explain the ways different variables may affect change in natural or human-made systems. *Reference: S8.B.3.2, PA 3.1.7.C, 4.3.7.B, 4.6.7.C, 4.8.7.D, 3.1.7.E, 4.3.7.C*

- Use evidence to explain factors that affect changes in populations (e.g., deforestation, disease, land use, natural disaster, and invasive species).
- Use evidence to explain how diversity affects the ecological integrity of natural systems.
- Describe the response of organisms to environmental changes (e.g., changes in climate, hibernation, migration, and pigmentation) and how those changes affect survival.

ACTIVITIES:

1. Describe and differentiate between the levels of ecological organization.
2. Describe characteristic biotic and abiotic components of terrestrial and aquatic ecosystems.
3. Describe how energy flows through an ecosystem.
4. Describe biotic interactions within an ecosystem.
5. Describe the niche of an organism.
6. Describe how matter recycles through an ecosystem.
7. Describe how ecosystems change in response to natural and human disturbances.
8. Describe the effects of limiting factors on population dynamics and potential species extinction.
9. Identify the functions that enable plants and animals to meet their basic needs
10. Compare and contrast the characteristics of organisms belonging to the various plant and animal kingdoms.
11. Describe the voluntary and involuntary responses of organisms within their environment.

RESOURCES:

Globe Fearon (Polar Bear) Book
Prentice Hall Science Explorer Series (Thin Books)
Frog Book

ASSESSMENTS:

Observation checklists
Interviews and dialogue
Group projects
Individual projects
Worksheets
Model creation
Writing responses
Lab participation
Lab reports
Journal entries
Presentations
Quizzes
Tests
Nature walks

REMEDIATION:

Small group instruction
Individualized teacher support
Web-based reinforcement activities
Peer tutoring
Chunking of information

ENRICHMENT:

Research Opportunities
Independent Investigations
Case Study
Individualized teacher support
Small group enrichment instruction
Biological inventory of local biome