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|  | **Tectonics and Properties of Earth’s Materials** | **Energy in Earth Systems** | **Biogeochemical Cycles** | **Organization and Development** | **Matter and Energy Transformations** | **Interdependence** | **Heredity and Reproduction** | **Evolution and Diversity** |
| Standard | Tectonics Students will gain an understanding of gravity, density, and convection which moves Earth’s plates causing the plates to impact other Earth systems. Students will demonstrate an understanding materials that make up the earth, including rocks, minerals, soils, and fossils, and how they are formed. | Energy in Earth Systems Students will understand that energy from the sun provides heat and light for the Earth and is essential for plant growth. | Biogeochemical Cycles Students will understand that Earth systems have a variety of cycles through which energy and matter continually flow | Organization and Development Students will understand that all life forms, at all levels of organization, use specialized structures and similar processes to meet life’s needs. | Matter and Energy Transformations Students will understand how living things obtain and use energy | Interdependence Students will demonstrate an understanding that ecosystems display patterns of organization, change, and stability as a result of the interactions and interdependencies among the life forms and the physical components of the Earth. | Heredity and Reproduction Students will understand the transmission of traits in living things. | Evolution and Diversity Students will describe and analyze diversity of species, natural selection, and adaptations. |
| EC1 |  |  |  | (Basic Needs of Living Things) 1. Distinguish between living and nonliving things.  (Basic Needs of Living Things) 2. Identify the basic needs of most animals (i.e., air, water, food, shelter). .  (Classification of Living Things) 3. Identify and compare the physical structures of a variety of animals (e.g., sensory organs, beaks, appendages, body covering) |  |  |  |  |
| EC2 |  | (What Drives the Water Cycle) 2. Investigate and report how sunlight affects plant growth.  (What Drives the Water Cycle) 3. Provide examples of how sunlight affects people and animals by providing heat and light. | (Earth’s Resources) 1. Describe various resources that provide the necessary things that are used by people in their daily lives.  (Earth’s Resources) 2. Identify resources we get from the living (e.g., forests) and nonliving (e.g., minerals, water) environment and that resources are necessary to meet the needs and wants of a population.  (Earth’s Resources) 3. Observe and describe ways water, both as a solid and liquid, is used in everyday activities at different times of the year (e.g., bathe, drink, make ice cubes, build snowmen, cook, swim).  (Earth’s Resources) 4. Observe and describe ways humans use Earth’s materials (e.g., soil, rocks) in daily life.  (Caring for Earth’s Resources) 1. Describe how some resources can be used and reused.  (Caring for Earth’s Resources) 4. Describe ways Earth's renewable resources (e.g., fresh water, air, wildlife and trees) can be maintained. | (Basic Needs of Living Things) 1. Distinguish between living and nonliving things.  (Basic Needs of Living Things) 2. Identify the basic needs of most animals (i.e., air, water, food, shelter). .  (Basic Needs of Living Things) 3. Observe that animals need water, air, food, and shelter/space to grow and reproduce.  (Basic Needs of Living Things) 4. Identify the basic needs of most plants (i.e., air, water, light).  (Basic Needs of Living Things) 5. Predict and investigate the growth of plants when growing conditions are altered (e.g., dark vs. light, water vs. no water).  (Structure and Function of Organisms) 2. Investigate and describe how living things grow and change.  (Structure and Function of Organisms) 3. Observe, identify, and record external features of humans and other animals.  (Structure and Function of Organisms) 4. Investigate and describe how plants and animals have features that help them live in various environments.  (Structure and Function of Things) 2. Identify and compare the physical structures of a variety of plants (e.g., stem, leaves, (Classification of Living Things) 1. Sort animals and plants by observable characteristics.  [ Targeted Standards:1 ]  • (Classification of Living Things) 2. Identify and compare the physical structures of a variety of plants (e.g., stem, leaves, flowers, seeds, roots)>  flowers, seeds, roots).  [ Targeted Standards:1 ] | Needs and Survival of Living things) 1. Identify basic needs of plants and animals: Food, water, light, air, space.  (Needs and Survival of Living things) 2. Investigate and explain that plants need light energy from the sun to make food, while animals need to eat plants and/or other animals as their food.  (Needs and Survival of Living things) 3. Explain that all organisms require a form of energy to survive and that humans and other animals obtain energy and materials from food.  (Source of Energy for Living Things) 3. Differentiate between the needs of plants and those of animals. | (Effects of Changing Environment on Living Things) 2.Identify the ways in which an organism’s habitat provides for its basic needs (plants require air, water, nutrients, and light; animals require food, water, air, and shelter). | (Life Cycles/Reproduction) 1. Describe the major stages that characterize the life cycle of the frog and butterfly as they go through meta- morphosis.  (Life Cycles/Reproduction) 2. Sequence the life cycle of a plant or animal when given a set of pictures.  (Metamorphsis) 1. Describe plant development and growth. | (Natural Selection) 2. Identify the specific functions of the physical structures of a plant or an animal (e.g. roots for water; webbed feet for swimming).  (Effect of Environment on Behaviors) 4. Describe plant behaviors, such as the way seedlings’ stems grow toward light and their roots grow downward in response to gravity. |
| Kindergarten |  |  | (Earth’s Resources) 1. Describe various resources that provide the necessary things that are used by people in their daily lives.  (Earth’s Resources) 2. Identify resources we get from the living (e.g., forests) and nonliving (e.g., minerals, water) environment and that resources are necessary to meet the needs and wants of a population.  (Earth’s Resources) 4. Observe and describe ways humans use Earth’s materials (e.g., soil, rocks) in daily life.  (Earth’s Resources) 5. Distinguish between and provide examples of materials that can be recycled/reus ed and those that cannot.  (Caring for Earth’s Resources) 1. Describe how some resources can be used and reused.  (Caring for Earth’s Resources) 2. Explain that the supply of many resources is limited but the supply can be extended through careful use, decreased use, reusing and/or recycling.  (Caring for Earth’s Resources) 3. Explain that the supply of many non- renewable resources is limited and can be extended through reducing, reusing and recycling but cannot be extended indefinitely.  (Caring for Earth’s Resources) 4. Describe ways Earth's renewable resources (e.g., fresh water, air, wildlife and trees) can be maintained.  (Caring for Earth’s Resources) 5. Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/cons ervation of species, paving/restor ing greenspace). |  |  | (Interactions among Organisms and their Environment) 5.Investigate and describe the roles of plants as producers and animals as consumers and how living things may depend on each other.  (Effects of Changing Environmenr on Living Things) 4.Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/cons ervation of species, paving/restor ing greenspace). |  |  |
| **Grade 1** | (Water) 5.Summarize the processes of the water cycle (including evaporation, condensation , precipitation, and runoff).  (Weather) 1. Observe and record daily changes in weather (e.g., clouds or air temperature) .  (Weather) 2. Observe, identify and record changes in weather and effects on living organisms.  (Weather) 3. Describe weather by measurable quantities such as temperature, wind direction, wind speed, precipitation and barometric pressure.  (Weather) 4. Graph recorded weather data to show daily and seasonal patterns in weather.  (Weather) 5. Identify and describe short- and longer-term patterns of events (including weather and seasons) that occur on the Earth and in the sky. | (What Drives the Water Cycle) 1. Compare temperatures in sunny and shady places.  (What Drives the Water Cycle) 3. Provide examples of how sunlight affects people and animals by providing heat and light.  (What Drives the Water Cycle) 4. Investigate and record temperature data to show the effects of heat energy on changing the states of water.  (What Drives the Water Cycle) 5. Identify the sun as the source of energy that evaporates water from the surface of Earth. |  | (Basic Needs of Living Things) 2. Identify the basic needs of most animals (i.e., air, water, food, shelter). .  (Basic Needs of Living Things) 3. Observe that animals need water, air, food, and shelter/space to grow and reproduce.  (Basic Needs of Living Things) 5. Predict and investigate the growth of plants when growing conditions are altered (e.g., dark vs. light, water vs. no water).  (Structure and Function of Organisms) 2. Investigate and describe how living things grow and change.  (Structure and Function of Organisms) 3. Observe, identify, and record external features of humans and other animals.  (Structure and Function of Organisms) 4. Investigate and describe how plants and animals have features that help them live in various environments.  (Structure and Function of Organisms) 5.Identify the structures in plants (leaves, roots, flowers, stem, bark, wood) that are responsible for food production, support, water transport, reproduction, growth, and protection.  (Structure and Function of Things) 4. Identify the relationships between the physical structures of plants and the function of those structures (e.g., absorption of water, absorption of light energy, support, reproduction) .  (Structure and Function of Things) 5.Identify the relationships between the physical structures of animals and the function of those structures (e.g., taking in water, support, movement, obtaining food, reproduction) . (Classification of Living Things) 1. Sort animals and plants by observable characteristics .  (Classification of Living Things) 2. Identify and compare the physical structures of a variety of plants (e.g., stem, leaves, flowers, seeds, roots)>  (Classification of Living Things) 3. Identify and compare the physical structures of a variety of animals (e.g., sensory organs, beaks, appendages, body covering)  (Classification of Living Things) 4. Identify the relationships between the physical structures of animals and the function of those structures (e.g., taking in water, support, movement, obtaining food, reproduction).  (Classification of Living Things) 5.Identify the relationships between the physical structures of plants and the function of those structures (e.g., absorption of water, absorption of light energy, support, reproduction). | (Needs and Survival of Living things) 1. Identify basic needs of plants and animals: Food, water, light, air, space.  (Needs and Survival of Living things) 2. Investigate and explain that plants need light energy from the sun to make food, while animals need to eat plants and/or other animals as their food.  (Needs and Survival of Living things) 3. Explain that all organisms require a form of energy to survive and that humans and other animals obtain energy and materials from food.  (Needs and Survival of Living things) 4. Explain that all living things have structures that provide the basic needs for survival.  (Source of Energy for Living Things) 3. Differentiate between the needs of plants and those of animals. | (Effects of Changing Environmenr on Living Things) 1.Observe how the living things in an environment change with the seasons (e.g., trees lose their leaves in the winter).  (Effects of Changing Environmenr on Living Things) 4.Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/cons ervation of species, paving/restor ing greenspace). | (Life Cycles/Reproduction) 1. Describe the major stages that characterize the life cycle of the frog and butterfly as they go through meta- morphosis.  (Life Cycles/Reproduction) 2. Sequence the life cycle of a plant or animal when given a set of pictures.  (Life Cycles/Reproduction) 3. Recognize that plants and animals go through predictable life cycles that include birth, growth, development, reproduction, and death.  (Life Cycles/Reproduction) 4. Compare the life cycles of different animals including birth to adulthood, reproduction and death (e.g., egg- tadpole-frog, egg- caterpillar- chrysalis- butterfly).  (Life Cycles/Reproduction) 5. Compare the life cycles of different plants including germination, maturity, reproduction and death.  (Metamorphsis) 1. Describe plant development and growth.  (Metamorphsis) 2. Illustrate complete metamorpho sis (e.g., butterfly, frog).  (Metamorphsis) 3. Illustrate incomplete metamorpho sis (e.g., grasshopper) .  (Metamorphsis) 4. Compare and contrast complete metamorpho sis and incomplete meta- morphosis.  (Metamorphsis) 5. Differentiate among complete metamorpho sis, incomplete metamorpho sis, and embryonic development.  (Embroynic Development) 3. Illustrate embryonic development (e.g., chicken).  (Inheritance) 1. Describe how plants and animals usually resemble their parents.  (Inheritance) 2. Investigate and describe how particular plants have seeds that produce the same kind of plant.  (Inheritance) 3. Investigate and describe how particular animals have offspring that are the same kind of animal.  (Inheritance) 4. Identify likenesses between parents and offspring (e.g., eye color, flower color) that are inherited. Explain that others likenesses, such as table manners are learned . . | (Natural Selection) 2. Identify the specific functions of the physical structures of a plant or an animal (e.g. roots for water; webbed feet for swimming).  (Natural Selection) 3. Identifying and explain how the physical structure/char acteristic of an organism allows it to survive and defend itself.  (Effect of Environment on Behaviors) 4. Describe plant behaviors, such as the way seedlings’ stems grow toward light and their roots grow downward in response to gravity.  (Effect of Environment on Behaviors) 5. Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration). |
| **Grade 2** | (Water) 3. Illustrate the locations of water on Earth by using drawings, maps, or models.  (Weather Maps) 5.Describe how temperature and precipitation determine climatic zones (biomes) (e.g., desert, grasslands, forests, tundra and alpine). |  | (Earth’s Resources) 2. Identify resources we get from the living (e.g., forests) and nonliving (e.g., minerals, water) environment and that resources are necessary to meet the needs and wants of a population.  (Earth’s Resources) 4. Observe and describe ways humans use Earth’s materials (e.g., soil, rocks) in daily life.  (Caring for Earth’s Resources) 4. Describe ways Earth's renewable resources (e.g., fresh water, air, wildlife and trees) can be maintained.  (Caring for Earth’s Resources) 5. Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/cons ervation of species, paving/restor ing greenspace). |  |  | Interactions among Organisms and their Environment) 2. Identify different environment s (i.e., pond, forest, prairie) support the life of different types of plants and animals.  (Interactions among Organisms and their Environment) 3. Investigate and describe how animals and plants that live in different places have similarities and differences.  (Interactions among Organisms and their Environment) 4. Identify the ways a specific organism may interact with other organisms or with the environment (e.g., pollination, shelter, seed dispersal, camouflage, migration, hibernation, defensive mechanism).  (Interactions among Organisms and their Environment) 5.Investigate and describe the roles of plants as producers and animals as consumers and how living things may depend on each other.  (Effects of Changing Environmenr on Living Things) 2.Identify the ways in which an organism’s habitat provides for its basic needs (plants require air, water, nutrients, and light; animals require food, water, air, and shelter).  (Effects of Changing Environmenr on Living Things) 3.Describe how people and other animals interact with the environment through their senses of sight, hearing, touch, smell, and taste.  (Effects of Changing Environmenr on Living Things) 4.Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/cons ervation of species, paving/restor ing greenspace).  (Effects of Changing Environmenr on Living Things) 5.Observe, record, and describe changes in the health or behavior of an organism as a result of changes in its environment.  (Food Webs) 5.Use information about organisms to design a habitat and explain how the habitat provides for the needs of the organisms that live there. |  | (Natural Selection) 2. Identify the specific functions of the physical structures of a plant or an animal (e.g. roots for water; webbed feet for swimming).  (Natural Selection) 3. Identifying and explain how the physical structure/char acteristic of an organism allows it to survive and defend itself.  (Natural Selection) 4. Analyze the structures needed for survival of populations of plants and animals in a particular habitat/envir onment (e.g. populations of desert plants and animals require structures that enable them to obtain/conser ve/ retain water).  (Effect of Environment on Behaviors) 5. Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration). |
| **Grade 3** | (Rocks and minerals) 1. Identify the earth materials (i.e., rocks, soil, water, air) found in aquatic and terrestrial environments.  (Rocks and minerals) 2. Use the senses to observe and describe the properties of a variety of earth materials (i.e., rock, soil, sand, water).  (Rocks and minerals) 3. Describe, compare, and sort rocks, soils, and minerals by similar or different physical properties (e.g., size, shape, color, texture, smell, weight, temperature, hardness, composition, reaction to vinegar).  (Rocks and minerals) 4. Use the physical properties of hardness, color, luster, and reaction to vinegar (weak acid). to identify common minerals (quartz, fluorite, calcite, and gypsum).  (Rocks and minerals) 5. Identify the importance of minerals, ores, and fossil fuels as Earth’s resources on the basis of their properties.  (Soils) 1. Use the senses to observe and then describe the physical properties of soil components.  (Soils) 2. Compare soil samples by sorting them according to properties (including color, texture, and the capacity to retain water).  (Soils) 3. Conduct simple tests to identify the three basic components of soil (sand, clay, humus).  (Soils) 5. Explain and give examples of the ways in which soil is formed (the weathering of rock by water and wind and from the decompositio n of plant and animal remains).  (Water) 3. Illustrate the locations of water on Earth by using drawings, maps, or models.  (Water) 4. Illustrate Earth’s saltwater and freshwater features (including oceans, seas, rivers, lakes, ponds, streams, and glaciers).  (Water) 5.Summarize the processes of the water cycle (including evaporation, condensation , precipitation, and runoff).  (Uses of Earth’s Materials) 1. Identify the composition of Earth (including rocks, sand, soil, and water).  (Uses of Earth’s Materials) 2. Identify which materials are best for different uses (e.g., soils for growing plants, sand for the sand box.)  (Uses of Earth’s Materials) 3. Identify different uses (e.g., building materials, sources of fuel) of Earth’s materials based on their properties.  (Uses of Earth’s Materials) 4. Identify Earth’s materials that are used as fuel, and other ways that humans use these materials to meet needs and wants (i.e., fluorite for toothpaste, marble for statues). | (What Drives the Water Cycle) 3. Provide examples of how sunlight affects people and animals by providing heat and light.  (What Drives the Water Cycle) 5. Identify the sun as the source of energy that evaporates water from the surface of Earth.  (Weather) 2. Observe, identify and record changes in weather and effects on living organisms.  (Weather) 4. Graph recorded weather data to show daily and seasonal patterns in weather. | (Earth’s Resources) 4. Observe and describe ways humans use Earth’s materials (e.g., soil, rocks) in daily life.  (Earth’s Resources) 5. Distinguish between and provide examples of materials that can be recycled/reus ed and those that cannot.  (Caring for Earth’s Resources) 1. Describe how some resources can be used and reused.  (Caring for Earth’s Resources) 2. Explain that the supply of many resources is limited but the supply can be extended through careful use, decreased use, reusing and/or recycling.  (Caring for Earth’s Resources) 3. Explain that the supply of many non- renewable resources is limited and can be extended through reducing, reusing and recycling but cannot be extended indefinitely.  (Caring for Earth’s Resources) 5. Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/cons ervation of species, paving/restor ing greenspace). | (Basic Needs of Living Things) 2. Identify the basic needs of most animals (i.e., air, water, food, shelter). . | (Needs and Survival of Living things) 1. Identify basic needs of plants and animals: Food, water, light, air, space.  (Needs and Survival of Living things) 2. Investigate and explain that plants need light energy from the sun to make food, while animals need to eat plants and/or other animals as their food.  (Needs and Survival of Living things) 3. Explain that all organisms require a form of energy to survive and that humans and other animals obtain energy and materials from food.  (Needs and Survival of Living things) 4. Explain that all living things have structures that provide the basic needs for survival.  (Needs and Survival of Living things) 5. Associate specific structures with their functions in the survival of an organism.  (Source of Energy for Living Things) 2. Describe how all animals depend upon plants whether or not they eat the plants directly.  (Source of Energy for Living Things) 3. Differentiate between the needs of plants and those of animals.  (Source of Energy for Living Things) 4.Explain that all organisms require a form of energy to survive and that humans and other animals obtain energy and materials from food. | (Effects of Changing Environment on Living Things) 2.Identify the ways in which an organism’s habitat provides for its basic needs (plants require air, water, nutrients, and light; animals require food, water, air, and shelter). |  |  |
| **Grade 4** |  |  | (Caring for Earth’s Resources) 5. Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/cons ervation of species, paving/restor ing greenspace). | (Basic Needs of Living Things) 3. Observe that animals need water, air, food, and shelter/space to grow and reproduce.  (Classification of Living Things) 4. Identify the relationships between the physical structures of animals and the function of those structures (e.g., taking in water, support, movement, obtaining food, reproduction). | (Source of Energy for Living Things) 2. Describe how all animals depend upon plants whether or not they eat the plants directly.  (Source of Energy for Living Things) 4.Explain that all organisms require a form of energy to survive and that humans and other animals obtain energy and materials from food.  (Source of Energy for Living Things) 5. Categorize organisms as predator or prey in a given ecosystem. | (Interactions among Organisms and their Environment) 2. Identify different environment s (i.e., pond, forest, prairie) support the life of different types of plants and animals.  (Interactions among Organisms and their Environment) 4. Identify the ways a specific organism may interact with other organisms or with the environment (e.g., pollination, shelter, seed dispersal, camouflage, migration, hibernation, defensive mechanism).  (Interactions among Organisms and their Environment) 5.Investigate and describe the roles of plants as producers and animals as consumers and how living things may depend on each other.  (Effects of Changing Environmenr on Living Things) 2.Identify the ways in which an organism’s habitat provides for its basic needs (plants require air, water, nutrients, and light; animals require food, water, air, and shelter).  (Effects of Changing Environmenr on Living Things) 4.Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/cons ervation of species, paving/restor ing greenspace).  (Effects of Changing Environmenr on Living Things) 5.Observe, record, and describe changes in the health or behavior of an organism as a result of changes in its environment.  (Food Webs) 1.Act out or construct simple diagrams (pictures or words) that shows a simple food web.  (Food Webs) 2. Use information about a simple food web to determine how basic needs (e.g. shelter and water) are met by the habitat/envir onment.  (Food Webs) 3. Demonstrate in a food web that all animals’ food begins with the sun.  (Food Webs) 4. Explain the way that plants and animals in a habitat depend on each other.  (Food Webs) 5.Use information about organisms to design a habitat and explain how the habitat provides for the needs of the organisms that live there. |  | (Natural Selection) 4. Analyze the structures needed for survival of populations of plants and animals in a particular habitat/envir onment (e.g. populations of desert plants and animals require structures that enable them to obtain/conser ve/ retain water).  (Natural Selection) 5.Give examples of how inherited characteristic s may change over time as adaptations to changes in the environment that enable organisms to survive, e.g., shape of beak or feet, placement of eyes on head, length of neck, shape of teeth, color.  (Effect of Environment on Behaviors) 5. Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration). |
| **Grade 5** |  |  | (Caring for Earth’s Resources) 1. Describe how some resources can be used and reused.  (Caring for Earth’s Resources) 2. Explain that the supply of many resources is limited but the supply can be extended through careful use, decreased use, reusing and/or recycling.  (Caring for Earth’s Resources) 3. Explain that the supply of many non- renewable resources is limited and can be extended through reducing, reusing and recycling but cannot be extended indefinitely.  (Caring for Earth’s Resources) 4. Describe ways Earth's renewable resources (e.g., fresh water, air, wildlife and trees) can be maintained.  (Caring for Earth’s Resources) 5. Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/conservation of species, paving/restoring greenspace). | (Structure and Function of Things) 2. Identify and compare the physical structures of a variety of plants (e.g., stem, leaves, flowers, seeds, roots).  (Structure and Function of Things) 3. Identify and compare the physical structures of a variety of animals (e.g., sensory organs, beaks, appendages, body covering).  [ Targeted Standards:1 ]  LS.1.4B: By the end of Grade 4, students will sort/classify different living things using similar and different characteristics. Describe why organisms belong to each group or cite evidence about how they are alike or not alike.  (Classification of Living Things) 1. Sort animals and plants by observable characteristics. | (Needs and Survival of Living things) 2. Investigate and explain that plants need light energy from the sun to make food, while animals need to eat plants and/or other animals as their food.  (Needs and Survival of Living things) 3. Explain that all organisms require a form of energy to survive and that humans and other animals obtain energy and materials from food.  [ Targeted Standards:1 ]  (Source of Energy for Living Things) 2. Describe how all animals depend upon plants whether or not they eat the plants directly. | (Effects of Changing Environment on Living Things) 4.Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/cons ervation of species, paving/restor ing greenspace). |  |  |
| **Grade 6** |  |  | (Earth’s Resources) 6. Identify the properties of water that make it an essential component of the Earth system (e.g., its ability to act as a solvent, its ability to remain as a liquid at most Earth temperatures) .  (Caring for Earth’s Resources) 6. Describe how human needs and activities (e.g., irrigation, damming of rivers, waste treatment, sources of drinking water) have affected the quantity and quality of major bodies of fresh water.  (The Hydrosphere) 6. Describe the composition, circulation, and distribution of the world’s oceans, estuaries, and marine environments.  (The Hydrosphere) 7. Explain how major bodies of water are important natural resources for human activity (e.g., food, recreation, habitat, irrigation, solvent, transportation ).  (The Hydrosphere) 8. Relate the comparative amounts of fresh water and salt water on the Earth to the availability of water as a resource for living organisms and human activity.  (Water Cycle) 6. Explain and trace the possible paths of water through the hydrosphere, geosphere, and atmosphere (i.e., the water cycle: evaporation, condensation, precipitation, surface run- off/ groundwater flow).  (Water Cycle) 7. Relate the different forms water can take (i.e., snow, rain, sleet, fog, clouds, dew, humidity) as it moves through the water cycle to atmospheric conditions (i.e., temperature, pressure, wind direction and speed, humidity) at a given geographic location.  (Water Cycle) 8. Describe the processes of the hydrologic cycle, including evaporation, condensation , precipitation, surface runoff and groundwater percolation, infiltration, and transpiration.  (Water Cycle) 9. Explain how thermal energy is transferred throughout the water cycle by the processes of convection, conduction, and radiation. | (Basic Needs of Living Things) 6. Describe the hierarchical organization of multicellular organisms from cells to tissues to organs to systems to organisms.  (Basic Needs of Living Things) 7. Recognize and illustrate (e.g. flow chart) the structural organization of an organism from a cell to tissue to organs to organ systems to organisms.  (Basic Needs of Living Things) 8. Explain how each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole.  (Structure and Function of Organisms) 7. Explain how the cell, as the basic unit of life, has the same survival needs as an organism (i.e., obtain energy, grow, eliminate waste, reproduce, provide for defense).  (Structure and Function of Organisms) 8. Investigate and describe how cells, grow, divide, and take in nutrients, which they use to provide energy for cellular functions.  (Structure and Function of Things) 7. Describe the importance of the transport and exchange of oxygen and carbon dioxide to the survival of the organism.  (Structure and Function of Things) 8. Explain that oxygen is needed by all cells of most organisms for the release of energy from nutrient (sugar) molecules.  (Structure and Function of Things) 9. Describe photosynthes is as a chemical change with reactants (water and carbon dioxide) and products (energy-rich sugar molecules and oxygen) that takes place in the presence of light and chlorophyll.  (Cells) 6. Explore how the use of a microscope allows one to see cells in a variety of organisms.  (Cells) 7. Explain that all organisms are composed of cells, and that many organisms are single- celled (unicellular), (e.g., bacteria, yeast). In these single- celled organisms, one cell must carry out all of the basic functions of life.  (Cells) 8. Observe and describe (e.g., drawing, labeling) individual cells as seen through a microscope targeting cell membrane, cell wall, nucleus, and chloroplasts.  (Cells) 9. Compare and contrast plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, cytoplasm, chloroplasts, mitochondria , vacuoles).  (Function of Cells) 6. Explain the functions of the cell (e.g., growth, metabolism, reproduction, photosynthes is, response).  (Function of Cells) 7. Explain that within cells, many of the basic functions of organisms (e.g., extracting energy from food and getting rid of waste) are carried out. The way in which cells function is similar in all living organisms.  (Function of Cells) 8. Explain that specialized cells perform specialized functions. (e.g., muscle cells contract, nerve cells transmit impulses, and skin cells provide protection).  (Function of Cells) 9. Compare individual cells of tissues and recognizing the similarities of cells and how they work together to perform specific functions. | (Needs and Survival of Living things) 6. Explain that most multicellular organisms have specialized cells to survive, while unicellular organisms perform all survival functions. (e.g. nerve cells communicate with other cells, muscle cells contract, unicellular are not specialized). |  |  |  |
| **Grade 7** |  |  |  | (Structure and Function of Things) 9. Describe photosynthes is as a chemical change with reactants (water and carbon dioxide) and products (energy-rich sugar molecules and oxygen) that takes place in the presence of light and chlorophyll.  (Classification of Living Things) 6. Follow a taxonomic key to identify a given organism (e.g. flowering and non- flowering plants).  (Classification of Living Things) 7. Sort organisms with similar characteristic s into groups based on internal and external structures.  (Classification of Living Things) 8. Explain how species with similar evolutionary histories/char acteristics are classified more closely together with some organisms than others (e.g., a fish and human have more common with each other than a fish and jelly fish).  (Classification of Living Things) 9. Classify organisms into the currently recognized kingdoms according to characteristic s that they share. Be familiar with organisms from each kingdom.  (Cells) 6. Explore how the use of a microscope allows one to see cells in a variety of organisms.  (Cells) 7. Explain that all organisms are composed of cells, and that many organisms are single- celled (unicellular), (e.g., bacteria, yeast). In these single- celled organisms, one cell must carry out all of the basic functions of life.  (Cells) 8. Observe and describe (e.g., drawing, labeling) individual cells as seen through a microscope targeting cell membrane, cell wall, nucleus, and chloroplasts.  (Cells) 9. Compare and contrast plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, cytoplasm, chloroplasts, mitochondria , vacuoles).  (Function of Cells) 6. Explain the functions of the cell (e.g., growth, metabolism, reproduction, photosynthes is, response). • (Function of Cells) 7. Explain that within cells, many of the basic functions of organisms (e.g., extracting energy from food and getting rid of waste) are carried out. The way in which cells function is similar in all living organisms.  (Function of Cells) 8. Explain that specialized cells perform specialized functions. (e.g., muscle cells contract, nerve cells transmit impulses, and skin cells provide protection).  (Function of Cells) 9. Compare individual cells of tissues and recognizing the similarities of cells and how they work together to perform specific functions. | (Needs and Survival of Living things) 6. Explain that most multicellular organisms have specialized cells to survive, while unicellular organisms perform all survival functions. (e.g. nerve cells communicate with other cells, muscle cells contract, unicellular are not specialized).  (Needs and Survival of Living things) 7. Identify various specialized cells and common unicellular organisms in diagrams, photographs and/or microscopic slides.  (Needs and Survival of Living things) 8. Describe the common life processes necessary to the survival of organisms (i.e., growth, reproduction, life span, response to stimuli, energy use, exchange of gases, use of water, elimination of waste).  (Needs and Survival of Living things) 9. Explain the relationships between and amongst the specialized structures of the cell and their functions (e.g. transport of materials, energy transfer, waste disposal, information feedback, and even movement).  (Source of Energy for Living Things) 6. Classify populations of unicellular and multicellular organisms as producers, consumers, and decomposers by the role they serve in the ecosystem.  (Source of Energy for Living Things) 7. Differentiate between the three types of consumers (herbivore, carnivore, omnivore).  (Source of Energy for Living Things) 8. Diagram and describe the transfer of energy in an aquatic food web and a land food web with reference to producers, consumers, decomposers, scavengers, and predator/prey relationships.  (Source of Energy for Living Things) 9. Describe how energy derived from the sun is used by plants to produce sugars (photosynthe sis) and is transferred within a food chain from producers (plants) to consumers to decomposers.  (Flow of Energy In An Ecosystem) 6. Explain how energy is transferred through food chains and food webs in an ecosystem.  (Flow of Energy In An Ecosystem) 7. Explain how the amount of useable energy available to organisms decreases as it passes through a food chain and/or food web.  (Flow of Energy In An Ecosystem) 8. Explain that the total amount of matter in a closed system remains the same as it is transferred between organisms and the physical environment even though its location or form changes.  (Flow of Energy In An Ecosystem) 9. Compare and contrast predator/prey , parasite/host and producer/con sumer/decom poser relationships. | (Interactions among Organisms and their Environment) 6. Identify the biotic factors (populations of organisms ) and abiotic factors (e.g., quantity of light and water, range of temperatures, soil composition) that make up an ecosystem.  (Interactions among Organisms and their Environment) 7. Explain the factors that affect the number and types of organisms an ecosystem can support, including available resources, abiotic and biotic factors and disease.  (Interactions among Organisms and their Environment) 8. Describe the factors related to matter and energy in an ecosystem that both influence fluctuations in population size and determine the carrying capacity of a population.  (Interactions among Organisms and their Environment) 9. Predict and analyze how a change in an ecosystem, resulting from natural causes, changes in climate, human activity or introduction of invasive species, can affect both the number of organisms in a population and the biodiversity of species in the ecosystem.  (Effects of Changing Environmenr on Living Things) 6. Identify ways organisms interact with one another in various ways besides providing food.  (Effects of Changing Environmenr on Living Things) 7. Identify populations within a community that are in competition with one another for resources.  (Effects of Changing Environmenr on Living Things) 8. Predict the possible effects of removing an organism from a food chain.  (Effects of Changing Environmenr on Living Things) 9. Predict the possible effects of changes in the number and types of organisms in an ecosystem on the populations of other organisms within that ecosystem.  (Food Webs) 6. Identify the sun as the major source of energy for life on earth and sequence the energy flow in an ecosystem.  (Food Webs) 7. Describe the basic processes and recognize the substances involved in photo- synthesis and respiration.  (Food Webs) 8. Explain the transfer of the sun’s energy through living systems and its effect upon them.  (Food Webs) 9. Describe the basic processes and recognize the names and chemical formulas of the substances involved in photo- synthesis and respiration. | (Life Cycles/Reproduction) 6. Explain that an individual organism does not live forever; therefore reproduction is necessary for the continuation of every species and traits are passed on to the next generation through reproduction.  (Life Cycles/Reproduction) 7. Explain reproduction as a fundamental process by which the new individual receives genetic information from parent(s).  (Life Cycles/Reproduction) 8. Describe forms of asexual reproduction that involve the genetic contribution of only one parent (e.g., binary fission, budding, vegetative propagation, regeneration) .  (Life Cycles/Reproduction) 9. Describe sexual reproduction as a process that combines genetic material of two parents to produce a new organism (e.g., sperm/egg, pollen/ova).  (Inheritance) 6. Differentiate between inherited and acquired traits.  (Inheritance) 7. Observe, record and compare differences in inherited traits (e.g. connected earlobe, tongue rolling).  (Inheritance) 8. Explain that characteristic s of an organism result from inherited traits of one or more genes from the parents and others result from interactions with the environment.  (Inheritance) 9. Identify that genetic material (i.e. chromosome s and genes) is located in the cell’s nucleus. | (Natural Selection) 6. Explain how a population’s or species’ traits affect their ability to survive over time.  (Natural Selection) 7. Describe possible causes for the extinction of an animal or plant.  (Natural Selection) 8. Cite evidence that demonstrates evolutionary relationships among organisms (e.g., similarities in body structure, early development, traits).  (Natural Selection) 9. Explain how natural selection leads to evolution (e.g., survival of the fittest).  (Effect of Environment on Behaviors) 6. Explain that some animal behaviors are instinctive (e.g., turtles burying their eggs), and others are learned (e.g., humans building fires for warmth).  (Effect of Environment on Behaviors) 7. Explain that many plants and animals can survive harsh environments because of seasonal behaviors, e.g., in winter, some trees shed leaves, some animals hibernate, and other animals migrate.  (Effect of Environment on Behaviors) 8. Differentiate between observed characteristic s of plants and animals that are fully inherited (e.g., color of flower, shape of leaves,) and characteristic s that are affected by the climate or environment (e.g., browning of leaves).  (Effect of Environment on Behaviors) 9. Give examples of how organisms can cause changes in their environment to ensure survival and explain how some of these changes may affect the ecosystem. |
| **Grade 8** | (Soils) 6. Investigate that soils are often found in layers and can be different from place to place.  (Soils) 7. Observe and describe the composition of soil (e.g., small pieces of rock and decomposed pieces of plants and animals, and products of plants and animals).  (Soils) 8. Investigate the properties of soil (e.g., color, texture, capacity to retain water, ability to support plant growth).  (Cycles in Earth’s Systems) 6. Describe movement of a carbon atom from the atmosphere through a plant, animal, and decomposer, and back into the atmosphere.  (Cycles in Earth’s Systems) 7. Diagram the nitrogen cycle and provide examples of human actions that affect this cycle (e.g., fertilizers, crop rotation, fossil fuel combustion).  (Cycles in Earth’s Systems) 8. Trace ways in which the atmosphere has been altered by living systems and has itself strongly affected living systems over the course of Earth’s history.  (Cycles in Earth’s Systems) 9. Describe ways the biosphere, hydrosphere, and lithosphere interact with the atmosphere (e.g., volcanic eruptions putting ash and gases into the atmosphere, hurricanes, changes in vegetation). (Earth’s Structure) 6. Describe Earth’s layers as a lithosphere (crust and upper mantle), convecting mantle, and dense metallic core.  (Earth’s Structure) 7. Describe, on the basis of relative position, density, and composition., Earth’s layers as a lithosphere (crust and upper mantle), convecting mantle, and dense metallic core.  (Earth’s Structure) 8. Identify the energy sources that cause material to move within Earth.  (Earth’s Structure) 9. Model the movement of materials within Earth.  (The Theory of Tectonics) 6. Define and describe the location of the major plates and plate boundaries.  (The Theory of Tectonics) 7. Describe the three types of plate boundaries (convergent, divergent, transform) and geographic features associated with them (continental rifts and mid- ocean ridges, volcanic and island arcs, deep sea trenches).  (The Theory of Tectonics) 8. Explain how the theory of plate tectonics accounts for the motion of the lithospheric plates, the geologic activities at the plate boundaries, and the changes in landform areas over geologic time.  (The Theory of Tectonics) 9. Relate plate boundary movements to their resulting landforms, including: Mountains, faults, rift valleys, trenches and volcanoes.  [ Targeted Standards:1 ]  ESS.4.8B: By the end of Grade 8, students will describe how the magnetic field of Earth and a magnet are similar.  • (Earth’s Magnetic Field) 6. Construct a compass and explain how it works. using Earth’s magnetic field.  [ Targeted Standards:1 ]  • (Earth’s Magnetic Field) 7. Compare Earth’s magnetic field to the magnetic field of a magnet. |  | (Earth’s Resources) 6. Identify the properties of water that make it an essential component of the Earth system (e.g., its ability to act as a solvent, its ability to remain as a liquid at most Earth temperatures) .  (Earth’s Resources) 7. Recognize, describe, and compare renewable energy resources (e.g., solar, wind, water, biomass) and nonrenewable e energy resources (e.g., fossil fuels, nuclear energy).  (Earth’s Resources) 8. Describe the benefits of Earth’s resources, air, soil, and trees.  (Earth’s Resources) 9. Describe the role atmosphere (e.g., clouds, ozone) plays in precipitation, reflecting and filtering light from the Sun, and trapping heat energy emitted from the Earth’s surface.  (Caring for Earth’s Resources) 6. Describe how human needs and activities (e.g., irrigation, damming of rivers, waste treatment, sources of drinking water) have affected the quantity and quality of major bodies of fresh water.  (Caring for Earth’s Resources) 7. Describe the effects on the environment and on the carbon cycle of using both renewable and nonrenewable sources of energy.  (Caring for Earth’s Resources) 8. Identify the ways humans affect the erosion and deposition of Earth’s materials (e.g., clearing of land, planting vegetation, paving land, construction of new buildings).  (Caring for Earth’s Resources) 9. Identify ways that humans affect the atmosphere and the oceans and their limited capacity to absorb wastes and recycle materials naturally.  (The Hydrosphere) 6. Describe the composition, circulation, and distribution of the world’s oceans, estuaries, and marine environments.  (The Hydrosphere) 7. Explain how major bodies of water are important natural resources for human activity (e.g., food, recreation, habitat, irrigation, solvent, transportation ).  (The Hydrosphere) 8. Relate the comparative amounts of fresh water and salt water on the Earth to the availability of water as a resource for living organisms and human activity.  (Water Cycle) 6. Explain and trace the possible paths of water through the hydrosphere, geosphere, and atmosphere (i.e., the water cycle: evaporation, condensation, precipitation, surface run- off/ groundwater flow).  (Water Cycle) 7. Relate the different forms water can take (i.e., snow, rain, sleet, fog, clouds, dew, humidity) as it moves through the water cycle to atmospheric conditions (i.e., temperature, pressure, wind direction and speed, humidity) at a given geographic location.  Cycle) 8. Describe the processes of the hydrologic cycle, including evaporation, condensation , precipitation, surface runoff and groundwater percolation, infiltration, and transpiration.  [ Targeted Standards:1 ]  • (Water Cycle) 9. Explain how thermal energy is transferred throughout the water cycle by the processes of convection, conduction, and radiation. | (Basic Needs of Living Things) 9. Describe structures or behaviors that help organisms survive in their environment (e.g., defense, obtaining nutrients, reproduction, and eliminating waste).  (Classification of Living Things) 6. Follow a taxonomic key to identify a given organism (e.g. flowering and non- flowering plants).  (Classification of Living Things) 7. Sort organisms with similar characteristic s into groups based on internal and external structures.  (Classification of Living Things) 8. Explain how species with similar evolutionary histories/char acteristics are classified more closely together with some organisms than others (e.g., a fish and human have more common with each other than a fish and jelly fish).  (Classification of Living Things) 9. Classify organisms into the currently recognized kingdoms according to characteristic s that they share. Be familiar with organisms from each kingdom. | (Needs and Survival of Living things) 8. Describe the common life processes necessary to the survival of organisms (i.e., growth, reproduction, life span, response to stimuli, energy use, exchange of gases, use of water, elimination of waste).  (Source of Energy for Living Things) 6. Classify populations of unicellular and multicellular organisms as producers, consumers, and decomposers by the role they serve in the ecosystem.  (Source of Energy for Living Things) 7. Differentiate between the three types of consumers (herbivore, carnivore, omnivore).  (Source of Energy for Living Things) 8. Diagram and describe the transfer of energy in an aquatic food web and a land food web with reference to producers, consumers, decomposers, scavengers, and predator/prey relationships.  (Source of Energy for Living Things) 9. Describe how energy derived from the sun is used by plants to produce sugars (photosynthe sis) and is transferred within a food chain from producers (plants) to consumers to decomposers.  (Flow of Energy In An Ecosystem) 6. Explain how energy is transferred through food chains and food webs in an ecosystem.  (Flow of Energy In An Ecosystem) 7. Explain how the amount of useable energy available to organisms decreases as it passes through a food chain and/or food web.  (Flow of Energy In An Ecosystem) 8. Explain that the total amount of matter in a closed system remains the same as it is transferred between organisms and the physical environment even though its location or form changes.  (Flow of Energy In An Ecosystem) 9. Compare and contrast predator/prey , parasite/host and producer/con sumer/decom poser relationships. | (Interactions among Organisms and their Environment) 6. Identify the biotic factors (populations of organisms ) and abiotic factors (e.g., quantity of light and water, range of temperatures, soil composition) that make up an ecosystem.  (Interactions among Organisms and their Environment) 7. Explain the factors that affect the number and types of organisms an ecosystem can support, including available resources, abiotic and biotic factors and disease.  (Interactions among Organisms and their Environment) 8. Describe the factors related to matter and energy in an ecosystem that both influence fluctuations in population size and determine the carrying capacity of a population.  (Interactions among Organisms and their Environment) 9. Predict and analyze how a change in an ecosystem, resulting from natural causes, changes in climate, human activity or introduction of invasive species, can affect both the number of organisms in a population and the biodiversity of species in the ecosystem.  (Effects of Changing Environmenr on Living Things) 6. Identify ways organisms interact with one another in various ways besides providing food.  (Effects of Changing Environmenr on Living Things) 7. Identify populations within a community that are in competition with one another for resources.  (Effects of Changing Environmenr on Living Things) 8. Predict the possible effects of removing an organism from a food chain.  (Effects of Changing Environmenr on Living Things) 9. Predict the possible effects of changes in the number and types of organisms in an ecosystem on the populations of other organisms within that ecosystem.  (Food Webs) 6. Identify the sun as the major source of energy for life on earth and sequence the energy flow in an ecosystem.  (Food Webs) 7. Describe the basic processes and recognize the substances involved in photo- synthesis and respiration.  (Food Webs) 8. Explain the transfer of the sun’s energy through living systems and its effect upon them.  (Food Webs) 9. Describe the basic processes and recognize the names and chemical formulas of the substances involved in photo- synthesis and respiration. |  | (Effect of Environment on Behaviors) 6. Explain that some animal behaviors are instinctive (e.g., turtles burying their eggs), and others are learned (e.g., humans building fires for warmth).  (Effect of Environment on Behaviors) 7. Explain that many plants and animals can survive harsh environments because of seasonal behaviors, e.g., in winter, some trees shed leaves, some animals hibernate, and other animals migrate.  (Effect of Environment on Behaviors) 8. Differentiate between observed characteristic s of plants and animals that are fully inherited (e.g., color of flower, shape of leaves,) and characteristic s that are affected by the climate or environment (e.g., browning of leaves).  (Effect of Environment on Behaviors) 9. Give examples of how organisms can cause changes in their environment to ensure survival and explain how some of these changes may affect the ecosystem. |
| **Grade 9** |  | 1. Identify static processes that influence climate.  2. Identify dynamic processes that influence climate.  3. Show how tracking cloud cover adds to our knowledge of climatic changes.  4. Show how landscape characteristics influence our climate. | 1. Explain that different chemical forms exist in Earth’s systems.  2. Describe the movement of elements within the Earth system.  3. Justify that the Earth system has essentially fixed amounts of each stable chemical.  1. Explain how energy sources move matter through Earth’s systems.  2. Describe the cycles of materials through the Earth’s system. i.e. carbon cycle.  3. Distinguish between physical and chemical changes within cycles. | 1. Describe how the elements most common in organisms (carbon, hydrogen, oxygen, nitrogen and sulfur) interact to form complex molecules.  2. Explain that many organic molecules are continuously constructed and deconstructed in cells.  3. Describe the general structure and function of the major groups of organic molecules: carbohydrates, lipids, proteins and nucleic acids.  4. Describe proteins as complex organic molecules that carry out most cellular functions and explain that the function that proteins serve is determined by their structure.  5. Relate the concept that DNA molecules in cells serve as instructions to the cell for making proteins. | 1. Describe photosynthesis as the process of converting water and carbon dioxide into high- energy sugar molecules using energy from the sun.  2. Display an understanding that plants, many protests and many bacteria are producers and carry out photosynthesis  3. Describe aerobic cellular respiration as the process of releasing energy from organic molecules in the presence of oxygen to power cellular processes.  4. Distinguish between those organisms that carry out aerobic and anaerobic respiration as their primary means of obtaining energy.  5. Compare and contrast how photosynthesis and aerobic cellular respiration move carbon through the biosphere.  1. Demonstrate an understanding of several different ways that the products of photosynthesis are used in organisms.  2. Compare and contrast the ways in which energy and matter are transformed as they move through trophic levels in food webs.  3. Compare and contrast the ways in which energy and matter are conserved and/or lost as they move through trophic levels in food webs. | 1. Investigate and relate what impacts rapid climate change might have on an ecosystem.  2. Display an understanding of the relationship between climate change and evolution using specific examples.  3. Interpret and evaluate data to determine the impact of humans on ecosystems (i.e. overfishing, deforestation).  4. Investigate the relationship between human population growth and habitat loss and make predictions about the future.  5. Propose and evaluate measures to lessen human impact on the environment. |  | 3. Explain how natural selection causes changes in populations over time and can lead to the formation of new species.  4. Interpret, evaluate and summarize data about changes in a population over time. |
| **Grade 10** | 1. Identify mid-ocean ridges from maps.  2. Describe Earth’s magna’s magnetic characteristics.  3. Use magnetic mapping data to support the theory of plate tectonics. | 2. Identify dynamic processes that influence climate. | 1. Explain that different chemical forms exist in Earth’s systems.  2. Describe the movement of elements within the Earth system.  3. Justify that the Earth system has essentially fixed amounts of each stable chemical.  1. Explain how energy sources move matter through Earth’s systems.  2. Describe the cycles of materials through the Earth’s system. i.e. carbon cycle.  3. Distinguish between physical and chemical changes within cycles. | 1. Describe how the elements most common in organisms (carbon, hydrogen, oxygen, nitrogen and sulfur) interact to form complex molecules.  2. Explain that many organic molecules are continuously constructed and deconstructed in cells.  3. Describe the general structure and function of the major groups of organic molecules: carbohydrates, lipids, proteins and nucleic acids.  4. Describe proteins as complex organic molecules that carry out most cellular functions and explain that the function that proteins serve is determined by their structure.  5. Relate the concept that DNA molecules in cells serve as instructions to the cell for making proteins.  1. Compare the daughter cells of cell division to the parent cells to include chromosome number.  2. Diagram chromosome movement during the process of mitosis.  3. State that different types of cells are different from one another in multi- cellular organisms due to expression of different genes during development.  4. Describe ways in which cellular processes are regulated by internal and external signals. |  | 1. Investigate and relate what impacts rapid climate change might have on an ecosystem.  2. Display an understanding of the relationship between climate change and evolution using specific examples.  4. Investigate the relationship between human population growth and habitat loss and make predictions about the future.  5. Propose and evaluate measures to lessen human impact on the environment. | 1. Distinguish between genes, chromosomes, and DNA.  2. State that genes code for the synthesis of polypeptides.  3. Explain that a gene may affect one or many traits, depending on the role of the protein that it codes for.  4. Explain why each cell in a multicellular organism contains thousands of genes.  5. Explain why all cells in multicellular organisms contain the same DNA (except for gametes).  1. Compare and contrast haploid and diploid cells.  2. Illustrate and annotate the production of gametes through meiosis.  3. Explain the ways in which sexual reproduction causes variation in populations.  1. Define and describe the human genome.  2. Define the term allele.  3. Explain why organisms have 2 genes for each trait.  • 4. Describe a human karyotype to include chromosome number and homologous pairs of chromosomes.  5. Predict alleles and traits of the offspring of 2 parents using a Punnet square.  1. Outline the production of a transgenic organism.  2. Describe how genetically modified organisms (GMOs) are produced and describe potential benefits and harms of the creation and use of GMOs.  3. Display an understanding of what gene therapy is and the challenges and potential benefits of this technology.  4. Describe the applications of sequencing genes or genomes of humans and other organisms. | 1. Distinguish between organisms, species and populations.  2. Define evolution as a change in the gene pool of a population over time.  3. Explain how natural selection causes changes in populations over time and can lead to the formation of new species.  4. Interpret, evaluate and summarize data about changes in a population over time.  5. GIVE examples showing why populations that are diverse are more able to survive changes in their environment. |