Pace

Charter School of Hamilton

SCIENCE CURRICULUM GUIDE

5TH GRADE

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This curriculum may be modified through varying techniques, strategies and materials as per an individual student's Individualized Educational Plan (IEP).

Approved by the Pace Charter School of Hamilton Board of Education on September 13th, 2016

Introduction

This guide has been prepared to meet the requirements of the Pace Charter School of Hamilton and the New Jersey Department of Education. This document will serve as a guide for lesson planning. It sets forth a framework upon which each school can build a program suited both to the needs of the students and to the expectations of the community.

Fifth Grade Next Generation Science Standards

The performance expectations in fifth grade help students formulate answers to questions such as: "When matter changes, does its weight change? How much water can be found in different places on Earth? Can new substances be created by combining other substances? How does matter cycle through ecosystems? Where does the energy in food come from and what is it used for? How do lengths and directions of shadows or relative lengths of day and night change from day to day, and how does the appearance of some stars change in different seasons?" Fifth grade performance expectations include PS1, PS2, PS3, LS1, LS2, ESS1,

ESS2, and ESS3 Disciplinary Core Ideas from the NRC Framework. Students are able to describe that matter is made of particles too small to be seen through the development of a model. Students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. Through the development of a model using an example, students are able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. They describe and graph data to provide evidence about the distribution of water on Earth. Students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment and that energy in animals' food was once energy from the sun. Students are expected to develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. The crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; energy and matter; and systems and systems models are called out as organizing concepts for these disciplinary core ideas. In the fifth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, engaging in argument from evidence, and obtaining, evaluating, and communicating information; and to use these practices to demonstrate understanding of the core ideas.

Course Description

Science is a content area that is taught to all fifth grade students. The units of study include living systems, environments, and mixtures and solutions. Greenhouse activities will be introduced in the Fall & Spring for 5th graders to align with curriculum. Appropriate Next Generation Science Standards are addressed while investigating the nature of science. Students are given opportunities to explore the world around them

while coming to understand the fundamentals of scientific principles and inquiry. Knowledge from previous grades is reinforced and built upon, laying the foundation for deeper understanding of basic scientific principles.

Topic I
Living Systems
Approximate # of Weeks: 6

Topic II
Environments
Approximate # of Weeks: 6

Topic III
Mixtures & Solutions
Approximate # of Weeks: 6

TOPIC I
LIVING SYSTEMS
APPROXIMATE # OF WEEKS: 6

Essential Questions

How can you identify a system?
Is planet Earth a system?
What organisms are both predators and prey in the kelp forest ecosystem?
What happens when compost worms interact with organic litter?
What does yeast need to break its dormancy?
How do plants get the food they need?
How do animals get the nutrients they need?
How are nutrients transported to cells in ta plant?
How do humans transport nutrients to all their cells?
Why do people breathe?
What features of organisms attract attention?
What behaviors are instinctive, and what behaviors are learned?
What are the parts of a marine ecosystem?

Objectives

Upon completion of this unit, students will be able to:

1) Look at Earth as having four subsystems, geosphere, atmosphere, hydrosphere & biosphere.
2) Explore ecosystems and organisms in terms of their interacting parts.
3) Think about systems on different scales. (e.g. systems in an organism)
4) Understand there are nutrient and transport systems within an organism that moves matter and provides energy to the individual organism.

5) Experience how plants get materials they need for growth primarily from water and air and that energy in animal's food was once energy from the sun.
6) Understand how human activities in agriculture, industry, and everyday life can have major effects on these systems.
7) Gain experience that will contribute to the understanding of crosscutting concepts of patterns, scale, proportion, and quantity, energy and matter.

Next Generation Science Standards

Students who demonstrate understanding can:

5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. [Clarification Statement: Examples of models could include diagrams, and flow charts.]

5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water. [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

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Interdisciplinary Standards

Activities

- Students are introduced to a system as a collection of interacting parts that work together.
- Explore Earth as a system focusing on biosphere.
- Describe ecosystems by looking at feeding relationships.
- Review food webs and energy transfers.
- Set up red worm habitat to study detritivores.
- Investigate nutrient system of yeast, plants and animals.
- Infer that the plants growing in light are producing food to provide nutrients to their cells.
- Students learn that all cells have basic needs: water, food, gas exchange, and waste disposal.
- Explore multicellular organisms.
- Investigate leaf transpiration.
- Through video, text, and simulations, students learn about the role of sensory and motor neurons in brain messages.

Enrichment/Extension Activities

- Think of other experiments to study the role of decomposition.
- Take a trip out to the greenhouse and add to the composter.
- Design an investigation to determine the necessary conditions for activating dry yeast.
- Plant wheat and observe the seedlings to determine which plants have chlorophyll.
- Investigate how animals acquire nutrients by eating and digesting food.
- Model a human heart system.

- Invite nurse in to explain body functions.
- Explore ways that animals communicate through sound, visual displays, and smell.

Methods of Assessment/Evaluation

- Interactive whiteboard lessons
- KWL Charts
- Exit Slips
- Labs
- Class work/ Independent Work
- Science Notebooks
- Focus Question Answers
- Power Point Presentations
- Oral Presentations
- Poster/Display
- Tests/Quizzes

Text Resources & Online Resources

Access Google Drive for *"Science Curriculum Hyper Links"*

Vocabulary

Adaptation a structure, feature, or behavior that helps an organism survive and/or reproduce (IG)
Algae a large plantlike group of water organisms that make their own food (IG)
Alveoli spherical air sacs where gases pass into and from the blood (IG)
Aquatic referring to water (SRB)
Aquatic ecosystem an ecosystem in a body of water (IG)
Artery a blood vessel that carries blood from the heart to the body (SRB, IG)
Atmosphere the layer of gases surrounding Earth (SRB, IG)

Bacteria microorganisms that act as decomposers (SRB, IG)
Behavior the things organisms do to survive and reproduce (IG)
Biosphere a system of interacting living organisms on Earth (SRB, IG)
Blade the flat part of a leaf (SRB)
Bloodstream the transporter of nutrients to the body's cells (IG)
Bolus a wad of food (SRB)
Brain part of the central nervous system protected by the skull (SRB, IG)
By-product a secondary, and often unintended, product of a process (IG)
Capillary the smallest blood vessel. Gases, nutrients, and wastes are exchanged between capillaries and cells. (SRB, IG)
Carbohydrate a nutrient, such as sugar and starch, that provides energy (SRB)
Carbon dioxide (CO_2) a waste gas produced during cellular respiration. Plants use carbon dioxide during photosynthesis to make food. (SRB, IG)
Carnivore an animal that eats other animals (IG)
Cell the basic unit of life (SRB, IG)
Central nervous system where sensory impulses pass through the brain and spinal cord (SRB, IG)
Chlorophyll a molecule that absorbs red and blue light and reflects green light
Circulatory system the system of blood vessels and organs that transports blood to all the cells in the body (SRB, IG)
Classification the process by which scientists identify and organize objects and organisms, such as plants (SRB)
Classify to identify and organize according to similar properties or other criteria
Colon the large intestine where solid waste is compacted in preparation for elimination (SRB)
Compete to rely on or need the same resource as another organism (SRB)
Compost decaying organic material (IG)
Consumer an organism that cannot make its own food. Consumers eat other organisms. (SRB, IG)
Cytoplasm the liquid that fills living cells (SRB)
Decomposer an organism that breaks down plant and animal material into simple chemicals (SRB, IG)
Detritivore an organism that feeds on broken down materials from dead organisms
Detritus organic litter made up of dead organisms, their parts, and waste (SRB)
Diaphragm a large, flat, arched muscle that draws air in as well as pushes air out of the lungs (IG)
Digestion the process of breaking down food into nutrients that can be used by cells (SRB, IG)

Digestive system the organs and structures that digest food. The digestive system includes the teeth, mouth, esophagus, stomach, small intestine, large intestine, and colon. (SRB, IG)
Dormancy the state of being dormant or at rest (IG)
Ecosystem a community of organisms interacting with each other and with the nonliving environment (SRB, IG)
Energy what cells need to do work (SRB, IG)
Esophagus the tube connecting the mouth and the stomach (SRB, IG)
Food chain a description of the feeding relationships between organisms in an environment (SRB, IG)
Food web the feeding relationships among all the organisms in an ecosystem. Arrows show the flow of matter and energy from one organism to another. (SRB, IG)
Freshwater ecosystem a subset of Earth's aquatic ecosystems that include lakes and ponds, rivers, streams, springs, and wetlands (IG)
Fungus (plural **fungi**) an organism that lacks chlorophyll and gets nutrients from dead or living organisms (SRB, IG)
Geosphere (lithosphere) Earth's core, mantle, and crust (SRB, IG)
Glucose a sugar found in food; the sugar broken down in cells to release energy
Heart a muscular organ that pumps blood (SRB, IG)
Heart valve a regulator that moves blood in one direction, ensuring that it does not pump the wrong way in the system (IG)
Herbivore an animal that eats plants (IG)
Hydrosphere the interacting water on, under, and above Earth's surface (SRB, IG)
Inherited trait a characteristic that is passed down from generation to generation
Instinct an action that is performed without thinking or planning (IG)
Instinctive a behavior that is imprinted in an organism's brain from birth and helps it to survive (IG)
Interact to act upon one another (SRB, IG)
Kelp forest a seaweed forest that occurs in the ocean (IG)
Large intestine the part of the digestive system between the small intestine and the rectum where water is removed from the solid waste (SRB, IG)
Leaf vein the branching network of tiny raised lines on the underside of a leaf (IG)
Learned behavior a behavior that is acquired by being taught by an older individual and practicing (IG)
Left atrium the upper chamber on the left side of the heart (SRB)
Left ventricle the lower chamber on the left side of the heart (SRB, IG)
Living alive (IG)

Lung the organ in animals where gases, such as oxygen and carbon dioxide, pass between the atmosphere and the blood (SRB, IG)
Margin the edge of a leaf (SRB)
Marine ecosystem an ocean ecosystem (IG)
Membrane the outside of a living cell (SRB)
Metabolism the process that occurs when an organism uses nutrients for energy and produces waste products (IG)
Microorganism microscopic organisms such as bacteria and fungi (IG)
Mineral a nutrient that xylem transports to the cells in a vascular plant (SRB)
Motor neuron the cells that send information to the muscles (SRB)
Mouth a body opening where an animal takes in food (SRB)
Multicellular organism an organism composed of many cells (SRB)
Neuron a communication cell found in the brain and nervous system (SRB, IG)
Nonliving referring to something that has never been alive or to things that were once alive and are no longer alive (SRB, IG)
Nutrient a chemical in food that helps keep an organism alive and active (SRB, IG)
Omnivore an animal that eats plants and animals (IG)
Oxygen a waste gas produced by plants during photosynthesis. All plants and animals use oxygen during cellular respiration. (SRB)
Palmate describing a leaf in which several veins start at one point near the base. The veins look like the fingers of a hand. (SRB, IG)
Parallel describing a leaf in which the veins are straight lines all running in the same direction (SRB, IG)
Phloem the long cells through which nutrients, such as sugars, are distributed in a plant (SRB, IG)
Photosynthesis a process used by plants and algae to make sugar (food) out of light, carbon dioxide, and water (SRB, IG)
Phytoplankton microscopic plantlike organisms in aquatic environments that produce their own food (SRB)
Pinnate describing a leaf that has one main vein with smaller veins branching off sideways from it (SRB, IG)
Predator an animal that preys on other animals (IG)
Prey the living animal that is hunted and eaten by another animal (IG)
Producer an organism, such as a plant or algae, that makes its own food (SRB, IG)
Receptor cells that send messages to the brain when it receives stimuli (SRB, IG)
Recycle to use again (IG)
Redworm an earthworm that lives on the surface of the soil (IG)

Reflex a simple one-dimensional action that is performed without thinking or planning (IG)
Respiratory system the system of lungs and connecting tubes that transports oxygen to the red blood cells and gets rid of carbon dioxide (SRB, IG)
Respond to react or to answer (SRB)
Response a reaction of a living thing to a stimulus (IG)
Response time the length of time it takes for a person to respond to a stimulus (IG)
Right atrium the upper chamber on the right side of the heart (SRB)
Right ventricle the lower chamber on the right side of the heart (SRB, IG)
Saliva the liquid produced in the mouth that aids digestion (SRB)
Sap a sugar-rich liquid transported by phloem (SRB, IG)
Sensory neuron a nerve cell that sends information from sense organs to the brain
Small intestine the part of the digestive system between the stomach and large intestine, where nutrients are absorbed from digested food (SRB, IG)
Specialized structure a structure used primarily for one purpose (SRB)
Stimulus something that causes an action or response (SRB, IG)
Stomach the organ where food is reduced to mush by acid and muscle activity
Subsystem a small system that is inside a larger system (IG)
Sugar the nutrient that cells use for energy (SRB, IG)
System a collection of interacting parts (SRB, IG)
Teeth hard structures in the mouth used for cutting, biting, and chewing food (SRB)
Terrestrial referring to land (SRB)
Terrestrial ecosystem an ecosystem on land (IG)
Transpiration the process in which water is removed from the cells and passes into the environment (SRB, IG)
Transport to move or carry (SRB)
Variable anything you can change in an experiment that might affect the outcome
Vascular bundle the group of xylem tubes and phloem tubes in a vascular plant
Vascular plant a plant with an internal system of tubes for transporting nutrients to its roots, stems, and leaves (SRB)
Vascular system keeps fluids moving throughout the entire system, maintaining a moist (aquatic) environment for all cells (IG)
Vein the blood vessel that carries blood from the body to the heart (SRB, IG)

Vital capacity the maximum volume of air a person can take into their lungs and then expel (IG)
Waste no longer of use, excess (IG)
Xylem the hollow cells of a plant that transport water and minerals to plant cells
Yeast a single-celled fungus (IG)
Zooplankton microscopic animals in aquatic environments (SRB)

TOPIC II
ENVIRONMENTS
APPROXIMATE # OF WEEKS: 6

Essential Questions

What do mealworms need to live and grow?
What do isopods need from their environment?
What are the characteristics of animals living in the leaf-litter environment?
What are the environmental factors in an aquatic system?
What are the roles of organisms in a food chain?
How does food affect a population in its home range?
What organisms are both predators and prey in the kelp forest ecosystem?
How can we find out if salinity affects brine shrimp hatching?
How does salinity affect the hatching of brine shrimp eggs?
Does changing the environment allow the brine shrimp eggs to hatch?
What are some benefits of having variation within a population?
How much water is needed for early growth of different kinds of plants?
What is the salt tolerance of several common farm crops?
How does mapping the plants in the schoolyard help us to investigate environmental factors?
What are some examples of plant adaptations?

Objectives

Upon completion of this unit, students will be able to:

1) Determine an organism's environmental preferences for various nonliving environmental factors to better understand the environment in which it will survive.
2) Observe and record changes in organisms and their environment over time.
3) Identify and describe ecosystem feeding relationships.

4) Use modeling to construct representations of the natural world and make predictions.
5) Conduct controlled experiments with organisms to discover their range of tolerance for environmental factors.
6) Graph and interpret data from multiple trials from experiments, and build explanations from evidence.

Next Generation Science Standards

Students who demonstrate understanding can:

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5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

Interdisciplinary Standards

PS3.D: Energy in Chemical Processes and Everyday Life
-The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1)

LS1.C: Organization for Matter and Energy Flow in Organisms
-Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.
-Plants acquire their material for growth chiefly from air and water. (5-LS1-1)

LS2.A: Interdependent Relationships in Ecosystems
-The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems
-Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

Activities

- Design an investigation so that the effect of one environmental factor can be observed.
- Determine an organism's environmental preferences for various nonliving environmental factors to better understand the environment in which it will survive.
- Observe and record changes in animals and their environments over time.
- Identify and describe ecosystem-feeding relationships.
- Use modeling to construct representations of the natural world and make predictions.
- Conduct scientific investigation and build explanations from evidence.
- Design an investigation to test the viability of brine shrimp eggs.
- Conduct controlled experiments with four kinds of plants to discover their range of tolerance for water and their range of salt tolerance.
- Graph and interpret data form multiple trials form plant experiments.

Enrichment/Extension Activities

- Investigate local isopods outdoors in recess/greenhouse area. Determine if it is a sow bug or a pill bug.
- Conduct isopod races using five to ten of each kind of isopod.
- Sample terrestrial environments on nature walk to Kuser Park.
- Make a terrarium of local organisms.
- Investigate beetle complete metamorphosis and keep data on moisture and light.
- Build a compost pile made of leaves, twigs, bark and other plant parts and see what it attracts.
- Investigate water holes to mini-ponds and describe the difference.
- Observe the life cycle of brine shrimp.
- Investigate brine shrimp and light and other environmental factors that might affect its life cycle.
- Start planting in greenhouse & monitor soil moisture. Transplant to school gardens.

Methods of Assessment/Evaluation

- Interactive whiteboard lessons
- KWL Charts
- Exit Slips
- Labs
- Class work/ Independent Work
- Science Notebooks
- Focus Question Answers
- Power Point Presentations
- Oral Presentations
- Poster/Display
- Tests/Quizzes

Text Resources & Online Resources

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Vocabulary

Adaptation any structure or behavior of an organism that allows it to survive in its environment (IG)
Adult a fully grown organism (IG)
Algae a large plantlike group of water organisms (SRB, IG)
Amphibian an animal, such as a frog or spadefoot toad, that reproduces in water
Aquarium a tank for keeping live water plants and animals (IG)
Aquatic referring to water (SRB)
Aquatic Environment referring to the two kinds of freshwater environments: standing-water (lakes, ponds, and vernal pools) and flowing-water (rivers, streams, and creeks) (IG)
Bacteria microorganisms that act as decomposers (SRB)
Behavior the actions of an animal in response to its environment (SRB, IG)

Brine salty water (IG)
Brine Shrimp tiny animals related to crabs and lobsters. Brine shrimp are found in salt ponds and salt lakes (IG)
Burrow a hole or tunnel dug by a small animal (SRB)
Canopy the highest layer in a forest, where there is a lot of sunlight (SRB)
Carnivore an animal that eats only animals (SRB, IG)
Carrying Capacity the greatest number of organisms that can be supported (carried) by an area without damaging it (IG)
Climate the average or typical weather conditions in a region of the world (SRB)
Community the plants and animals in an ecosystem (SRB)
Compete to rely on or need the same resource as another organism (SRB)
Competition a demand for resources, such as food, water, or space, by two or more organisms (IG)
Complete Metamorphosis the cycle of growth changes for an insect. The stages include egg, larva, pupa, and adult. (SRB)
Concentration the amount of a substance, such as salt, in an amount of another substance, such as water (SRB, IG)
Condition the factors of an environment, such as water, light, air, chemicals, and temperature (IG)
Consumer an organism that cannot make its own food. Consumers eat other organisms. (SRB, IG)
Controlled Experiment a set of compared investigations in which one variable is manipulated by steps while all other variables are controlled or kept the same (IG)
Crustacean a class of mostly aquatic animals with hard, flexible shells (SRB)
Darkling Beetle an adult mealworm (IG)
Decomposer an organism that breaks down plant and animal material into simple chemicals (SRB, IG)
Dominant Plant a plant that covers more space or is larger than others and usually has a significant influence on other organisms in the area (IG)
Dormant inactive or resting (SRB)
Drought a long period of dry weather (IG)
Ecologist a scientist who studies ecosystems (SRB)
Ecosystem a community of organisms interacting with each other and with the nonliving environment (SRB, IG)
Elodea a vascular plant often found in freshwater aquariums (IG)
Endangered at risk of becoming extinct (SRB)
Energy what allows organisms to grow and move (SRB, IG)
Entomologist a biologist who studies insects (SRB)
Environment everything that surrounds and influences an organism. Deserts, forests, and the ocean are environments. (SRB,

IG)
Environmental factor one part of the environment. An environmental factor can be nonliving, such as water, light, and temperature. It can be living, such as plants and animals. (SRB, IG)
Evaporate to dry up and go into the air (SRB)
Extinction a species that no longer exists (SRB)
Fertile able to support growth and development (SRB)
Fertilizer any natural or synthetic material used in soil to help plants grow (SRB)
Food a form of chemical energy that organisms need to survive (SRB)
Food Chain a description of the feeding relationships between organisms in an environment (SRB, IG)
Food Web all of the connected and interacting food chains in an ecosystem. Arrows show the flow of matter and energy from one organism to another. (SRB, IG)
Fossil any remains, trace, or imprint of animal or plant life preserved in Earth's crust (SRB)
Freshwater Environment a lake, pond, river, or stream (IG)
Function an action that helps a plant or an animal survive (SRB, IG)
Fungus (plural **fungi)** an organism that lacks chlorophyll and gets nutrients from dead or living organisms (SRB)
Generation a group of organisms born and living at the same time (SRB)
Habitat the natural environment of a plant or an animal (SRB)
Herbicide a chemical used to kill plants (SRB)
Herbivore an animal that eats only plants or algae (SRB, IG)
Home Range a well-established territory that animals forage for food in year after year (IG)
Inference the meaning that you make from your observations (IG)
Inherited Trait a characteristic that is passed down from generation to generation
Insect an animal that has six legs, a head, a thorax, and an abdomen (SRB)
Interact to act upon one another (SRB)
Interaction how living and nonliving components act together in an ecosystem (IG)
Irrigate to water crops by artificial means (IG)
Isopod a small crustacean with 14 legs that all function the same (SRB, IG)
Kelp Forest ecosystem that is home to thousands of different kinds of organisms where kelp seaweed is a main producer (IG)
Larva (plural **larvae)** the wormlike early stage in the life cycle of an insect (SRB, IG)
Life Cycle the stages in the life of a plant or animal (IG)

Living the condition of being alive (SRB, IG)
Marine a type of ocean ecosystem, like a kelp forest (IG)
Matter anything that has mass and takes up space (SRB)
Mealworm a darkling beetle larva (IG)
Microorganism a microscopic organism, such as bacteria and some algae (SRB, IG)
Migrate when animals move from place to place with a change in the weather (SRB,
Molting the process of shedding skin to make room for growing (IG)
Nocturnal active at night (SRB)
Nonliving referring to something that has never been alive or to things that were once alive and are no longer alive (SRB, IG)
Nutrient a material needed by a living organism to help it grow and develop (SRB)
Observation information obtained through your senses (sight, hearing, smell, touch, and taste) (IG)
Omnivore an animal that eats both plants and animals (SRB, IG)
Optimum most favorable to growth, development, and reproduction of an organism
Organism any living thing (SRB, IG)
Pesticide a chemical developed to kill animals that are in some way harmful to humans (SRB)
Petroleum an oil that comes from the earth (SRB)
Photosynthesis a process used by plants and algae to make sugar (food) out of light, carbon dioxide, and water (SRB)
Phytoplankton microscopic plantlike organisms in aquatic environments that produce their own food (SRB, IG)
Pill Bug isopod that has a highly domed shape, short legs, and inconspicuous antennae (IG)
Plant Distribution how plants are spread out or arranged in an area related to environmental factors (IG)
Pollination the moving of pollen to the female part of a flower (SRB)
Pollute to make an environment unsuitable for organisms because of substances introduced into air, water, or soil (SRB)
Population all organisms of one kind that are living together (IG)
Predator an animal that hunts and catches other animals for food (SRB, IG)
Preferred Environment the set of environmental conditions that an organism appears to choose over other conditions (IG)
Prey an animal eaten by another animal (SRB, IG)
Producer an organism, such as a plant or algae, that makes its own food (SRB, IG)
Pupa (plural **pupae)** the stage of an animal's life cycle between the larva and the adult stages (SRB, IG)
Pupate to change into a pupa (IG)
Range an amount of variation or difference (SRB)

Range of Tolerance the varying conditions of one environmental factor in which an organism can survive (SRB, IG)
Recycle to use again (SRB)
Reproduce to have offspring (SRB, IG)
Salinity the concentration of salt in water (IG)
Salt Lake a body of water that contains a high concentration of salt (IG)
Salt-sensitive unable to survive in salty environments (IG)
Salt-tolerant able to survive in salty environments (IG)
Scavenger an animal that eats dead organisms (SRB)
Seed Dispersal the movement of seeds away from the parent plant (SRB)
Source the beginning of something, such as where a river starts (SRB)
Sow Bug isopod that is relatively flat with legs that extend a little beyond the edge of the shell and powerful antennae to sense its environment (IG)
Species a group of organisms that are all the same kind (SRB)
Stage the name for different points of insect development (IG)
Structure any identifiable part of an organism (SRB, IG)
Survive to remain living (IG)
Temperature a measure of how hot or cold matter is (SRB)
Terrarium a container with plants growing inside (SRB, IG)
Terrestrial referring to land (SRB)
Thrive to grow fast and stay healthy (SRB, IG)
Tolerance the ability of an organism to survive under a given set of conditions (IG)
Understory the layer above the rain forest floor and below the rain forest canopy
Variation difference (SRB, IG)
Vernal Pool a shallow, temporary pond (SRB)
Viable alive and able to grow (IG)
Zooplankton microscopic animals in aquatic environments (SRB, IG)

TOPIC III
MIXTURES & SOLUTIONS
APPROXIMATE # OF WEEKS: 6

Essential Questions

How can a mixture be separated?
Where does the solid material go when a solution is made?
How can you separate a mixture of dry materials?
Are there materials outdoors that will dissolve in water?
Are all solutions made with soft-drink powder and water the same?
How can you determine which salt solution is more concentrated?
Why do salt solutions layer in only one order?
Is there a limit to the amount of salt that will dissolve in 50mL of water?
Can you identify the mystery substance by its properties?
What happens when two substances are mixed with water?
How can you tell if a liquid is really a solution?
What happens when you mix substances with water in a bag?
What is the difference between a saturated solution and a super saturated solution?

Objectives

Upon completion of this unit, students will be able to:

1) Make and separate mixtures, using screens, filters and evaporation.
2) Measure solids and liquids to compare the mass of a mixture to the mass of its parts.
3) Use a balance to determine relative concentration.
4) Layer solutions to determine relative density (concentration).
5) Plan and conduct saturation investigations.
6) Compare the solubility of substances in water.

7) Identify an unknown substance based on the properties of solubility and crystal form.
8) Observe and compare reactants and products of several chemical reactions.

Next Generation Science Standards

Students who demonstrate understanding can:

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.]

5-PS1-3. Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]

5-PS1-4. Conduct an investigation to determine whether the mixing of two or

more substances results in new substances.

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Interdisciplinary Standards

PS1.A: Structure and Properties of Matter
-Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1)
-The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)
-Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)

PS1.B: Chemical Reactions
-When two or more different substances are mixed, a new substance with different

properties may be formed. (5-PS1-4)
-No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

ETS1.A: Defining and Delimiting Engineering Problems
-Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1)

ETS1.B: Developing Possible Solutions
-Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)
-At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)
-Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3)

ETS1.C: Optimizing the Design Solution
-Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)

Activities

- Make mixtures and solutions with different solid materials and water.
- Separate mixtures and solutions, using screens, filters, and evaporation.

- Measure solids and liquids to compare the mass of a mixture to the mass of its parts.
- Use a balance to determine relative concentration.
- Layer solutions to determine relative density.
- Plan and conduct saturation investigations.
- Compare the solubility of materials in water.
- Identify an unknown substance based on the properties of solubility and crystal form.
- Observe and compare reactants and products of a chemical reaction.
- Separate and identify the products of reactions.
- Compare the properties of the products of several reactions.

Enrichment/Extension Activities

- Investigate if different materials dissolve, other than materials used in class.
- Research the origin of diatomaceous earth and its uses.
- Research NaCl; consider the periodic table of elements.
- Try making density demonstration bottles of different concentrations to further test students.
- Make concentration rainbows by layering solutions.
- Compare crystals that form when dissolving solutions with different concentrations.
- Investigate different soft drinks by comparing labels.
- Compare diet and regular colas by floating in basin of water.
- Find out if time affects saturation.
- Dissolve two materials in one solution and try to separate.
- Change temperatures of solutions and compare.
- Get involved with World Water Monitoring Day.
- Investigate thermal conductivity.

Methods of Assessment/Evaluation

- Interactive whiteboard lessons

- KWL Charts
- Exit Slips
- Labs
- Class work/ Independent Work
- Science Notebooks
- Focus Question Answers
- Power Point Presentations
- Oral Presentations
- Poster/Display
- Tests/Quizzes

Text Resources & Online Resources

Access Google Drive for *"Science Curriculum Hyper Links"*

Vocabulary

Atmosphere the layer of gases surrounding Earth (air) (SRB)
Baking Soda a solid material in the form of a white powder; also called sodium bicarbonate (IG)
Bends a condition that causes pain in deep-sea divers' arms and legs after returning to the surface (SRB)
Boiling Point the temperature at which liquid turns to gas. The boiling point of water is 100°C. (SRB)
Caisson a large box with no bottom. These boxes were used to provide environments for workers underwater. (SRB)
Calcium Carbonate ($CaCO_3$) a solid material; powdered chalk (IG)
Calcium Chloride ($CaCl_2$) a white solid material that absorbs water from the air **Carbon Dioxide** (CO_2) a compound made from carbon and oxygen (SRB, IG) chalk a solid material; one form of calcium carbonate
Chemical Reaction the process in which two or more substances combine to make one or more new substances that have different properties from the original ones
Chemist a person trained in chemistry (SRB)
Citric Acid a white, crystalline solid acid found in citrus fruits (SRB, IG)

Climate the average or typical weather conditions in a region of the world (SRB) **Compress** to reduce in volume by applying pressure (SRB)
Concentrated a solution containing a lot of solute (SRB, IG)
Concentration the ratio of solute to solvent in a solution (SRB, IG)
Condensation the change of state from gas to liquid (SRB)
Crystal a natural form of a substance. Crystal shape is also a physical property that helps to identify a substance. (SRB, IG)
Decompression the change from higher pressure to lower pressure (SRB)
Density mass per unit volume (SRB, IG)
Diatomaceous Earth the skeletal remains of microscopic aquatic organisms (diatoms) (SRB, IG)
Dilute a solution containing little solute (SRB, IG)
Dissolve the process of a substance becoming incorporated uniformly into another
Energy the ability to make things happen. Energy can take a number of forms, such as heat and light. (SRB)
Epsom Salts a white, crystalline solid used for medical or healing purposes (IG)
Equal Volumes comparing equivalent amounts of two solutions to determine which is more concentrated (IG)
Evaporation the change of state from a liquid to a gas (SRB, IG)
Explosion a fast reaction that produces heat, light, and sound energies, and gas
Extract a solution of substances dissolved out of organic material (SRB, IG)
Filter a fine-mesh screen with holes that are so small they cannot be seen by the naked eye (noun); to pass through a filter to remove unwanted material (verb)
Fossil Fuels the preserved remains of organisms that lived long ago and changed into oil, coal, and natural gas (SRB)
Freezing change of state from liquid to solid. The freezing point of water is 0°C.
Gas a state of matter that is shapeless and expands to fill any closed container it is placed in (SRB, IG)
Gaseous existing in the gas state (not a solid or liquid) (SRB)
Gravel rocks that are smaller than pebbles (IG)
Greenhouse Gas a gas, such as carbon dioxide, that contributes to the warming of the atmosphere (SRB)
Herbicide a poison intended to kill plants (SRB)
Insoluble incapable of being dissolved. Calcium carbonate is insoluble in water.
Layer a single thickness of a material (IG)
Less Dense less mass per unit volume (IG)
Liquid a state of matter that flows and takes the shape of the container it is in (SRB)

Magnet an object that sticks to or attracts iron or steel (IG)
Magnetism the ability to attract iron (SRB)
Mass a quantity of matter (SRB, IG)
Matter anything that has mass and takes up space (SRB)
Methane the main ingredient in natural gas (SRB)
Mixture two or more substances together (SRB, IG)
More Dense more mass per unit volume (IG)
Nitrogen a colorless, odorless gas that makes up about 78 percent of Earth's atmosphere (air) (SRB)
Oxygen a colorless, odorless gas that makes up about 21 percent of Earth's atmosphere (air) (SRB)
Particle a very small piece or part
Physical Property a characteristic that describes a substance, such as color, size, shape, and texture (SRB)
Powder a solid material made up of tiny granules (IG)
Precipitate a new substance that forms and settles out of a liquid (IG)
Product the substance(s) produced in a chemical reaction (SRB, IG)
Property a characteristic that describes a substance, such as color, size, shape.
Ratio the comparison of two (or more) parts of a whole (SRB)
Reactant one of the starting substance(s) in a chemical reaction (SRB, IG)
Room Temperature how hot or cold it is in an indoor space. Room temperature is 22°C. (SRB)
Salt table salt. A white crystalline solid that dissolves in water. Its chemical name is sodium chloride. (SRB, IG)
Saturated when the solvent cannot dissolve any more solute (SRB)
Saturated Solution a solution where the solvent cannot dissolve any more solute
Screen a mesh-like tool used to separate mixtures by particle size (noun); to pass through a screen to separate particles of different sizes (verb) (IG)
Separate to take apart (IG)
Sodium Chloride the chemical name for table salt (SRB)
Solid a state of matter that has a definite shape (SRB)
Solubility the property a substance has of dissolving solvents, such as the solubility of salt in water (IG)
Soluble capable of being dissolved. Table salt is soluble in water. (SRB, IG)
Solute a substance that dissolves in a solvent to form a solution (SRB, IG)
Solution a mixture formed when one or more substances dissolve in another

Supersaturated when a solution contains more solute than it normally would at a given temperature or pressure (SRB, IG)
Transparent clear; describes something through which you can see an image clearly
Volume three-dimensional space (SRB)
Water Vapor water in its gas state (SRB)