

Science Curriculum Distribution



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The NGSS Disciplinary Core Ideas: An Overview of the Fundamentals			
Life Science	Earth and Space Science	Physical Science	Engineering, Technology, and the Application of Science
• LS1 From Molecules to Organisms: Structures and Processes ○ Structure and Function ○ Growth and Development of Organisms ○ Organization for Matter and Energy Flow in Organisms ○ Information Processing • LS2 Ecosystems: Interactions, Energy, and Dynamics ○ Interdependent Relationships in Ecosystems ○ Cycles of Matter and Energy Transfer in Ecosystems ○ Ecosystem Dynamics, Functioning, and Resilience ○ Social Interactions and Group Behavior • LS3 Heredity: Inheritance and Variation of Traits	• ESS1 Earth's Place in the Universe ○ The Universe and Its Stars ○ Earth and the Solar System ○ The History of Planet Earth • ESS2 Earth's Systems ○ Earth Materials and Systems ○ Plate Tectonics and Large-Scale System Interactions ○ The Roles of Water in Earth's Surface Processes • ESS 3 Earth and Human Activity ○ Natural Resources ○ Natural Hazards ○ Human Impacts on Earth Systems ○ Global Climate Change	• PS1 Matter and Its Interactions ○ Structure and Properties of Matter ○ Chemical Reactions ○ Nuclear Processes • PS 2 Motion and Stability: Forces and Interactions ○ Forces and Motion ○ Types of Interactions ○ Stability and Instability in Physical Systems • PS3 Energy ○ Definitions of Energy ○ Conservation of Energy and Energy Transfer ○ Relationship Between Energy and Forces ○ Energy in Chemical Processes and Everyday Life	• ETS 1 Engineering Design ○ Defining and Delimiting an Engineering Problem ○ Developing Possible Solutions ○ Optimizing the Design Solution



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○ Inheritance of Traits ○ Variation of Traits • LS4 Biological Evolution: Unity and Diversity ○ Evidence of Common Ancestry and Diversity ○ Natural Selection ○ Adaptation ○ Biodiversity and Humans		• PS4 Waves and Their Applications in Technologies for Information Transfer ○ Wave Properties ○ Electromagnetic Radiation ○ Information Technologies and Instrumentation	
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Let's Do SCIENCE Kindergarten

TEXTBOOK A			ACTIVITY BOOK A	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
1	LIVING THINGS AROUND US -	K.IRE/LS/ K-2.ED	1	LIVING THINGS AROUND US
	WHAT ARE LIVING THINGS?		2	YOUR BODY AND SENSES
	NEEDS OF LIVING THINGS		3	ALL ABOUT PLANTS
	CHARACTERISTICS OF LIVING THINGS		4	ALL ABOUT ANIMALS
	REVIEW		5	ENVIRONMENTS
2	YOUR BODY AND SENSES	K.IRE/LS/ K-2.ED		
	YOUR BODY AND SENSES			
	YOUR HEAD AND FACE			
	THE FIVE SENSES			
	STAYING HEALTHY			
3	ALL ABOUT PLANTS	K.IRE/LS/ K-2.ED		
	PLANTS AROUND US			
	PARTS OF A PLANT			
	NEEDS OF A PLANT			
	HOW PLANTS GROW			
4	ALL ABOUT ANIMALS	K.IRE/LS/ K-2.ED		
	ANIMALS AROUND US			
	NEEDS OF ANIMALS			
	HOW ANIMALS MOVE			
	ANIMALS HAVE YOUNG			
5	ENVIRONMENTS	K.IRE/LS/ K-2.ED		
	WHERE PLANTS AND ANIMALS LIVE			
	RAINFORESTS			
	GRASSLANDS			
	DESERTS			
	THE OCEAN			
	TUNDRA			
	REVIEW			



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TEXTBOOK B			ACTIVITY BOOK B	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
6	CHANGES IN THE ENVIRONMENT	K.FI/LS/ K-2.ED	6	CHANGES IN THE ENVIRONMENT
	NATURAL CHANGES		7	THE EARTH AND THE SUN
	HUMAN CHANGES		8	WEATHER AND SEASONS
	CARING FOR THE ENVIRONMENT		9	FORCES AND MOTION
	REVIEW		10	MATTER
7	THE EARTH AND THE SUN	K.FI/ESS/ K-2.ED	11	SOUND AND LIGHT
	OUR SUN			
	EARTH AND THE MOON			
	REVIEW			
8	WEATHER AND SEASONS	K.WC/PS/ESS/ K-2.ED		
	DAILY WEATHER			
	AROUND THE WORLD			
	SEASONS			
	WEATHER FORECASTS			
	SEVERE WEATHER			
	REVIEW			
9	FORCES AND MOTION	K.FI/PS/ K-2.ED		
	WHAT IS A FORCE?			
	USING FORCE			
	HOW THINGS MOVE			
	FORCES IN NATURE			
	FORCES AND MOVEMENT			
	REVIEW			
10	MATTER	K.IRE /LS/PS/ K-2.ED		
	DESCRIBING MATTER			
	GROUPING MATTER			
	CHANGING MATTER			
	OBJECTS AND MATTER			
	STATES OF MATTER			
11	SOUND AND LIGHT	K.FI / PS/ K-2.ED		
	WHAT IS SOUND?			
	WHAT IS LIGHT?			
	REVIEW			



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Topic K.IRE: Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment

SCI.K.K-LS1-1

Use observations to describe patterns of what plants and animals (including humans) need to survive. Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.

SCI.K.K-ESS2-2

Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.

SCI.K.K-ESS3-1

Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas, and grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.

SCI.K.K-ESS3-3

Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.

Topic K.FI: Forces and Interactions: Pushes and Pulls

SCI.K.K-PS2-1

Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.

Assessment is limited to different relative strengths or different directions, but not both at the same time.

Assessment does not include non-contact pushes or pulls such as those produced by magnets.

SCI.K.K-PS2-2

Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.

Topic K.WC: Weather and Climate

SCI.K.K-PS3-1

Make observations to determine the effect of sunlight on Earth's surface.

Examples of Earth's surface could include sand, soil, rocks, and water.

Assessment of temperature is limited to relative measures such as warmer/cooler.



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SCI.K.K-PS3-2

Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.

Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.

SCI.K.K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.

Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.

Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.

SCI.K.K-ESS3-2

Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

Emphasis is on local forms of severe weather.

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TEXTBOOK A			ACTIVITY BOOK A	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
1	LIVING AND NON-LIVING THINGS	1.SFI/LS/ K-2.ED	1	LIVING AND NON-LIVING THINGS
	LIVING THINGS		2	PLANT AND ANIMAL PARTS
	NON-LIVING THINGS		3	PARENTS AND OFFSPRING
	REVIEW		4	EARTH AND SPACE PATTERNS
2	PLANT AND ANIMAL PARTS	1.SFI/LS/ K-2.ED	5	WEATHER AND SEASONS
	PLANT PARTS			
	ANIMAL PARTS			
	RESPONDING TO CHANGE			
	MIMICKING NATURE			
	REVIEW			
3	PARENTS AND OFFSPRING	1.SFI/LS/ K-2.ED		
	PLANT LIFE CYCLES			
	ANIMAL LIFE CYCLES			
	SIMILAR AND DIFFERENT			
	PARENTS AND THEIR YOUNG			
	REVIEW			
4	EARTH AND SPACE PATTERNS	1.SS/ESS/ K-2.ED		
	STARS AND THE SUN			
	AROUND THE EARTH			
	MOVEMENT OF THE EARTH			
	EARTH AND THE MOON			
	THE SOLAR SYSTEM			
5	WEATHER AND SEASONS	1.SS/ESS/ K-2.ED		
	DESCRIBING WEATHER			
	MEASURING WEATHER			
	EXTREME WEATHER			
	SEASONS			
	REVIEW			



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TEXTBOOK B			ACTIVITY BOOK B	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
6	FORCE AND MOTION	1.SS/PS/ K-2.ED	6	FORCE AND MOTION
	DESCRIBING MOTION		7	MATTER
	WHAT IS A FORCE?		8	SOUND
	WHAT FORCES CAN DO		9	LIGHT
	REVIEW			
7	MATTER	1/PS/LS/SS K-2.ED		
	WHAT IS MATTER?			
	STATES OF MATTER			
	CHANGING MATTER			
	REVIEW			
8	SOUND	1.W/PS K-2.ED		
	WHAT IS SOUND?			
	DESCRIBING SOUND			
	MAKING SOUNDS			
	REVIEW			
9	LIGHT	1.W/PS K-2.ED		
	LIGHT AND DARK			
	SOURCES OF LIGHT			
	USING LIGHT			
	LIGHT AND SHADOW			
	LIGHT AND MATERIALS			
	REFLECTING LIGHT			
	REVIEW			



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Topic 1.SFI: Structure, Function, and Information Processing

SCI.1.1-LS1-1

Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.

SCI.1.1-LS1-2

Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).

SCI.1.1-LS3-1

Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.

Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.

Topic 1.SS: Space Systems: Patterns and Cycles

SCI.1.1-ESS1-1

Use observations of the sun, moon, and stars to describe patterns that can be predicted.

Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.

Assessment of star patterns is limited to stars being seen at night and not during the day.

SCI.1.1-ESS1-2 Make observations at different times of year to relate the amount of daylight to the time of year.

Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.

Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.

Topic 1.W: Waves: Light and Sound

SCI.1.1-PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.

SCI.1.1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated.



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Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.

SCI.1.1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.

Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).

Assessment does not include the speed of light.

SCI.1.1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats.

Assessment does not include technological details for how communication devices work.



TEXTBOOK A			ACTIVITY BOOK A	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
1	YOUR HEALTH AND BODY	2.IRE/LS/ K-2.ED	1	YOUR HEALTH AND BODY
	YOUR BODY SYSTEMS		2	PLANTS AND ANIMALS
	STAYING HEALTHY		3	HABITATS
	WHEN YOU GET SICK		4	EARTH PROCESSES
	REVIEW			
2	PLANTS AND ANIMALS	2.IRE/LS/ K-2.ED		
	CLASSIFYING ANIMALS			
	THE NEEDS OF PLANTS			
	PLANT PARTS			
	REVIEW			
3	HABITATS	2.IRE/LS/ K-2.ED		
	HABITATS AND DIVERSITY			
	LAND HABITATS			
	WATER HABITATS			
	REVIEW			
4	EARTH PROCESSES	2.ES/ESS/ K-2.ED		
	RAPID CHANGES			
	SLOW CHANGES			
	HUMAN CHANGES			
	REVIEW			

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TEXTBOOK B			ACTIVITY BOOK B	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
5	EARTH'S LAND AND WATER	2.ES/ESS/ K-2.ED	5	EARTH'S LAND AND WATER
	EARTH'S LANDFORMS		6	FORCES AND MOTION
	EARTH'S WATER		7	PROPERTIES OF MATTER
	SALT WATER ON EARTH		8	CHANGES TO MATTER
	FRESH WATER ON EARTH		9	HEAT AND ELECTRICITY
	LIQUID AND SOLID WATER			
	MAPPING THE EARTH			
	REVIEW			
6	FORCES AND MOTION	SCI/PS/ K-2.ED		
	POSITION AND MOTION			
	FORCES AND MOTION			
	TYPES OF FORCES			
	REVIEW			
7	PROPERTIES OF MATTER	2.SPM/PS/ K-2.ED		
	WHAT IS MATTER?			
	STATES OF MATTER			
	DESCRIBING AND MEASURING MATTER			
	PROPERTIES OF MATERIALS			
	REVIEW			
8	CHANGES TO MATTER	2.SPM/PS/ K-2.ED		
	CHANGING MATTER			
	HEAT AND MATTER			
	REVIEW			
9	HEAT AND ELECTRICITY	SCI/PS/ K-2.ED		
	WHAT IS HEAT?			
	SOURCES OF HEAT			
	USING HEAT			
	HEAT AND TEMPERATURE			
	USING ELECTRICITY			
	SIMPLE CIRCUITS			
	REVIEW			



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Topic 2.ES: Earth's Systems: Processes that Shape the Earth

SCI.2.2-ESS1-1

Use information from several sources to provide evidence that Earth events can occur quickly or slowly. Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.

Assessment does not include quantitative measurements of timescales.

SCI.2.2-ESS2-1

Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.

SCI.2.2-ESS2-2

Develop a model to represent the shapes and kinds of land and bodies of water in an area.

Assessment does not include quantitative scaling in models.

SCI.2.2-ESS2-3

Obtain information to identify where water is found on Earth and that it can be solid or liquid.

Topic 2.IRE: Interdependent Relationships in Ecosystems

SCI.2.2-LS2-1

Plan and conduct an investigation to determine if plants need sunlight and water to grow.

Assessment is limited to testing one variable at a time.

SCI.2.2-LS2-2

Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

SCI.2.2-LS4-1

Make observations of plants and animals to compare the diversity of life in different habitats.

Emphasis is on the diversity of living things in each of a variety of different habitats.

Assessment does not include specific animal and plant names in specific habitats.

Topic 2.SPM: Structure and Properties of Matter

SCI.2.2-PS1-1

Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.

SCI.2.2-PS1-2

Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.

Assessment of quantitative measurements is limited to length.

SCI.2.2-PS1-3

Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

Examples of pieces could include blocks, building bricks, or other assorted small objects.



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SCI.2.2-PS1-4

Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.

Topic 2.IRE: Interdependent Relationships in Ecosystems

SCI.2.2-LS2-1

Plan and conduct an investigation to determine if plants need sunlight and water to grow.

Assessment is limited to testing one variable at a time.

SCI.2.2-LS2-2

Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

SCI.2.2-LS4-1

Make observations of plants and animals to compare the diversity of life in different habitats.

Emphasis is on the diversity of living things in each of a variety of different habitats.

Assessment does not include specific animal and plant names in specific habitats.

Topic K-2.ED: Engineering Design

SCI.K-2.K-2-ETS1-1

Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

SCI.K-2.K-2-ETS1-2

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

SCI.K-2.K-2-ETS1-3

Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.



TEXTBOOK A			ACTIVITY BOOK A	
UNIT	TOPIC	STABDARD	UNIT	TOPIC
1	LIVING THINGS AROUND US	3.IRE/LS/ETS1	1	LIVING THINGS AROUND US
	WHAT ARE THE LIVING THINGS?		2	ALL ABOUT PLANTS
	NEEDS OF LIVING THINGS		3	ALL ABOUT ANIMALS
	CLASSIFYING LIVING THINGS		4	INHERITANCE AND TRAITS
	REVIEW		5	ADAPTATIONS FOR SURVIVAL
2	ALL ABOUT PLANTS	3.IRE/LS/ETS1	6	ORGANISMS OF THE PAST
	PLANT NEEDS			
	PLANT PARTS			
	CLASSIFYING PLANTS			
	REVIEW			
3	ALL ABOUT ANIMALS	3.IRE/LS/ETS1		
	NEEDS OF ANIMALS			
	CLASSIFYING ANIMALS			
	VERTEBRATES			
	INVERTEBRATES			
	THE CIRCLE OF LIFE			
	REVIEW			
4	INHERITANCE AND TRAITS	3.IVT /LS/ETS1		
	HEREDITY AND TRAITS			
	BEHAVIORAL TRAITS			
	ENVIRONMENTAL TRAITS			
	NATURAL SELECTION			
	REVIEW			
5	ADAPTATIONS FOR SURVIVAL	3.IRE/LS/ETS1		
	WHAT ARE ADAPTATIONS?			
	LIVING IN GROUPS			
	SURVIVING CHANGE			
	REVIEW			
6	ORGANISMS OF THE PAST	3.IRE/LS/ETS1		
	LIFE ON EARTH LONG AGO			
	FOSSILS			
	REVIEW			



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TEXTBOOK B			ACTIVITY BOOK B	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
7	EARTH AND SPACE	SCI/ESS/ETS1	7	EARTH AND SPACE
	MOVEMENT OF THE EARTH		8	ROCKS AND SOIL
	THE EARTH'S MOON		9	WEATHER AND CLIMATE
	OUR OWN STAR - THE SUN		10	STATES OF MATTER
	OUR SOLAR SYSTEM		11	INTERACTIONS AND FORCES
	REVIEW		12	FORMS OF ENERGY
8	ROCKS AND SOIL	SCI/ESS/ETS1		
	MINERALS AND ROCKS			
	USING MINERALS AND ROCKS			
	WHAT IS SOIL?			
	USING AND CARING FOR SOIL			
	REVIEW			
9	WEATHER AND CLIMATE	SCI.3/ESS/ETS1		
	UNDERSTANDING WEATHER			
	MEASURING WEATHER			
	EXTREME WEATHER			
	WEATHER AND SEASONS			
	CLIMATE			
	CLIMATE CHANGE			
	REVIEW			
10	STATES OF MATTER	SCI/LS/PS/ETS1		
	WHAT IS MATTER?			
	STATES OF MATTER			
	HEATING MATTER			
	COOLING MATTER			
	REVIEW			
11	INTERACTIONS AND FORCES	3.FI/PS/ETS1		
	POSITION AND MOTION			
	WHAT IS A FORCE?			
	BALANCED AND UNBALANCED FORCES			
	PREDICTING MOTION			
	REVIEW			
12	FORMS OF ENERGY	SCI /PS /ETS1		
	WHAT IS ENERGY?			
	SOUND			
	LIGHT			
	THERMAL ENERGY			
	REVIEW			



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Topic 3.FI: Forces and Interactions

SCI.3.3-PS2-1

Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.

Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.

SCI.3.3-PS2-2

Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.

Assessment does not include technical terms such as period and frequency.

SCI.3.3-PS2-3

Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.

Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.

SCI.3.3-PS2-4

Define a simple design problem that can be solved by applying scientific ideas about magnets.

Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.

Topic 3.IRE: Interdependent Relationships in Ecosystems

SCI.3.3-LS2-1

Construct an argument that some animals form groups that help members survive.

SCI.3.3-LS4-1

Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.

Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.

Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages..



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SCI.3.3-LS4-3

Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.

SCI.3.3-LS4-4

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.

Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.

Topic 3.IV: Inheritance and Variation of Traits: Life Cycles and Traits

SCI.3.3-LS1-1

Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

Changes organisms go through during their life form a pattern.

Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.

SCI.3.3-LS3-1

Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.

Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.

SCI.3.3-LS3-2

Use evidence to support the explanation that traits can be influenced by the environment.

Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.

SCI.3.3-LS4-2

Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.

Topic 3.WC: Weather and Climate

SCI.3.3-ESS2-1

Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

Examples of data could include average temperature, precipitation, and wind direction.

Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.



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SCI.3.3-ESS2-2

Obtain and combine information to describe climates in different regions of the world.

SCI.3.3-ESS3-1

Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.

Let's Do SCIENCE Grade 4

TEXTBOOK A			ACTIVITY BOOK A	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
1	CLASSIFICATION OF ORGANISMS	SCI/LS/ETS1	1	CLASSIFICATION OF ORGANISMS
	CHARACTERISTICS OF LIFE		2	PLANT STRUCTURES AND FUNCTIONS
	CELLS		3	ANIMAL STRUCTURES AND FUNCTIONS
	ORGANISM CLASSIFICATION		4	HUMAN BODY SYSTEMS
	REVIEW		5	ECOSYSTEMS
2	PLANT STRUCTURES AND FUNCTIONS	4.SFI /LS/ ETS1		
	PLANT STRUCTURES AND FUNCTIONS			
	EXTERNAL STRUCTURES			
	INTERNAL STRUCTURES			
	REVIEW			
3	ANIMAL STRUCTURES AND FUNCTIONS	4.SFI /LS/ETS1		
	ANIMAL STRUCTURES AND FUNCTIONS			
	EXTERNAL STRUCTURES			
	INTERNAL STRUCTURES			
	ANIMAL SENSES			
	REVIEW			
4	HUMAN BODY SYSTEMS	4.SFI /LS/ETS1		
	YOUR AMAZING BODY			
	HUMAN SENSES			
	REVIEW			
5	ECOSYSTEMS	4.ES /ESS/ETS1		
	WHAT IS AN ECOSYSTEM?			
	ENERGY IN ECOSYSTEMS			
	REVIEW			



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TEXTBOOK B			ACTIVITY BOOK B	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
6	PROCESSES THAT SHAPE THE EARTH	4.ES /ESS/ETS1	6	PROCESSES THAT SHAPE THE EARTH
	MINERALS, ROCKS AND SOIL		7	MAPPING THE EARTH'S SURFACE
	CHANGES TO THE EARTH		8	USING EARTH'S RESOURCES
	WEATHERING AND EROSION		9	ENERGY AND MOTION
	RAPID CHANGES		10	WAVES AND INFORMATION
	NATURAL HAZARD IMPACTS			
	EARTH LONG AGO			
	REVIEW			
7	MAPPING THE EARTH'S SURFACE	4.ES /ESS /ETS1		
	EARTH'S LANDFORMS			
	EARTH'S WATER			
	MAPS			
	LANDFORM PATTERNS			
	OCEAN PATTERNS			
	REVIEW			
8	USING EARTH'S RESOURCES	4.ES /ESS/ETS1		
	NATURAL RESOURCES			
	NON-RENEWABLE ENERGY			
	RENEWABLE ENERGY			
	ENVIRONMENTAL IMPACTS			
	REVIEW			
9	ENERGY AND MOTION	4.E /PS /ETS1		
	WHAT IS ENERGY?			
	ENERGY AND MOTION, AND FORCE			
	COLLISIONS			
	FORMS OF ENERGY			
	TRANSFORMATION OF ENERGY			
	ELECTRIC CHARGE AND CIRCUITS			
	REVIEW			
10	WAVES AND INFORMATION	4.SFI /PS/ETS1		
	WHAT ARE WAVES?			
	CHARACTERISTICS OF WAVES			
	PROPERTIES OF WAVES			
	TYPES OF WAVES			
	LIGHT WAVES			
	WAVES AND INFORMATION			
	REVIEW			

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Topic 4.E: Energy

SCI.4.4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.

Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.

SCI.4.4-PS3-2

Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

Assessment does not include quantitative measurements of energy.

SCI.4.4-PS3-3

Ask questions and predict outcomes about the changes in energy that occur when objects collide. Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.

Assessment does not include quantitative measurements of energy.

SCI.4.4-PS3-4

Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.

Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.

SCI.4.4-ESS3-1

Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.

Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.

Topic 4.ES: Earth's Systems: Processes that Shape the Earth

SCI.4.4-ESS1-1

Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.

Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.

SCI.4.4-ESS2-1

Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.



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Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.

Assessment is limited to a single form of weathering or erosion.

SCI.4.4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features.

Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.

SCI.4.4-ESS3-2

Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.

Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.

Topic 4.SFI: Structure, Function, and Information Processing

SCI.4.4-PS4-2

Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.

SCI.4.4-LS1-1

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.

Assessment is limited to macroscopic structures within plant and animal systems.

SCI.4.4-LS1-2

Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Emphasis is on systems of information transfer.

Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.

Topic 4.W: Waves: Waves and Information

SCI.4.4-PS4-1

Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.

Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.

SCI.4.4-PS4-3

Generate and compare multiple solutions that use patterns to transfer information.

Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.



TEXTBOOK A			ACTIVITY BOOK A	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
1	DIVERSITY OF LIFE	SCI.5.5 /LS /ETS1	1	DIVERSITY OF LIFE
	WHAT ARE ORGANISMS?		2	PLANTS
	CLASSIFYING ORGANISMS		3	ANIMAL CLASSIFICATION
	KINGDOMS		4	ENERGY IN ECOSYSTEMS
	WHAT'S INSIDE CELLS		5	EARTH'S LAND AND WATER
	CELL ORGANIZATION			
	REVIEW			
2	PLANTS	SCI.5.5 /LS /ETS1		
	CLASSIFICATION OF PLANTS			
	PLANT STRUCTURES			
	PLANT LIFE CYCLES			
	REVIEW			
3	ANIMAL CLASSIFICATION	SCI.5.5 /LS /ETS1		
	CLASSIFICATION OF ANIMALS			
	INVERTEBRATES			
	VERTEBRATES			
	REVIEW			
4	ENERGY IN ECOSYSTEMS	5.ES /ESS/ETS1		
	WHAT IS AN ECOSYSTEM?			
	ENERGY IN ECOSYSTEMS			
	MATTER IN ECOSYSTEMS			
	REVIEW			
5	EARTH'S LAND AND WATER	5.ES /ESS/ETS1		
	STRUCTURE OF THE EARTH			
	EARTH'S LANDFORMS			
	THE HYDROSPHERE			
	REVIEW			



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TEXTBOOK B			ACTIVITY BOOK B	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
6	EARTH'S SYSTEMS	5.ES /ESS/ETS1	6	EARTH'S SYSTEMS
	EARTH'S SPHERES		7	SPACE
	EARTH'S CYCLES		8	FORCES AND INTERACTIONS
	REVIEW		9	MATTER AND MATERIALS
7	SPACE	5.SS /PS/ESS/ETS1	10	ENERGY
	MOVEMENTS OF THE EARTH			
	MOVEMENTS OF THE MOON			
	THE SUN			
	THE SOLAR SYSTEM			
	BEYOND THE SOLAR SYSTEM			
	REVIEW			
8	FORCES AND INTERACTIONS	SCI.5.5/ PS /ETS1		
	DESCRIBING MOTION			
	FORCES AND INTERACTIONS			
	CONTACT FORCES			
	NON-CONTACT FORCES			
	LAWS OF MOTION			
	REVIEW			
9	MATTER AND MATERIALS	5.MEO/ 5.SPM /PS/LS/ETS1		
	PROPERTIES OF MATERIALS			
	WHAT IS MATTER?			
	CHANGES IN MATTER			
	MIXTURES AND SOLUTIONS			
10	REVIEW	5.MEO/PS/LS/ETS1		
	ENERGY			
	ENERGY			
	WHAT IS ENERGY?			
	THERMAL ENERGY			
	LIGHT			
	REVIEW			



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Topic 5.ES: Earth's Systems

SCI.5.5-ESS2-1

Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.

Assessment is limited to the interactions of two systems at a time.

SCI.5.5-ESS2-2

Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.

SCI.5.5-ESS3-1

Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Topic 5.MEO: Matter and Energy in Organisms and Ecosystems

SCI.5.5-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.

Examples of models could include diagrams, and flow charts.

SCI.5.5-LS1-1

Support an argument that plants get the materials they need for growth chiefly from air and water. Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.

SCI.5.5-LS2-1

Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

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 does not include molecular explanations.

Topic 5.SPM: Structure and Properties of Matter

SCI.5.5-PS1-1

Develop a model to describe that matter is made of particles too small to be seen.

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 does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.



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SCI.5.5-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.

Examples of reactions or changes could include phase changes, dissolving, and mixing that forms new substances.

Assessment does not include distinguishing mass and weight.

SCI.5.5-PS1-3

Make observations and measurements to identify materials based on their properties.

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 does not include density or distinguishing mass and weight.

SCI.5.5-PS1-4

Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Topic 5.SS: Space Systems: Stars and the Solar System

SCI.5.5-PS2-1

Support an argument that the gravitational force exerted by Earth on objects is directed down.

"Down" is a local description of the direction that points toward the center of the spherical Earth.

Assessment does not include mathematical representation of gravitational force.

SCI.5.5-ESS1-1

Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.

Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).

SCI.5.5-ESS1-2

Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.

Assessment does not include causes of seasons.



TEXTBOOK A			ACTIVITY BOOK A	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
1	LIFE ON EARTH	SCI/MS-LS/ MS-ETS1	1	LIFE ON EARTH
	CLASSIFICATION		2	PLANTS
	KINGDOMS		3	ANIMALS
	CELLS		4	PLANT AND ANIMAL ADAPTATIONS
	REVIEW		5	ECOSYSTEM INTERACTIONS
2	PLANTS	SCI.6-8.MS-LS/ MS-ETS1		
	PLANT CLASSIFICATION			
	PLANT STRUCTURES			
	PLANT LIFE CYCLES			
	REVIEW			
3	ANIMALS	SCI.6-8.MS-LS/ MS-ETS1		
	ANIMAL CLASSIFICATION			
	VERTEBRATES			
	INVERTEBRATES			
	ANIMAL SYSTEMS			
4	PLANT AND ANIMAL ADAPTATIONS	SCI.6-8.MS-LS/MS-ETS1		
	WHAT ARE ADAPTATIONS			
	ENVIRONMENTAL ADAPTATION			
	BEHAVIORAL ADAPTATIONS			
	ADAPTING TO CHANGE			
5	ECOSYSTEM INTERACTIONS	SCI.6-8.MS-LS2/ MS-ETS1		
	SYSTEMS AND ECOSYSTEMS			
	ABIOTIC FACTORS			
	BIOTIC FACTORS			
	ENERGY FLOW IN ECOSYSTEMS			
	REVIEW			



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TEXTBOOK B			ACTIVITY BOOK B	
UNIT	TOPIC	STANDARD	UNIT	TOPIC
6	THE UNIVERSE	SCI.6-8.MS-ESS1/ MS-ETS1	6	THE UNIVERSE
	WHAT IS THE UNIVERSE?		7	MATTER
	GALAXIES		8	FORCES
	STARS		9	WORK AND SIMPLE MACHINES
	THE SOLAR SYSTEM		10	ELECTRICITY AND CIRCUITS
	EXPLORING SPACE			
	REVIEW			
7	MATTER	SCI.6-8.MS/LS/PS/ MS-ETS1		
	WHAT IS MATTER?			
	CHANGES IN MATTER			
	MIXTURES AND SOLUTIONS			
	REVIEW			
8	FORCES	SCI.6-8.MS-PS/ MS-ETS1		
	WHAT IS A FORCE?			
	CONTACT FACTORS			
	NON-CONTACT FACTORS			
	LAWS OF MOTION			
	REVIEW			
9	WORK AND SIMPLE MACHINES	SCI.6-8.MS-PS/MS-ETS1		
	WHAT IS WORK?			
	SIMPLE MACHINES			
	COMPOUND MACHINES			
	REVIEW			
10	ELECTRICITY AND CIRCUITS	SCI.6-8.MS-PS/ MS-ETS1		
	WHAT IS ELECTRICITY?			
	ELECTRIC CIRCUITS			
	ELECTROMAGNETS			
	REVIEW			



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PHYSICAL SCIENCE

MS.Structure and Properties of Matter

MS.Chemical Reactions

MS.Forces and Interactions

MS.Energy

MS.Waves and Electromagnetic Radiation

LIFE SCIENCE

MS.Structure, Function, and Information Processing

MS.Matter and Energy in Organisms and Ecosystems

MS.Interdependent Relationships in Ecosystems

MS.Growth, Development, and Reproduction of Organisms

MS.Natural Selection and Adaptations

EARTH AND SPACE SCIENCES

MS.Space Systems

MS.History of Earth

MS.Earth's Systems

MS.Weather and Climate

MS.Human Impacts

ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE

MS.Engineering Design



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PHYSICAL SCIENCE

MS. Structure and Properties of Matter

- MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.** [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete description of all individual atoms in a complex molecule or extended structure is not required.]
- MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.** [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]
- MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.** [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawing and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

MS. Chemical Reactions

Students who demonstrate understanding can:

- MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.** [Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.] [Assessment boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.]
- MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.** [Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.] [Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]
- MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*** [Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.] [Assessment Boundary: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.]

MS. Forces and Interactions

- MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.*** [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.]
- MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.** [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]



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MS-PS2-3. **Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.** [Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.] [Assessment Boundary: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.]

MS-PS2-4. **Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.** [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.] [Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.]

MS-PS2-5. **Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.** [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.] [Assessment Boundary: Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.]

MS.Energy

MS-PS3-1. **Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.** [Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.]

MS-PS3-2. **Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.** [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]

MS-PS3-3. **Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.*** [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]

MS-PS3-4. **Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.** [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]

MS-PS3-5. **Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.** [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary: Assessment does not include calculations of energy.]

MS.Waves and Electromagnetic Radiation

MS-PS4-1. **Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.** [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.]



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- MS-PS4-2.** **Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.** [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]
- MS-PS4-3.** **Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.** [Clarification Statement: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.] [Assessment Boundary: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.]

LIFE SCIENCE

MS.Structure, Function, and Information Processing

- MS-LS1-1.** **Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.** [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]
- MS-LS1-2.** **Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.** [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]
- MS-LS1-3.** **Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.** [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]
- MS-LS1-8.** **Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.** [Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]

MS.Matter and Energy in Organisms and Ecosystems

- MS-LS1-6.** **Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.** [Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] [Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.]
- MS-LS1-7.** **Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.** [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]
- MS-LS2-1.** **Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.** [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]



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MS-LS2-3. **Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.** [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]

MS-LS2-4. **Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.** [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

MS.Interdependent Relationships in Ecosystems

MS-LS2-2. **Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.** [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

MS-LS2-5. **Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*** [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]

MS.Growth, Development, and Reproduction of Organisms

Students who demonstrate understanding can:

MS-LS1-4. **Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.** [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

MS-LS1-5. **Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.** [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] [Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]

MS-LS3-1. **Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.** [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]

MS-LS3-2. **Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.** [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

MS-LS4-5. **Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.** [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]



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MS.Natural Selection and Adaptations

- MS-LS4-1.** Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]
- MS-LS4-2.** Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]
- MS-LS4-3.** Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]
- MS-LS4-4.** Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]
- MS-LS4-6.** Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

EARTH AND SPACE SCIENCES

MS.Space Systems

- MS-ESS1-1.** Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]
- MS-ESS1-2.** Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).] [Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.]
- MS-ESS1-3.** Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.] [Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies.]

MS.History of Earth

- MS-ESS1-4.** Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old



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(such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] *[Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]*

MS-ESS2-2.

Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. *[Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]*

MS-ESS2-3.

Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. *[Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]*

MS.Earth's Systems

MS-ESS2-1.

Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. *[Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]*

MS-ESS2-4.

Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. *[Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]*

MS-ESS3-1.

Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. *[Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]*

MS.Weather and Climate

MS-ESS2-5.

Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions. *[Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]*

MS-ESS2-6.

Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. *[Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]*

MS-ESS3-5.

Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. *[Clarification Statement: Examples of factors include human activities (such as fossil fuel*



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combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity).

Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

MS.Human Impacts

- MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.** [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]
- MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*** [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]
- MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.** [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE

MS.Engineering Design

- MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.**
- MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.**
- MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**
- MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**