Appendix 15B: Grade 4 Science Item Descriptions Developed During the TIMSS 2019 Benchmarking

Items at Low International Benchmark (400)	
Life Science	
S06_01	Recognizes an animal that has a backbone
S10_01	Identifies 4 or 5 of 6 animals as birds, insects, mammals, or reptiles (1 of 2 points)
Physical Science	
S04_10	Identifies the most likely material making up a spoon that gets hot sitting in a pot of boiling soup
Earth Science	
S04_12	Identifies natural resources used to grow plants

Items at Intermediate International Benchmark (475)	
Life Science	
S14_05	Explains why a plant kept by a window is healthier than a plant kept in a closed closet
S12_05	Identifies the characteristic used to sort animals into two groups
S04_01	Recognizes the function in common between a hedgehog's spines and snail's shell
S13_03	Analyzes a diagram to explain which flower will grow better
S01_01	Recognizes that in mammals, a male and female of the same kind are needed to reproduce
S11_06	Describes one way a polar bear's fur helps it survive (1 of 2 points)
S03_05	Describes how human heart rate changes during exercise

S06_04	States two reasons why a plant will not survive by analyzing given conditions
S05_04	States one reason why plastic objects in the ocean are dangerous for sea animals
S03_03	Recognizes a living thing that produces its own food (1 of 2 points)
S04_03	Identifies a predator and its prey
S09_02	States two things that plants need from their environment to make their own food
S13_04	Evaluates two diagrams to explain which environment is better for sharks
S10_02	Explains why a person should wash their hands before eating even if they do not appear dirty
S09_01	Recognizes why milk is important in a balanced diet
Physical Science	
S06_06	Recognizes the states of matter of three different materials
S09_08	Classifies materials as solids, liquids, or gases
S10_10	Recognizes an object that could be used to complete a circuit to light a bulb
S13_08	Identifies the best material to complete a circuit
S07_09	Using a model of a flashlight, identifies an object that can be used to complete an electrical connection
S08_08	Predicts what will happen to magnets in plastic and iron cups when the cups are turned upside down
S14_08	Identifies which of six objects can be picked up using a magnet
S10_07	Explains why a flashlight needs batteries in order to turn on
S12_07	Describes what will happen to the temperature of a table where it touches the bottom of a hot cup of tea
S04_07	Identifies the diagram that shows a circuit where a bulb will be lit

S11_10	Identifies why a bulb will not light in a model of an electric circuit
S07_08	Gives a reason why two objects of the same shape and size travel different distances after a push
S09_09	Explains why one object requires more force to start its motion than another
S02_10	Recognizes the best explanation for why a box on a cart is easier to pull than a box resting directly on the floor
S08_07	Recognizes the ramp that will make it easiest to move a heavy box onto a table
Earth Science	
S05_10	Matches each item in a list of Earth's landscape features to its description
S14_11	Recognizes the cause of the movement of sand dunes in a desert

Items at High International Benchmark (550)	
Life Science	
S02_01	Lists two living things and two nonliving things shown in a picture of a desert ecosystem
S02_03	Identifies characteristics that describe either a toy duck and a living duck or only a living duck
S06_02	Describes two ways that a mammal helps its young survive
S03_04	Recognizes a feature of how snakes eat
S01_05	Identifies a function of a plant's stalk by interpreting an observation from an investigation
S02_02	Identifies the human organ with the same function as a fish's gills
S11_03	Completes a diagram describing the stages in the life cycle of a flowering plant
S12_01	Orders the life stages of a butterfly within a diagram

S08_04	Identifies the process that must have occurred in a strawberry plant from two pictures of the plant taken four weeks apart
S14_02	Recognizes another life stage of a caterpillar
S04_05	Identifies the characteristics that a female rabbit's mate must have
S10_05	Recognizes a characteristic of a seedling that will show whether it is a fir tree or a cherry tree
S08_02	Identifies the picture showing the seedling form of an adult plant
S02_06	Describes how holding its tail over its head helps a ground squirrel survive in hot, dry environments
S05_03	Recognizes an advantage of thin, pointed leaves compared to broad, flat leaves
S11_04A	Interprets data from an investigation to recognize the best condition for growing plants
S09_03	Identifies a reason that some mammals pant on hot days
S11_05	Relates factory pollution to its effect on farm fields
S14_01	Identifies which of six animals could live in a desert
S02_04	Explains how an increase in the number of bats in an area could lead to a decrease in the number of insects
S03_02	Uses a list of living things in an Arctic ecosystem to complete a food chain
S08_03	Completes a food chain using three given animals
S06_03A	Uses a food web to identify what a predator eats
S05_05	Provides a possible reason why some trees in a group do not grow as well as others
S01_02	Explains that germs can be transmitted even when people do not appear to be sick
S04_06	Describes how germs can still spread if a person covers their mouth with their hands when they cough
S12_02	Explains how one way of eating ice cream exposes a person to fewer germs than another way of eating ice cream

S09_06	Recognizes a way to avoid spreading the flu
Physical Science	
S05_07	Describes a difference between ice and water in addition to their physical states
S11_07	Identifies a physical property of metal pot that makes it good for boiling water
S01_09	Using a diagram, identifies which hidden object could complete an electric circuit
S01_07	Observes that two metal bars repel and determines whether they are magnets
S12_10	Identifies an explanation for why magnets push against each other when they are brought together
S03_06	Identifies a way to sort objects containing metals
S10_08	Recognizes a pair of carts carrying magnets that will move away from each other
S03_08	Recognizes what happens to the water when a puddle of water on a metal tray becomes smaller
S11_09A	Explains why boiling decreases the amount of water in a container
S11_09B	Predicts the effect on a cold window glass of boiling water nearby
S07_06	States a reason for the color change and surface roughening of a metal object over time
S03_10	Explains why pressing a guitar string stops the sound
S05_09A	Identifies from a diagram how a shadow is formed
S03_07	Analyzes a diagram to identify one way to make a shadow bigger
S04_09	Identifies a graph showing the relationship between increasing the force used to hit a drum and the loudness of the drum's sound
S01_08	Explains that heat in a metal object reaches the nearest point soonest
S12_08	Recognizes the energy change occurring in a circuit with a battery and a lightbulb

S14_09	Explains which of two circuits will have a lit bulb
S02_09	Recognizes the energy change that occurs when a flashlight is turned on
S14_07	Recognizes the energy change that occurs in an electric iron
S08_10	States the force that causes a skydiver and a book to fall
S14_10	Recognizes the force that makes it more difficult to move a sofa on a rug than on a wood floor
S02_08	Recognizes the force that causes a skydiver to fall to Earth
S12_06	Identifies the force that makes an open parachute fall more slowly than a crumpled parachute
S08_09	Identifies a description of how a pulley makes it easier to move a heavy box
Earth Science	
S08_11	Recognizes what covers most of Earth's surface
S14_12	Recognizes the best way to replenish a forest from which wood is taken
S12_12	Explains what a fish fossil reveals about the history of a desert area
S08_12	Interprets data in a table to identify which of two locations is a desert and explains reasoning
S06_10A	Interprets information from a graph to recognize which crops will grow best in an area with given precipitation
S03_12	Recognizes which step in a diagram of a water cycle shows evaporation
S11_01	Recognizes which place is likely to have weather that is hot and wet
S01_11	Recognizes that the solar system is made up of the Sun and its planets
S03_11	Using two pictures of the same location, explains that the Moon can look different at different times
S10_13	Recognizes pictures of shapes the Moon can have

S12_13	Identifies a diagram that represents the Solar System
S07_11	Recognizes a feature of the Moon from observations over a month
S11_02	Recognizes seasons north and south of the Equator
S04_11	Interprets a diagram of the Sun and the Earth to identify the season in a labeled city

Items at Advanced International Benchmark (625)	
Life Science	
S01_04	States two things in addition to water that animals need to survive
S05_01	States one difference between living things and nonliving things
S10_01	Identifies 6 of 6 animals as birds, insects, mammals, or reptiles (2 of 2 points)
S07_01	Recognizes the function of muscles attached to bones
S07_05	Draws a conclusion by relating one function of feathers to keeping a body warm in the case of dinosaurs
S03_01	Recognizes the plant part that produces seeds
S09_04	Identifies a difference in the life cycles of a grasshopper and a butterfly
S04_04	States either an advantage for a dandelion to make many seeds or an advantage for a dandelion to make light, fluffy seeds (1 of 2 points)
S07_03Z	Recognizes whether labeled features of a bird are inherited
S12_03	Identifies an explanation for why laying many eggs is helpful for insects' survival
S01_03B	Identifies a desert plant and describes one feature that helps it survive in the desert
S10_04	States why it is better for a lemur to sit in the sun with its arms outstretched rather than at its sides in order to get warm

S11_06	Describes two ways a polar bear's fur helps it survive (2 of 2 points)
S07_04	Evaluates three experimental designs and explains which is best to test if plants need light to grow
S08_06	States one way that the human body reacts to cold temperatures
S11_04B	Identifies a conclusion about plant growth using data from an investigation
S10_06	Recognizes the ecosystem where a set of living things is most likely to be found
S02_05	Recognizes how a Venus flytrap differs from most other plants
S09_05	Predicts the consequences of removing a predator from an animal's habitat
S12_04	Explains why the number of mice in a town increased after trees were cut down
S10_03	Identifies the food chain that best shows how energy is transferred from the Sun to an owl
S06_03B	Uses a food web to determine which animals are competitors
S13_02	States two ways to avoid catching illness in a crowded space
S13_05	Describes how boiling water makes it safe to drink
Physical Science	
S13_06	Recognizes one property of a liquid
S01_06	Identifies that two objects of the same size and shape have the same volume and, from a diagram, that they have different masses
S06_08	Explains how to separate a mixture of two types of solids of different sizes
S09_07	Predicts which of two objects is a better conductor of heat with supporting explanation
S11_08A	Evaluates the best way to separate a mixture of solids of similar size
S05_08	Identifies that the temperature at which an object melts depends on the material from which it is made

S11_08B	Evaluates the best way to separate a mixture of things that dissolve and things that do not dissolve
S04_08	Predicts how a train car with a magnet attached will move when another train car with a magnet attached is brought towards it
S02_07	Recognizes a change in which the materials in objects stay the same
S06_09A	Recognizes set-ups that will more quickly dissolve a solid in water
S06_09B	Explains the importance of controlling a variable in an experiment
S13_07	Evaluates the best set-up to investigate whether temperature affects the rate at which a solid dissolves in water
S14_06	Identifies a statement describing the change that occurs when water boils
S10_09	Identifies conclusions that are supported by the results of an experiment during which a gas is collected in a balloon
S05_09B	Recognizes that a shadow produced in colored light is black
S09_10	States one form of energy present in a model of an electric circuit (1 of 2 points)
S13_09	Recognizes a diagram that demonstrates motion due to gravity
Earth Science	
S01_10	Identifies the diagram that shows relative amounts of water and land on the Earth's surface
S02_11A	States one advantage of farming near a river
S02_11B	States one disadvantage of farming near a river
S05_11	Identifies how fish fossils are formed
S09_12	From pictures of rock formations, identifies how a given rock may have looked long ago
S10_12	Identifies the best explanation for finding a tropical plant fossil in a cold region
S13_10	Relates two different environments and weathering effects on rocks

S13_12	Interprets information from temperature graphs to identify which of two places has certain climate properties
S06_10B	Synthesizes precipitation information from a graph and diagram to recognize the best area to plant a crop in a given climate
S07_10	Identifies that clouds are made of water droplets
S09_11	Recognizes a diagram showing the correct relative positions of the Earth, Moon, and Sun
S02_12	Places the Earth in a model to show its position relative to the Sun when a labeled city is experiencing summer
S07_12	Interprets a diagram of the Earth and the Sun to describe how Earth turning on its axis causes day and night in a particular location
S08_13	Identifies a picture of a tree and its shadow in the afternoon based on a picture of the tree and its shadow in the morning
S12_11	Interprets a diagram of a man and his shadow to identify the Sun's relative position when his shadow will be shorter

Items Above Advanced International Benchmark (625)	
Life Science	
S04_02	Identifies which of four animals have backbones
S07_02	Recognizes the main function of leaves on a plant
S04_04	States both an advantage for a dandelion to make many seeds and an advantage for a dandelion to make light, fluffy seeds (2 of 2 points)
S14_04	Explains why a single elephant calf has a better chance of survival than a single frog egg
S01_03A	Explains that to test the survival of plants, they should be compared under different conditions
S05_06	Identifies that more use of public transportation will decrease air pollution in a large city
S03_03	Recognizes a living thing that produces its own food and describes the process (2 of 2 points)
S08_05	Identifies the animal that competes with giraffes for food

Physical Science	
S07_07	Explains why a metal spoon in hot soup feels hotter than a wooden spoon in hot soup
S06_07	Explains the process by which wet objects become dry
S03_09	States one source of energy other than sunlight that can be changed into electricity
S09_10	States two forms of energy present in a model of an electric circuit (2 of 2 points)
Earth Science	
S13_11	Recognizes four true statements about recycling metals
S14_13	Explains one benefit of using sunlight or wind to produce electricity compared to oil or natural gas
S10_11	Interprets data in a table to identify the place where is it most likely to rain