

TIMSS 2011

Eighth Grade Science Item Descriptions developed during the TIMSS 2011 Benchmarking

Items at Low International Benchmark (400)

Biology

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| S02_01 | Recognizes that genetic material is inherited from both parents |
| S12_01A | Recognizes that influenza is caused by a virus |

Chemistry

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| S06_01 | Recognizes the chemical formula of carbon dioxide |
| S06_07 | Recognizes a material that would complete an electric circuit |
| S11_06 | Recognizes a material that best conducts both heat and electricity |

Physics

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| S09_06 | Recognizes the form of energy in a compressed spring |
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Earth Science

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| S01_13 | Identifies from a list of common materials which material breaks down fastest |
| S04_12A | Recognizes what moves water from an artesian basin to the surface |

Items at Intermediate International Benchmark (475)

Biology

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| S01_02 | Explains that an acquired characteristic cannot be passed onto the next generation |
| S02_02 | Recognizes from a diagram showing rock layers, that the fossils found in the deepest layers are likely the oldest |
| S03_01 | Interprets a graph showing changes in pulse rates before, during, and after exercise and recognizes what can be concluded from the graph |
| S07_01 | Recognizes which cells destroy bacteria that enter the body |
| S07_04 | States why exercise is important for good health |
| S08_02 | Analyzes information about a lake ecosystem and explains how an introduced population can effect an existing population |
| S09_01 | Recognizes how vaccination helps prevent illnesses |
| S09_05A | Based on data in a table, describes the changes in the populations of two organisms over time |
| S10_01 | Recognizes which living thing has growth rings |
| S10_04 | Recognizes from a list of foods which is the best source of calcium |
| S10_05A | Recognizes why fish eat mosquito larva but not adult mosquitoes |

S11_01	Recognizes an organism that is a producer
S11_05C	Recognizes an advantage for a species of butterfly to resemble another species that is toxic to birds

Chemistry

S02_08	Recognizes that a fire can be stopped by cutting off the oxygen
S06_05	Recognizes from a description of indicator color changes that neutralization has occurred
S11_04	In the context of an investigation, identifies the condition under which nails would rust most
S11_08	Identifies which of two solutions is more dilute and justifies the selection
S14_07	Applies knowledge of concentration to explain why one solution is paler than another solution

Physics

S03_12C	Draws a conclusion from a line graph showing the results of an investigation into the relative efficiency of two heat sources
S04_11	Recognizes the placement of a fulcrum that requires the least amount of force to move an object
S13_10A	Given a diagram showing a ball being thrown upwards, states the force that causes the ball to fall

Earth Science

S03_13	Recognizes where active volcanoes are most likely to be found
S07_10	Given a starting point, orders the processes involved in the water cycle
S07_11	Recognizes which soil change is due to a natural cause rather than human activity
S09_09	Recognizes that carbon dioxide is increasing in Earth's atmosphere
S09_13	Matches each of four processes that take place in the water cycle with the description of the process
S11_13	Describes a cause of earthquakes
S11_14	Recognizes that day and night is caused by Earth rotating on its axis
S14_12	Recognizes that air temperature at high altitudes is very low

Items at High International Benchmark (550)

Biology

S01_03	Explains how snail coloration allows it to blend into its surroundings (camouflage)
S02_04	Recognizes which food diabetics should be careful about eating
S02_05	Justifies whether or not planting trees to decrease the amount of carbon dioxide in a city is a good decision
S03_02	Recognizes that the first organisms that appeared on Earth lived in water
S03_05A	From a graph showing the population changes over time of two organisms, identifies the time when the population of one of the organisms is at its highest
S05_04	States one function of the uterus
S05_11A	Selects the relevant information about two countries from a table, and predicts how their population will change over time
S06_06	Using a graphical representation of the results of an investigation, describes the relationship between carbon dioxide concentration and rate of photosynthesis
S07_02	Interprets graph showing a sudden drop in the size of a population of an organism and recognizes the factor that is most likely to have caused this sudden drop
S08_01	Recognizes which food is the best source of carbohydrates
S08_03B	States how a crocodile's wide angle of vision helps it to survive in its environment
S09_05B	Based on data in a table, concludes that there is a population decline and then gives an explanation for the population decline

S10_02	Recognizes how puffing their feathers helps birds in cold weather
S10_05B	Analyzes information about a pond ecosystem and explains that an increase in a predator population can affect all life stages of a prey population
S12_02	Recognizes what happens to biceps and triceps when an elbow bends
S13_02	Classifies animals in a list into two groups on the basis of a physical or behavioral characteristic and states the characteristic used
S13_04A	Indicates in a table which gas is released into the air and which gas is removed from the air during animal respiration
S13_04C	Indicates in a table which gas is released into the air and which gas is removed from the air during photosynthesis
S14_03	Recognizes how decomposers get their energy
S14_04	Given a food chain, explains which organism competes most with humans
S14_05	For pairs of animals, recognizes predation or competition relationships

Chemistry

S01_05	Explains what causes a balloon to inflate when sodium bicarbonate in the balloon mixes with vinegar
S02_07	Identifies substances as metals based on their physical properties
S03_06	Given the chemical formula for sulfuric acid, completes a table to show the number of atoms of each element in a molecule of the acid
S04_05	Recognize a property of most nonmetals
S05_05	Recognizes which diagram best represents the structure of water molecules
S06_11	Recognizes a chemical process involving energy absorption
S07_06	Identifies a property of metals and describes how this property can be used to determine whether an unknown substance is a metal or nonmetal
S08_06	From a table of densities, identifies and explains which substance will float on water
S08_08	Recognizes which process makes bronze dark and dull over time
S09_08B	In the context of an investigation about the gold content of jewelry, selects information from a table of properties of gold alloys to complete a table relating the density of alloys to number of carats and percentage of gold in each piece of jewelry
S09_08C	In the context of an investigation about the gold content of jewelry, uses previously selected information and follows an example to calculate the mass of gold in jewelry
S10_07	From a table of melting and boiling points of three substances, identifies the state of each substance at a given temperature
S10_09	Recognizes an everyday activity that is a chemical process releasing energy
S12_05	From a list of symbols and formulas, recognizes which are elements and which are compounds
S12_07	Recognizes an everyday occurrence involving chemical change

Physics

S01_14	Recognizes what happens to gas molecules when temperature increases
S03_10	Recognizes what happens to molecules of a liquid as the liquid cools
S08_10	Given the density of two objects and three liquids, and diagrams showing the objects floating or sinking in the liquids, identifies each liquid
S09_12	Explains that there are forces acting on students sitting on a wall
S10_10	Recognizes the orientation of a hidden mirror given rays of light reflecting
S11_07	Using a table showing the speed of sound through different media and knowledge of the state of each medium, recognizes a conclusion that may be drawn about the relative speed of sound
S11_09	Recognizes why a helium balloon rises into the air
S11_12	Explains why lightning is seen before thunder is heard during an electrical storm
S12_09	Recognizes how to increase the strength of an electromagnet
S12_10	In the context of an investigation, explains the effect of temperature on diffusion

S12_11	Applies knowledge about the relationship between depth and water pressure to recognize a conclusion about the pressure at different depths
S13_07	Recognizes the pathway of light required for an object to be seen
S13_08	Recognizes the everyday object most likely to be used as a lever
S14_09B	Explains that in a parallel arrangement of two bulbs, one bulb failing does not affect the other bulb
S14_10	Recognizes the best explanation of why two bar magnets repel each other

Earth Science

S01_10	Recognizes the main difference between planets and moons
S01_12	States one way a volcanic eruption impacts the environment
S02_12	Recognizes how holes in some volcanic rocks were formed
S05_09	Recognizes the major cause of tides
S05_10A	Interprets a contour map to recognize a topographical representation of a mountain top
S06_17	States two factors related to the water cycle (evaporation, transportation, and condensation) to explain how water from the sea ended up as rain on land
S08_13	Recognizes from a graph of average monthly temperature which city is most likely to be located at the equator
S10_13	Recognizes which energy source is non-renewable
S13_14	Recognizes a consequence of the gravitational pull of the moon on Earth
S14_11A	From a table of planetary data, and using knowledge about the relation between rotation and day length, recognizes which planet has the shortest day length

Items at Advanced International Benchmark (625)

Biology

S01_06	Recognizes a way to provide the body with long-term immunity
S02_03	Recognizes which described experiment would show that water travels through a plant into the air
S03_03	Applies knowledge of competition to explain the importance of removing weeds from a field where crops are sown
S03_04	States a life function of a single-celled organism, other than taking in nutrients to produce energy
S03_05B	Interprets a graph showing the population changes of two organisms over time and describes how the changes in population sizes are related
S04_01	Recognize the function of shivering
S04_03B	In the context of an investigation about cellular respiration, identifies the gas produced and its source
S04_04	Applies knowledge about heredity to explain why offspring have traits like their parents
S05_01	Identifies the criterion used for classifying animals into two groups
S05_02	Recognizes the definition of an organism that is a producer
S05_11C	Given a table showing demographic data and data on grain production and oil consumption for two countries, predicts how a change in population in each country will affect pollution over the next 10 years
S06_02	Recognizes the function of a labeled part of a plant cell
S06_03	Recognizes an organ in a frog that has a function similar to that of lungs
S07_03	States that light is the environmental factor that has an effect on pupil size and identifies the diagram that illustrates the effect
S07_13	Recognizes the likely cause of increased algae growth in a lake
S08_04	States one similarity of the life cycles of a bird and a frog
S08_05	Recognizes an explanation for disappearance of a trait over time
S09_02	Applies knowledge of ecosystems to explain why birds of prey cannot survive in an environment without plants

S09_03	Recognizes a function of the cell membrane
S10_03	Applies knowledge about the evolution of anatomical structures to recognize which conclusion is best supported by figures of limbs from different animals
S10_06	Recognizes pictures of organ systems
S11_02	Recognizes and describes an example of asexual reproduction
S11_03	Recognizes an organism in which oxygen and carbon dioxide are exchanged between air and blood through the skin
S11_05A	In the context of an observation of butterflies and plants, explains that the larval stage is the growth stage
S11_05B	In the context of an observation of butterflies and plants, explains that the egg or pupa is the development stage
S12_03	Recognizes a characteristic in humans that is acquired
S13_01	Recognizes a function shared by lungs, skin, and kidneys
S13_04B	Indicates in a table which gas is released into the air and which gas is removed from the air during plant respiration
S13_05	Using the equipment and materials shown in a diagram, describes an investigation to find out how fertilizer affects the growth of plants
S14_01	States two reasons why male penguins' incubation behavior helps their eggs survive
S14_02	Recognizes an organism that is made up of cells with cell walls

Chemistry

S01_04	Recognizes the graph that most likely shows the effect of temperature on the solubility of sugar in water
S02_06	Recognizes what happens to atoms in an object if the shape of the object changes
S02_09	Recognizes the property of water that has the most effect on splitting a rock
S03_08	Recognizes the definition of a compound
S03_11	Describes two things that might be observed as a chemical reaction takes place
S04_06	Recognizes the reason for the difference in taste between distilled and drinking water
S04_07	Identifies which everyday liquids do and do not neutralize a base
S07_05	Recognizes the diagram that best represents the hierarchy in the particulate structure of matter
S08_07	Recognizes a property that is common to both acids and bases
S09_08A	In the context of an investigation about the gold content of jewelry, describes the measurements to be taken using a graduated cylinder and water to find the volume of the jewelry
S11_10	Applies knowledge of conservation of mass during a neutralization reaction to explain what happens to mass when new substances are formed
S11_11	Applies knowledge of density to explain why oil floats on water
S12_06	Identifies an element as a metal or a nonmetal based on some physical properties and predicts one additional property
S13_06	Recognizes a mixture
S13_09	Applies knowledge of expansion of water during freezing to explain why a bottle full of water cracked when it was left in a freezer
S13_12	Applying knowledge of heat conduction, explains why ice will stay frozen in a wooden container longer than in a metal container
S14_08	Recognizes an everyday process that is an example of a physical change

Physics

S01_08	Recognizes why some railway tracks are laid down with gaps between lengths
S01_09	States what happens to the sound of a bell in a jar when air is removed from the jar and explains why
S02_10	Given the densities of two liquids and an object, explains in which liquid the object will float
S02_11B	In the context of water flowing from a tank to a water wheel, states the kind of energy the water has just before it hits the wheel

S02_11C	In the context of water flowing from a tank to a water wheel, states one change to the system that will make the wheel rotate faster
S03_09	Given two metal bars, one of which is a magnet, describes how to use the magnet to determine if the other metal bar is a magnet
S03_12A	Recognizes where to place a thermometer in a liquid to take a reading while conducting an investigation
S03_12B	In the context of an investigation into the relative efficiency of two heat sources, identifies a variable that was controlled
S04_08	Given two unknown samples and using knowledge that only gases fill the available space, recognizes a statement about the spacing of particles in the samples
S04_09	Applies knowledge of heat transfer to recognize the outside temperature of containers made of materials with different thermal properties
S05_08	Identifies the process by which heat is transferred along a metal rod
S06_08	From a description of an investigation about magnets, recognizes how the strength of a magnet is defined in the investigation
S06_12	Identifies from a list of five characteristics or properties at least four that change or remain the same as a liquid changes into a gas
S06_13	Explains why an unwrapped block of ice will melt faster than a block of ice wrapped in newspaper
S06_14	On a diagram of a person looking through a periscope, draws the path and direction of a light ray through the periscope
S07_09	Recognizes that the force of gravity acts on a person regardless of position and movement
S08_09	Recognizes why gases are easier to compress than solids and liquids
S09_07	Interprets a diagram and describes the direction of heat flow in metals
S09_11	Describes a way to distinguish between fresh water and salt water, using two hot plates and without using a thermometer
S10_12	Explains the orientation of a rectangular block which exerts the greatest pressure on the ground
S14_09A	States one reason why a bulb in a diagram of a circuit does not light
S14_09C	Recognizes the correct statement about battery life and bulb brightness in two given circuits

Earth Science

S01_11	Given a diagram showing weather conditions at different elevations on a mountain, identifies the most likely location of a jungle
S02_13	States what fossil evidence would support the idea that two continents were once joined
S02_14	States one advantage of using the terracing method of farming
S04_12B	Recognizes the cause of a decrease in water flow in an artesian well over time
S04_12C	Explains why water from an artesian well can be hot
S05_10B	Draws the path and direction of a river from a mountain to a bay on a contour map
S07_12	Describes two changes in atmospheric conditions that occur with increasing elevation
S08_12	States one condition below Earth's crust which can be inferred from volcanic eruptions
S09_14	Recognizes what causes the moon to appear to change shape
S10_14	States two advantages for plants to have roots that go down into the subsoil
S10_15	Explains why an object's weight is less on the moon than on the Earth
S11_15	Recognizes how a shadow changes as the Sun moves
S11_16	Draws an arrow on a map to show the direction a river flows and explains why it flows in this direction
S12_12	Recognizes the source of energy for the water cycle
S12_13	Explains one way trees protect soil from erosion
S14_11B	Draws a conclusion about the distances of planets from the Sun from a table of their revolution times

Items Above Advanced International Benchmark

Biology

S01_01	Recognizes the purpose of cellular respiration
S04_02	Matches mammals, amphibians, fish, and birds to their characteristic features
S04_03A	In the context of an investigation about cellular respiration, interprets the role of parts of an experimental set-up to provide a controlled condition
S05_03	States two conditions needed for seeds to germinate
S05_11B	Given a table showing demographic data and data on grain production and oil consumption for two countries, predicts how a change in population in each country will affect land use over the next 10 years
S06_04	Recognizes the word equation that summarizes the process of respiration
S06_09	Designs an investigation to test a hypothesis about whether red and green peppers are produced by the same type of pepper plant
S08_03A	Explains how the fact that current crocodiles look like ancient crocodiles means they are well suited to their environment
S09_04	Recognizes an explanation for a change over time in a physical characteristic of an organism
S12_01B	Explains that influenza is spread rapidly around the world due to travel and person-to-person interaction
S12_04	Explains how flooding leads to a shortage of drinking water and the spread of disease
S13_03	Recognizes which organelle produces energy for the cell

Chemistry

S05_06	States one thing that could be observed that shows energy has been released during a chemical reaction
S06_10	Classifies six examples of matter as elements, compounds, or mixtures
S10_08	Given two proposed methods for separating a mixture of small pieces of two metals, identifies which method will work and which will not and explains why
S14_06	Given their chemical formulas, recognizes a compound with the same number of atoms as another compound

Physics

S01_07	Recognizes why a closed empty plastic bottle collapses when brought from a mountain top to a valley
S02_11A	In the context of water flowing from a tank to a water wheel, states the kind of energy the water has when it is in the tank
S03_07	Applies knowledge of condensation of water vapor to explain why a liquid appeared on the cool outside surface of a pitcher
S04_10	From a diagram of an object floating in different liquids, explains that the portion of the object which is submerged depends on the density of the liquid
S05_07	Interprets a circuit diagram with bulbs in parallel and in series to recognize a correct statement about current in the bulbs
S06_15	Recognizes in which medium light travels fastest
S07_07	Recognizes the sequence of energy conversions that takes place in a battery-operated flashlight
S07_08	Interprets a diagram showing air and water in a sphere attached to a U-tube and explains what will happen to the water level in the open tube when the air in the sphere is heated
S09_10	Recognizes what happens to the mass and volume of water when it freezes
S10_11	From a picture, recognizes the correct statement about the relative motion of an object seen from two frames of reference
S12_08	Recognizes the property of a gas in a dented ping pong ball that stays constant if the ball is heated
S13_10B	Recognizes that a falling ball will not bounce as high as the point from which it fell and explains why
S13_11	Calculates resistance from current and voltage

Earth Science

S03_14	Recognizes a diagrammatic representation of the sun, moon, and Earth during an eclipse of the moon
S08_14	Recognizes an explanation for the fact that a constellation visible one night is no longer visible six months later
S12_14	Explains that the moon travels around the Sun, referring to the moon orbiting the Earth and the Earth orbiting the Sun
