West Windsor-Plainsboro Regional School District
Science I ESL Curriculum

Unit Title: Science Processes and the Chemistry of Life

Content Area: Science

Course & Grade Level: ESL Science I 9-12

Summary and Rationale

Students will be introduced to the idea of a hypothesis. Students will learn that the scientific method is a commonly accepted series of steps used to investigate a scientific problem. They will learn that the process is cyclic al in that one investigation may lead to a new problem and a new investigation.
Students will learn and study the basic steps of the scientific method and be able to identify the parts of an experiment (variables, controls, etc.).
Students will also be introduced to the different types of measurement which are used within experiments as well as the tools to carry out such measurements. Such measurements include mass, volume, length, width, height, density, temperature, and time.
Students will investigate the properties of matter as well as their connection to the periodic table.
Students will be able to identify the three major subatomic particles and their properties.
Students will learn to identify the four major classes of organic biomolecules (carbohydrates, lipids, proteins, nucleic acids) and their functions in relation to food and diets.

Recommended Pacing

12-16 weeks

NGSS Standards/Performance Expectations

Standard	
HS-LS1-6	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements for form amino acids and/or other large carbon-based molecules. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [*Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.*]
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [*Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.*]

Instructional Focus

Unit Enduring Understandings

- Hypotheses are made to be revised as more information becomes available.
- A scientific problem has no right answer. Although scientists make predictions, there is no right; only answers to be verified.
- Current scientific knowledge represents the most widely accepted plausible explanation of available information.
- Students will incorporate their measuring skills while taking both qualitative and quantitative data measurements within their experiments

- Structure and function are often related - an atom's electron configuration determines how it interacts with other atoms to form bonds
- Unity in diversity - all atoms are composed of the same fundamental building blocks
- Unity in diversity - all living things are composed of the same chemical building blocks
- Structure and function are often related - a molecule's atomic configuration determines its chemical and physical properties, including its shape.
- Nutrition labels tell us important information about what we are putting in our bodies when we ingest food.
- The US Government has standards for people to follow (My Plate) in the pursuit of healthful nutrition
- Food is made of important molecules that provide building blocks for life as well as the energy needed to maintain cellular metabolism.

Unit Essential Questions

- Do all scientists really use the scientific method?
- Do we use the scientific method in everyday life?
- Is there a "right" answer?
- What can influence scientific thinking?
- If all atoms are composed of the same fundamental building blocks, how is it that different atoms can behave chemically in vastly different ways?
- If all organisms are composed of the same fundamental building blocks, how can there be such great diversity among living things?
- To get the building blocks (monomers) needed for making macromolecules (polymers), we must eat other organisms. To get these building blocks, does it matter if we eat just other animals, just plants or both animals and plants?

Content Statements

- Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.
- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.
- Carbohydrates, lipids, and proteins are essential biomolecules which are found in the foods we eat and act to fuel our bodies.

Ability Objectives

- Write a hypothesis based on available information
- Develop vocabulary related to the unit
- Measure the length, width, mass and height of objects
- Utilize and manipulate the equation for density
- Identify lab tools and their function
- Students will learn all of the components of how to make a graph
- Collect quantitative and qualitative data
- Distinguish between observation and inference
- Identify and differentiate between dependent and independent variables
- Determine type of data that is most appropriate for the question asked
- Use data collected to formulate valid and supported conclusions
- Organize data in a meaningful manner using appropriate tools
- Differentiate between an atom, molecule, element and compound

- Determine the structure and properties of atoms and molecules.
- Use periodic table to predict atomic #, mass, isotopes for selected atoms
- Explain how the four major organic compounds are essential components to the composition of our bodies
- Follow various biomolecules from their synthesis through to their final destination.

Sample Performance Tasks - Specific for Unit 2: SWBAT:

- Obtain, evaluate, and communicate information about the cause and effect relationship between diet and nutrition as they relate to the hierarchical structural organization and function of the digestive system. (**HS-LS1-3, HS-LS1-6)**

Resources

Core Text:

Suggested Resources:

Brain Pop Videos
Amoeba sisters videos
Tools Lab
Element Project
Measuring Lab
Digestion Story book project

Unit Title: Cellular Structure and Function

Content Area: Science

Course & Grade Level: ESL Science I 9-12

Summary and Rationale

Students demonstrate understanding of how cell structure is related to cellular function and how systems of cells function together to support the life processes.
Investigations will be conducted and models will be used for cellular transport.

Recommended Pacing

3-4 weeks

NGSS Standards/Performance Expectations

Standard	
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [*Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.*]
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [*Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.*]

Instructional Focus

Unit Enduring Understandings

- Cellular function is maintained through the regulation of cellular processes in response to internal and external environmental conditions.
- An entity's structure often reveals its function. This principle applies to different types of cells as well as the components of the cells themselves.
- Many entities are made up of smaller units. Entities (cells e.g.) are made of smaller units (organelles, e.g.) whose characteristics are reflected in the larger entity.
- Cellular structure is directly related to its function.

Unit Essential Questions

- How do the structures of organisms enable life's functions?
- If all living things are composed of the same fundamental building blocks, how can there be such great diversity among living things?
- To what extent is cell structure related to its function?
- Why are humans/fish etc. not made up of one cell only?
- How is the whole more than the sum of its parts?
- Why is the cell considered to be the smallest living unit?
- Are components of different cells interchangeable?
- Which cell structure is most important for cell life?

Content Statements

- Cells are the basic unit of life.
- Cells are classified as eukaryotic and prokaryotic.
- Large organisms are made of many cells so nutrients can efficiently pass through the cell.
- There are distinct differences between plant and animal cells.
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.

Ability Objectives

- Identify the structure and function of a cell membrane
- Describe the parts of the cell theory
- Develop vocabulary related to the unit
- Explain functional relationships between selected organelles/structures.
- Use a compound microscope to observe/study cells
- Differentiate between plant and animal cells
- Differentiate between eukaryotic and prokaryotic cells
- Relate specialized cell function to cell structure
- Differentiate between various modes of cell transport
- Use models to demonstrate cellular transport
- Identify the basic structure of cells
- Compare and contrast the structure and functions of different types of cells
- Make a model of a plant and animal cell

Sample Performance Tasks - Specific for Unit 3: SWBAT:

- Develop and use a model of the cell membrane to explain how its structure relates to its function in determining mechanisms of cell transport allowing the cell to remain alive as external conditions change.(**HS-LS1-2, HS-LS1-3)**
- Develop and use a model of a plant and animal cell to explain how its structure relates to its function in determining mechanisms of cell division.(**HS-LS1-2, HS-LS1-3)**

Resources

Core Text:

Suggested Resources:

Brain Pop Videos
Amoeba sisters videos
Plant and animal cell lab
Plant and Animal Project
Cell Membrane Egg lab

Unit Title: DNA Structure and Function

Content Area: Science

Course & Grade Level: ESL Science I 9-12

Summary and Rationale

Students formulate an answer to the question: "How does the structure of DNA play a role in its function?" Students investigate the structural components of DNA and the importance of DNA to cellular structure.
Student will learn that a DNA molecule is a long chain of four kinds of smaller unit molecules (nucleotides) whose precise sequence in the chain encodes genetic information. The information passed from parents to offspring is coded in DNA molecules. Additionally, DNA is replicated within each cell.

Recommended Pacing

2-3 weeks

NGSS Standards/Performance Expectations

Standard	
HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

Instructional Focus

Unit Enduring Understandings

- DNA is found in all living things.
- The instructions for forming species characteristics are carried in DNA.
- All DNA in all organisms is comprised of the four nitrogen bases; adenine, thymine, guanine and cytosine.

Unit Essential Questions

- Can we live by only eating DNA?
- Is DNA essential for life?
- Do organisms of the same species have similar DNA?
- What does it mean if two organisms have very different DNA?
- How similar is the DNA between humans?

Content Statements

- DNA is an essential component to life. DNA is found in every living thing. DNA holds the instructions for making proteins. DNA is directly involved in the expression of our traits.
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

Ability Objectives

- Identify the parts of DNA.
- State the function of DNA.
- Label the different components of DNA.
- Make a model of DNA.
- Differentiate between gene, trait and chromosomes.
- Follow lab procedures to extract DNA from a living organism.

Sample Performance Tasks - Specific for Unit 4: SWBAT:

- Construct a model of DNA

Resources

Brain Pop Videos
Amoeba sisters
Strawberry DNA extraction lab
DNA model activity

Unit Title: Heredity and Cell Reproduction

Content Area: Science

Course & Grade Level: ESL Science I 9-12

Summary and Rationale

In multicellular organisms individual cells grow and then divide via a process called mitosis, allowing the organism to grow.
Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.
Students formulate answers to the questions: "How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?"
Students demonstrate understanding of why individuals of the same species vary in how they look, function, and behave.
Students can recognize the mechanisms of genetic inheritance.

Recommended Pacing

6-8 weeks

NGSS Standards/Performance Expectations

HS-LS1-4	Use a model to illustrate the role of cellular division [mitosis] and differentiation in producing and maintaining complex organisms. [*Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.*]
HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. [*Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.*]
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.] [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. [Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.] [*Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.*]

Instructional Focus

Unit Enduring Understandings

- All organisms reproduce
- The continuity of life is dependent on the process of reproduction
- Cell reproduction is important for cell growth and repair
- There are two types of reproduction; sexual and asexual
- Some organisms can reproduce both sexually and asexually
- Sexual reproduction results in genetic variation

- Asexual reproduction results in identical cell
- Genetic inheritance usually follows predictable patterns but sometimes real outcomes contradict prediction
- Patterns can be used to predict inheritance of a characteristic
- Probability and actuality are two very different things. Just because what you expect to happen didn't happen, doesn't mean it's wrong

Unit Essential Questions

- Why do individuals of the same species vary in how they look and function?
- How do siblings exhibit different characteristics even though they came from the same parents?
- How are genetic mutations related to DNA?
- How are traits passed from parents to offspring?
- What is the relationship between genotype and phenotype?
- How do scientists predict which genes an organism will inherit?
- To what extent is genetic diversity from generation to generation important?
- For a given genetic trait controlled by two alleles (dominant or recessive), which phenotype, the dominant or the recessive, will occur most frequently in a population?

Content Statement

- **Structure and Function**

  All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins.
- **Inheritance of Traits**

  Each chromosome consists of a single DNA molecule.

  Genes are located on chromosomes and are comprised of different arrangements of nitrogen bases.

  The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways.

Ability Objectives

- Differentiate between genotype and phenotype
- Differentiate between homozygous and heterozygous
- Show genetic outcomes via ratios and percentages
- Use principles of probability to solve selected Mendelian genetics problems
- Predict inheritance patterns of traits
- Interpret and analyze pedigrees and karyotypes

Sample Performance Tasks - Specific for Unit 5: SWBAT:

- Analyze and interpret genetic data to determine probability and patterns of inheritance of various genetic traits. **(HS-LS3-1, HS-LS3-3)**

Resources

Core Text:

Suggested Resources:

Brain Pop videos

Amoeba sisters video

Baby Lab

Unit Title: Evolution and Diversity	
Content Area: Science	
Course & Grade Level: ESL Science I 9-12	
Summary and Rationale	
Sometimes, differences between organisms of the same kind provide advantages for surviving and reproducing in different environments. These selective differences may lead to dramatic changes in characteristics of organisms in a population over extremely long periods of time.	
Recommended Pacing	
2-3 weeks	
NGSS Standards/Performance Expectations	
HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]
HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [*Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.*]
HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations. [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]
HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]

Instructional Focus

Unit Enduring Understandings

- Variation exists among members of any group. In the natural world, this variation is the cornerstone of evolution. Evolution builds on what already exists, so the more variety there is, the more there can be in the future
- All things change over time
- Variation leads to differential survival. Environmental factors influence which variations are favored
- Classifying organisms helps us to make sense out of the complexity of the living world
- Classification schemes change based on new information.

Unit Essential Questions

- How long does evolution take?
- How do we know evolution happens?
- Can an individual evolve?
- Is evolution happening now?
- Do the fittest always survive?
- How are organisms classified?

Content Statements

- **Evidence of Common Ancestry and Diversity**

  The theory of Evolution by natural selection states that those best adapted to their environment will survive and reproduce
  There are pieces of evidence that support the theory of evolution including fossils, body structure, biogeography, DNA sequences and embryology.
  Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2),(HS-LS4-3)
  The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population.

- **Adaptation**

  Natural selection leads to adaptation. Adaptation also means that the distribution of traits in a population can change when conditions change.
  Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species.

Ability Objectives

- Understand the process of evolution
- Define evolution and adaptation
- Recognize the different components of the theory of evolution by natural selection

- Recognize and cite the different pieces of evidence for evolution
- Use a model to show evolution occurring

Sample Performance Tasks - Specific for Unit 5: SWBAT:

- Construct an explanation based on evidence that the process of evolution results from adaptation, heritable variation, competition and survival of the fittest. **(HS-LS4-2)**
- Analyze and interpret data from DNA sequence, anatomical structures, embryological similarities and fossil records to identify common ancestry as it supports biological evolution. **(HS-LS4-1)**

Resources

Core Text:

Suggested Resources:

Brain Pop Videos
Amoeba sisters videos
Beak of Finch Lab
Peppered Moth Simulation

Unit Title: Bioenergetics-Cycling of Matter	
Content Area: Science	
Course & Grade Level: ESL Science I 9-12	
Summary and Rationale	
Food is required for energy and building cellular materials. Organisms in an ecosystem have different ways of obtaining food, and some organisms obtain their food directly from other organisms. Photosynthesis and cellular respiration are integral components of the carbon cycle and directly involved in the cycling of matter.	
Recommended Pacing	
4 weeks	
NGSS Standards/Performance Expectations	
HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.] [*Assessment Boundary: Assessment does not include specific biochemical steps.*]
HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. [Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.] [*Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.*]
HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [*Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.*]
HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [*Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.*]

Instructional Focus

Unit Enduring Understandings

- Over long spans of time, matter and energy are transformed among living things, and between them and the physical environment
- The energy to sustain most life is primarily derived from a conversion of light energy to chemical energy through the process of photosynthesis
- Cycling of matter is essential to maintaining balance in living systems
- Plants produce their own food through photosynthesis
- Animals and plants extract energy from food through cellular respiration

Unit Essential Questions

- Do plants breathe?
- How do plants grow?
- How are plants self-sustaining?
- Can life exist without the sun?
- How can plants exist in areas where sunlight is absent for long periods of time?
- Why is carbon an essential part of photosynthesis and cellular respiration?

Content Statement

- Photosynthesis is a process used by plants converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen.
- Cellular respiration also releases the energy from the food we eat.
- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.
- Photosynthesis and cellular respiration are important components of the carbon cycle. One process produces what the other needs thus a reciprocal relationship is produced.

Ability Objectives

- Apply the knowledge of basic biomolecules to the process of cell respiration and photosynthesis.
- Compare and contrast aerobic and anaerobic respiration.
- Develop vocabulary related to the unit
- Relate plant structure to process of photosynthesis
- Identify plant structures
- Identify reactants and products of photosynthesis and cellular respiration.
- Identify the organelles involved in photosynthesis and cellular respiration

Sample Performance Tasks - Specific for Unit 5: SWBAT:

- Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. **(HS-LS2-5)**
- Develop a model to support the claim that matter is conserved and cycled with an ecosystem. **(HS-LS2-3, HS-LS-4)**

Resources
Core Text: **Suggested Resources:** Brain Pop Videos Amoeba sisters videos Modified Elodea lab Modified Exercise lab

Unit Title: Ecology/Flow Energy

Content Area: Science

Course & Grade Level: ESL Science I 9-12

Summary and Rationale

Students will be introduced to several ecological terms. Students will differentiate between an organism's niche and habitat. Also students will explain the role of the organisms in the ecosystem. Students should answer the question, "How does energy move through an ecosystem"? Students can construct explanations of the flow of energy through an ecosystem and the interactions among organisms in an ecosystem.

Recommended Pacing

4 weeks

NGSS Standards/Performance Expectations

HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [*Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.*]

Instructional Focus

Unit Enduring Understandings

- All living things are linked directly or indirectly with each other in any given ecosystem.
- The link between the biotic and abiotic components of an ecosystem is demonstrated through the transformation of energy and the cycling of matter.
- In all ecosystems, there is continuity of life. When one organism dies, it opens up space for more life to flourish.
- Like many complex systems, ecosystems tend to show cyclic fluctuations around a state of approximate equilibrium.

Unit Essential Questions

- How does energy move through a food chain or food web?
- Where does the energy go that is "lost?
- What are the different trophic levels in a food chain/web?
- What would happen if you remove decomposers from an ecosystem?
- How long can a food chain be?
- Why are autotrophs at the base of a food chain/web?
- How do organisms interact with each other?

Content Statement

- Matter cycles, energy flows. As energy moves through a food chain only 10% of the energy is transferred to the next the level. Energy is lost as heat through metabolic reactions.
- If an organism is removed from a food chain/web it will impact the entire chain/web.
- Decomposers are an essential part of an ecosystem.

Ability Objectives

- Make a food chain/web
- Differentiate between the different trophic levels in a food chain
- Show the flow of energy in a food chain

- Differentiate between autotrophs, heterotrophs and decomposers
- Show how energy is lost as it moves through the different trophic levels
- Differentiate between biotic and abiotic factors

<u>Sample Performance Tasks - Specific for Unit 5: SWBAT:</u>

- Using food chains and food webs, construct and revise an explanation based on evidence for the flow of energy within ecosystems. **(HS-LS2-3)**
- Develop a model to support the claim that energy is lost within an ecosystem. **(HS-LS2-3, HS-LS-4)**

Resources

Core Text:

Suggested Resources:

Brain Pop Videos
Amoeba sisters videos
Food chain/web project
Biome Project