Appendix 15D: Grade 8 Science Item Descriptions Developed During the TIMSS 2019 Benchmarking

	Items at Low International Benchmark (400)
Biology	
S11_04	Describes one characteristic of mammals that is advantageous for survival in cold weather (1 of 2 points)
S01_01	States one reason why male penguins' incubation behavior helps their eggs survive (1 of 2 points)
S13_01B	Uses a food web to identify which organisms eat only plants
Chemistry	
S10_10	Identifies the form of wood that will burn fastest based on its size (1 of 2 points)
Physics	
S11_15	Recognizes whether an electromagnet would attract objects made of various materials
Earth Science	
S10_15	

S13_04	Recognizes the functions of 2 of 4 tissues found in the human stomach (1 of 2 points)
S06_02	States one substance plants obtain from their environment and use in photosynthesis (1 of 2 points)
S09_03	Recognizes characteristics inherited by rabbits in a given context
S05_03B	Reasons how a crocodile's angle of vision helps it to survive in the environment
S14_05	Identifies the rock layer containing the oldest fossils and justifies the choice
S10_05	Places four organisms in a model of an energy pyramid
S13_01A	Uses a food web to identify which organisms are producers
S08_01	Identifies the best description of the advantages to bird and crocodile in the symbiotic relationship formed when a bird picks food from around a crocodile's teeth
S05_02	Analyzes information about an ecosystem and explains the effect of introducing a new population
S04_04	Explains how reducing the number of vehicles in a city center affects air quality
S07_01A	Recognizes the agent that causes influenza
S14_02	Identifies diseases associated with 4 of 4 human behaviors
Chemistry	
S07_05Z	From a list of symbols and formulas, recognizes which are elements and which are compounds
S01_07	Applies knowledge of concentration to explain why one solution is paler than another solution
S12_09	Explains that volume is one factor that can be used to identify the solution with a higher concentration of solute (1 of 2 points)
S07_07	Recognizes an everyday occurrence that is an example of a chemical change
S03_01	Recognizes a chemical process that involves the absorption of light

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S10_08	Identifies a necessary property for a liquid in a thermometer
S04_08B	States one variable to hold constant when investigating reactivity of different types of steel with water (1 of 2 points)
S07_10	Explains the effect of temperature on diffusion in the context of an investigation
S11_07	Uses data in a table to order set-ups according to the rate at which a solute will dissolve in water
S05_07	Recognizes a property that is common to both acids and bases
S05_08	Recognizes which process makes bronze dark and dull over time
S13_11	Explains whether a reaction between two solutions in a given context can occur a second time
S08_08	Interprets a diagram to identify the number of hydrogen atoms present before a chemical reaction
Physics	
S08_12	States that the amount of a substance present in its liquid form and present in its solid form is the same (1 of 2 points)
S02_11	Recognizes steps that should be taken to ensure an experiment will show whether iron or copper is the better conductor of heat
S09_05	Relates knowledge of heat transfer to recognize a graph that shows how two substances eventually reach temperature equilibrium
S13_07	Recognizes whether a red object will absorb or reflect different colors of light
S02_13	Applies knowledge of sound transmission to explain whether a ringing cell phone in a vacuum can be heard outside the vacuum chamber
S06_07	Recognizes which graph represents a musical note with given specifications for volume and pitch
S01_09B	Explains that in a parallel arrangement of two bulbs, one bulb failing does not affect the other bulb
S08_14	Recognizes for 5 statements about magnets whether they are true or false
S01_10	Recognizes the best explanation of why two bar magnets repel each other
S04_12	States the force represented by an arrow in a diagram of a falling object

S01_11A	Uses information in a table with characteristics of planets to identify the planet with the shortest day length
S04_15	Recognizes a description of how the Sun produces its own light

Items at Advanced International Benchmark (625)

Biology S02_05A Classifies 7 of 7 animals as mammals or nonmammals S10_06 States two biological differences between fish and mammals (2 of 2 points) Explains why the percentage of oxygen differs in inhaled and exhaled air and why the S14_04 percentage of nitrogen is the same in inhaled and exhaled air (2 of 2 points) Interprets a diagram to identify what happens to biceps and triceps when an elbow S07_02 bends S02_02 Recognizes where DNA replication takes place in an animal cell S06_04A Identifies two ways that plant and animal cells are similar (2 of 2 points) S06_04B States one way that plant and animal cells are different (1 of 2 points) S13_04 Recognizes the functions of 4 of 4 tissues found in the human stomach (2 of 2 points) Identifies an explanation for why plants in a tank with woodlice grow faster than plants in S10_04 a tank without woodlice S10_03 Identifies the tube containing two substances bacteria need for cellular respiration S12_06 Identifies how fermentation differs from typical cellular respiration S05_04 States one similarity between the life cycles of a bird and a frog S07_03 Recognizes a human characteristic that is acquired States two reasons why male penguins' incubation behavior helps their eggs survive (2) S01_01 of 2 points)

S05_03A	Justifies a statement about crocodiles' adaptation to their environment, based on given facts
S03_04	Applies knowledge about the theory of evolution to identify the best conclusion supported by a diagram of limbs from different animals
S08_04	Identifies where the largest energy transfer occurs in an energy pyramid
S11_05	Recognizes an example of a symbiotic relationship between two organisms
S03_06B	Selects and evaluates data from a table to draw a conclusion about the likely reason for a change in population of a species
S14_06	States two ways that planting trees is beneficial for the environment
S12_02	Identifies a human activity that can increase the amount of nutrients in a pond
S14_07	Recognizes the function of white blood cells in the human immune system
S03_05	Selects and classifies 4 of 4 foods from a list that comprise a balanced diet (2 of 2 points)
Chemistry	
S04_07	States the subatomic particle that is not included in a diagram of an atom
S06_11	Recognizes what happens to the atoms in an object pounded flat
S09_08	Sr 4 0cpoint

S09_07	Recognizes an explanation for why a ball appears a certain color in a given context
S04_11	Uses a diagram to determine a position where an observer's shadow would not fall on a monument
S03_07	Recognizes which property of sound allows animals to navigate and find food
S14_13	Identifies a description of the relationship between sounds made by the longest and shortest bars on a xylophone
S01_09A	States one reason why a bulb in a diagram of an electrical circuit does not light
S08_13	Identifies the components that must be included in a circuit that will turn a bell on and off
S13_08	Indicates whether parts of a light bulb are electrical conductors or insulators
S01_09C	Recognizes a correct statement about battery life and bulb brightness in two given electrical circuits
S07_09	Recognizes how to increase the strength of an electromagnet
S08_11	States the two measurements needed to calculate average speed in an everyday context
S12_13A	Identifies the movement of a motorbike in a chronophotograph and explains how the chronophotograph reveals the motorbike's movement
S03_10	Identifies and explains which of three methods will require the smallest force to move a heavy box onto a truck
S12_12	Explains why a person slides down a waterslide faster when the water is turned on
S07_11	Applies knowledge about the relationship between depth and water pressure to recognize a conclusion about the pressure at different depths
Earth Science	
S05_12	States one condition below Earth's crust that can be inferred from volcanic eruptions
S03_11	Recognizes a major source of water for desalinization plants
S09_12	Recognizes the gas that makes up most of Earth's atmosphere
S02_14	Recognizes why a balloon gets bigger as its height above the ground increases

S09_14A	Recognizes the process that forms rock layers
S14_14	Recognizes climatic conditions that cause rock to erode the fastest
S03_13	Uses a diagram of a mountain range on the ocean and a given wind direction to recognize which location will have the greatest rainfall
S07_12	Recognizes the source of energy for the water cycle
S04_13	Identifies 7 of 7 activities as examples of reducing, reusing, or recycling (2 of 2 points)
S06_12	Describes one geographic factor to consider when selecting a safe location for a nuclear power plant
S07_13	Explains one way trees protect soil from erosion
S13_12	Recognizes a negative effect that fertilizer can have on the environment
S08_17	Recognizes the main cause of water level changes in a harbor over the course of 24 hours
S07_14	Justifies a claim that the Moon travels around the Sun

Items Above Advanced International Benchmark (625)

Biology	
S02_05B	States the biological characteristic used to distinguish vertebrates from invertebrates
S09_02	Recognizes 3 of 3 major organs in a diagram (2 of 2 points)
S06_04B	States two ways that plant and animal cells are different (2 of 2 points)
S06_02	States two substances plants obtain from their environment and use in photosynthesis (2 of 2 points)
S05_05	Identifies an explanation for disappearance of a trait over generations
S04_06	Identifies where the carbon in wood comes from

S08_06	Uses information in a table to explain why the abundance of two species in an ecosystem changed between two given years (2 of 2 points)
S03_06C	Predicts which species would best survive in a given environment, using information in a table, and provides a supporting explanation
S07_04	Explains how flooding leads to a shortage of drinking water and the spread of disease (2 of 2 points)
S07_01B	Explains how influenza can be spread rapidly around the world
Chemistry	
S13_10	Recognizes a true statement about neutral atoms
S09_08	Recognizes whether each of five substances is an element, a compound, or a mixture (2 of 2 points)
S04_08B	States two variables to hold constant when investigating reactivity of different types of steel with water (2 of 2 points)
S08_07	Evaluates whether a series of steps will separate a mixture of salt, sand, and iron
S02_08	Interprets information in a table to determine if 3 of 3 solutions are acidic, basic, or neutral
S02_09	Recognizes the reason for a temperature increase when an acid and base are combined
S04_09	Identifies and explains the solution that should be combined with an acidic solution to neutralize it
S11_08	Recognizes a property of a basic solution
S14_10	Predicts the color of flowers that are produced when peat moss is added to soil with a given pH
S13_09	Explains how painting a metal prevents rust from forming
S10_10	Identifies the form of wood that will burn fastest based on its surface area (2 of 2 points)
Physics	
S07_08	Recognizes the property of a gas in a dented ping pong ball that stays constant if the ball is heated
S09_09	Explains how a substance can be in two different states in a container at es0.8 all thnt

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