Oregon 8th Grade Science Assessment Specifications

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Science Test Specifications

Introduction

The primary purpose of Oregon's Test Specifications and Blueprints is to provide the consistency necessary for the development and administration of the Oregon Assessment of Knowledge and Skills (OAKS). OAKs provide critical data for Oregon's accountability system which meets Peer Review Requirements of the Elementary and Secondary Education Act. All Students in grades 3 through 8 are required to take the Smarter Balanced English Language Arts/Literacy and the Smarter Balanced Mathematics assessments. All students in grades 5 and 8 are required to take the science assessment. In high school, the Smarter Balanced English Language Arts/Literacy, Smarter Balanced Mathematics, and science are required assessments.

OAKS is also one way for students to demonstrate proficiency in the Essential Skills of reading, writing, and mathematics, which are necessary for earning a high school diploma. In addition, English Language Proficiency Assessment (ELPA) is required for non-English speaking students until they acquire sufficient skills in English to exit the program. Social Sciences is an optional assessment.

Test specifications provide guidelines for item writers, who are typically Oregon teachers, on what content may be tested and how items must be written. These specifications lead to test blueprints that outline test design and the number of questions to be tested in each score reporting category (SRC). The Test Specifications and Blueprints document is an important resource, not only for item writers and reviewers, but for educators administering OAKS and the general public who are interested in understanding the content and format of test items.

Background

The purposes of the Oregon Statewide Assessment Program are (1) to provide information on individual student achievement on performance standards set by the State Board of Education at grade and grade-group levels; (2) to provide information for federal ESSA requirements and for policy decisions by the legislature, the governor, the State Board of Education, and local school districts; (3) to support instructional program improvement efforts; and (4) to inform the public about student achievement in Oregon schools.

The Oregon Statewide Assessment is different from national norm-referenced tests used in many districts and states. The Oregon Statewide Assessment is a criterion-referenced assessment based on the Oregon Content Standards. As a result, the types of scores produced from the Oregon Statewide Assessment are somewhat different from those produced by national norm-referenced tests.

Oregon educators contribute to the test development and alignment process by serving on advisory committees called Content and Assessment Panels. Stakeholders in these committees are involved in each phase of the development of these specifications to assure that they accurately and clearly explain the overall design of the test and describe the specific content that might appear on the test to measure the knowledge and skills described in the content standards.

Oregon's knowledge and skills test questions use multiple choice and computer scored constructed response formats. Each multiple choice item has only one correct answer while

computer scored constructed response items may have many correct answers. A computer electronically collects and scores responses which are scored against the answer key to produce a raw score. The raw score is converted to a scale score called a Rasch unit or RIT score. Students receive a scale score based on the number of questions answered correctly compared to the total number of questions on the form—taking into account the difficulty of the questions. Students are not penalized for guessing.

The content of these specifications reflects the skill expectations outlined in the Content Standards adopted February 2009 by the State Board of Education. These standards were developed, in part, to correlate to the skills assessed on the science portion of the National Assessment of Educational Progress and align with the National Science Standards. As a result, Oregon uses similar terminology in its descriptions of the science subject score reporting categories (listed later in this document).

2018 Embedded Field Test

The 2018 OAKS Science Test will contain field test items aligned to the 2014 Oregon Science Standards (NGSS). These items are being tested for implementation in the 2019 OAKS Science Test and will not be utilized in any of the score reporting categories for 2018 OAKS Science Test. Total time on test is not expected to change.

Statewide and Local Assessments

Statewide assessments are multiple choice and computer scored constructed response tests of knowledge and skills that are developed and scored by the state. Local assessments include performance assessments that may be scored using statewide scoring guides that are administered and scored at the local level. Local assessments **are not included** in state accountability reports, e.g. Oregon Department of Education School and District Report Cards.

Electronic Administration

On the science knowledge and skills OAKS online tests, there are three opportunities to participate in fully-adaptive testing. In this format, the accuracy of the student responses to questions determines the next item or set of items the student will see.
Students are allowed to preview test questions if a set of questions link to a specific graphic or stimulus. Having the tests fully adaptive allows for more precision in measurement and less frustration for the students.

Electronic administration of the science test for each grade tested includes up to three test opportunities in English or English-Spanish formats. Students who need to have the test read to them may access the text to speech function of each test. The OAKS Online test delivery system allows students with visual impairments, who use Braille, to access the OAKS Online testing system. These students will have the same number of testing opportunities as other students and have access to the adaptive OAKS Online test. Paper- based Braille assessments will no longer be available. An online practice test of sample items is available for students who may need practice using a scrollbar, or who need practice with new item types.

The following pages contain a more detailed examination of the test content for science. The first column lists the content standard assessed for that particular score reporting category and academic vocabulary sometimes linked to that standard. The second column provides a description of the testable content and gives a more detailed explanation of how the standard will be assessed. Finally, the third column provides sample items that are very similar to the type of questions asked on a test related to that eligible content.

Core Standard 6.1 Structure and Function, Score Reporting Category 1/5

Living and non-living systems are organized groups of related parts that function together and have characteristics and properties.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.1P.1 Compare and contrast the properties of states of matter.

*Academic Vocabulary**

- displacement
- heterogeneous mixture
- homogeneous mixture
- reaction
- solution
- sublimation
- suspension

Links to National Standards

2009 NAEP Framework: P4.1, P4.3, P8.4-8.7

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Physical Properties

- State of matter, temperature, density, solubility, conductivity, magnetic, malleability, ductility, color, freezing and boiling points, etc.

Chemical Properties

- Flammability, corrosiveness, explosiveness, oxidation, etc.

Examples of science measuring tools

- Balance, metric ruler, beaker, graduated cylinder, thermometer, conductivity probe, etc.

Qualitative understanding of density

- E.g. heavy for its size

Content Connections from Previous Grades

3.1P.1, 4.2P.1

Sample Items

In order to be able to determine the density of an object's material, that has both physical and chemical properties, what MUST be known about the material?

A. Mass and volume
B. Weight and thickness
C. Length and width
D. Shape and volume

Answer Key: A

*Academic Vocabulary is a list of terms related to the content standard and may be used in test items without explanation. Vocabulary and concepts within the Explanation are assessable and not exclusive.

Core Standard 6.1 Structure and Function, Score Reporting Category 1/5

Living and non-living systems are organized groups of related parts that function together and have characteristics and properties.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.1P.2 Compare and contrast the characteristic properties of forms of energy.

*Academic Vocabulary**

- light
- properties

Links to National Standards

2009 NAEP Framework: P4.7-P4.10

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Qualitative descriptions of energy

- Mechanical, thermal, electro-magnetic, chemical, nuclear, electrical, sound

Kinetic energy

- Objects with kinetic energy (energy of motion) vs. potential energy (elastic, chemical, gravitational-stored energy).

Content Connections from Previous Grades

4.1P.1

Sample Items

Light is which type of energy?

A. Mechanical energy
B. Nuclear energy
C. Thermal energy
D. Electromagnetic energy

Answer Key: D

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Core Standard 6.1 Structure and Function, Score Reporting Category 1/6

Living and non-living systems are organized groups of related parts that function together and have characteristics and properties.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.1L.1 Compare and contrast the types and components of cells. Describe the functions and relative complexity of cells, tissues, organs, and organ systems.

*Academic Vocabulary**

- cell wall cellulose
- chloroplast/chlorophyll
- endoplasmic reticulum
- enzyme
- flagella
- mitochondria
- nucleus
- cytoplasm
- prokaryote / eukaryote
- organism
- ribosome
- Golgi bodies
- vacuole

Links to National Standards

2009 NAEP Framework: L8.1, L8.3

National Science Education Standards: Life Science Content Standard B, pgs. 155-158

AAAS Science Literacy Benchmarks

Explanation

Types of Cells

- Plant and animal cells have components (e.g. membranes, organelles) that are both similar and different.
- Plant and animal cells can be differentiated by some of their unique cell components.

Functions

- Certain cell functions are similar in all living things (reproduction, movement of materials in/out, etc.).
- Tissues, organs, and organ systems have specific functions.

Relative Complexity and Organization

- There are increasing levels of complexity from cell to tissue to organ to organ system.

Types of Organ Systems

- Endocrine, digestive, circulatory, nervous, muscular, reproductive, skeletal, etc.

Content Connections from Previous Grades

5.1L.1

Sample Items

Which of the following is different in a plant cell if compared to an animal cell?

A. The presence of a nucleus
B. The presence of a cell wall
C. The presence of proteins
D. The presence of ribosomes

Answer Key: B

In the human body, which system functions **primarily** to defend the body against disease?

A. Digestive
B. Immune
C. Nervous
D. Respiratory

Massachusetts Released Item #30 pg. 448

Answer Key: B

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Core Standard 6.1 Structure and Function, Score Reporting Category 1/7

Living and non-living things are organized in groups of related parts that function together and have characteristics and properties.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.1E.1 Describe and compare the properties and composition of the layers of the Earth.

*Academic Vocabulary**

- convection
- hydrosphere
- magma
- radiation

Links to National Standards

2009 NAEP Framework: E8.7-8.9

National Science Education Standards: Earth and Space Science Content Standard D, pgs. 158-161.

AAAS Science Literacy Benchmarks

Explanation

Composition, properties, and location of

- Crust
- Lithosphere
- Asthenosphere
- Mantle
- Outer Core
- Inner Core
- Atmosphere

Layers have different properties

- Composition
- Physical
- Chemical

Content Connections from Previous Grades

1.1E.1, 4.1E.1

Sample Items

Which is neither a solid nor a liquid layer of the Earth?

A. Asthenosphere
B. Core
C. Lithosphere
D. Crust

Answer Key: A

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Core Standard 6.1 Structure and Function, Score Reporting Category 1/7

Living and non-living systems are organized in groups of related parts that function together and have characteristics and properties.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.1E.2 Describe the properties of objects in the solar system. Describe and compare the position of the sun within the solar system, galaxy, and universe.

*Academic Vocabulary**

- meteor
- meteorite
- Oort cloud
- Kuiper Belt

Links to National Standards

2009 NAEP Framework: E8.1

National Science Education Standards: Earth and Space Science Content Standard D, pgs. 158-161

AAAS Science Literacy Benchmarks

Explanation

Size, location and composition of

- Planets
- Dwarf planets
- Moons
- Asteroids
- Meteoroid
- Comets

The Sun

- An energy source
- Located at the center of the Solar System
- A star located within the Milky Way galaxy

Universe

- Countless number of galaxies make up the universe
- Galaxies are made of many stars

Content Connections from Previous Grades

K.2E.1, 2.2E.1, 3.2E.1, 5.1E.1

Sample Items

Which of the following is a characteristic of an inner planet (Mercury, Venus, Earth, Mars)?

A. Have many moons
B. Have a rocky surface
C. Have rings
D. Are larger than outer planets

Answer Key: B

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Core Standard 6.2 Interaction and Change, Score Reporting Category 2/5

The related parts within a system interact and change.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.2P.1 Describe and compare types and properties of waves and explain how they interact with matter.

*Academic Vocabulary**

- diffraction
- reflect
- refract
- resonance

Links to National Standards

2009 NAEP Framework: P8.10

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Qualitative descriptions

- Wavelength, crest, trough, amplitude, frequency, period

Waves

- Different types of waves (e.g. seismic waves, sound waves, water waves, electromagnetic radiation)
- Properties of waves
- How waves are similar

Interactions

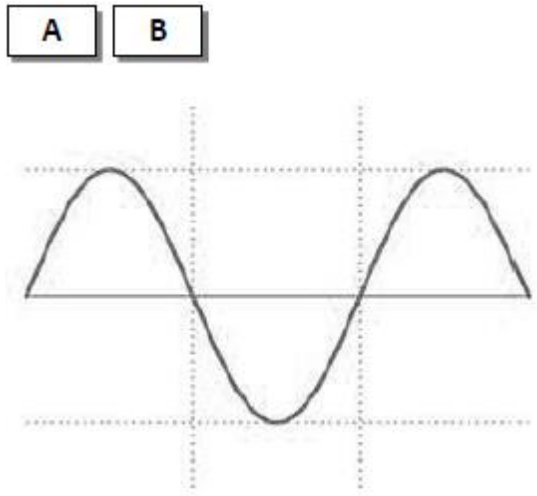
- Waves can travel through matter.
- Waves can be reflected.
- Waves can be refracted.
- Waves can change speed as they encounter different materials.
- Waves can combine to produce bigger waves.

Content Connections from Previous Grades

4.2P.1, 6.1P.2

Sample Items

The diagram below shows a wave diagram. Place the letter A where the crest of the wave is. Place the letter B where the trough of the wave is.



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Core Standard 6.2 Interaction and Change, Score Reporting Category 2/8

The related parts within a system interact and change.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.2P.2 Describe the relationships between: electricity and magnetism, static and current electricity, and series and parallel circuits.

*Academic Vocabulary**

- ampere (amp)
- conductivity
- electromagnetic field
- ohm
- open/closed circuit
- switch
- resistance
- voltage

Links to National Standards

2009 NAEP Framework: P4.11

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Relationships

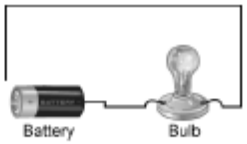
- Electricity and magnetism
- Static and current electricity
- Series and parallel circuits

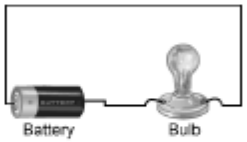
Content Connections from Previous Grades

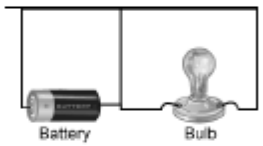
2.2P.1, 6.1P.2

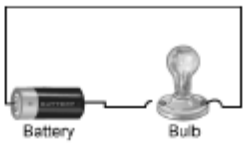
Sample Items

Which diagram bellow shows a circuit that will cause a bulb to light?

A.


B.


C.


D.


Massachusetts Release Item #3 pg. 410

Answer Key: B

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Core Standard 6.2 Interaction and Change, Score Reporting Category 2/5

The related parts within a system interact and change.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.2P.2 (Continued) Describe the relationships between: electricity and magnetism, static and current electricity, and series and parallel electrical circuits.

*Academic Vocabulary**

- ampere (amp)
- conductivity
- electromagnetic field
- ohm
- open/closed circuit
- switch
- resistance
- voltage

Links to National Standards

2009 NAEP Framework: P4.11

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Relationships

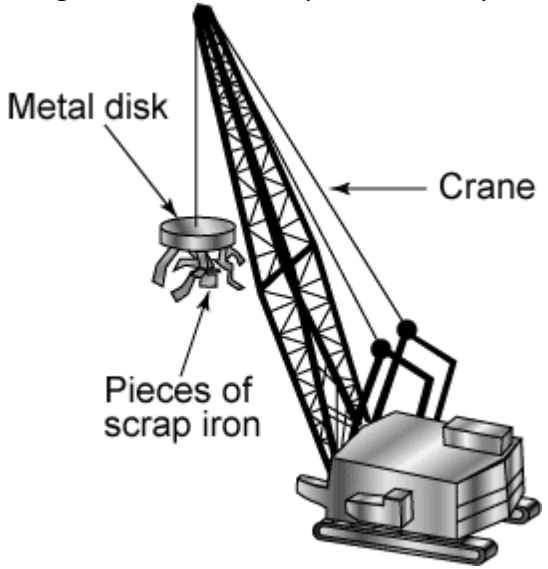
- Electricity and magnetism
- Static and current electricity
- Series and parallel circuits

Content Connections from Previous Grades

2.2P.1, 6.1P.2

Sample Items continued

The diagram below shows pieces of scrap iron being picked up by a metal disk hanging from a crane.



The pieces of scrap iron are attracted to the metal disk. The metal disk is most likely functioning as which of the following?

A. a battery
B. an engine
C. an insulator
D. an electromagnet

Massachusetts Released Item #1 pg. 411

Answer Key: D

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Core Standard 6.2 Interaction and Change, Score Reporting Category 2/6

The related parts within a system interact and change.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.2L.1 Describe the relationships and interactions between and among cells, tissues, organs, and organ systems.

*Academic Vocabulary**

- circulatory system
- digestive system
- endocrine system
- excretory system
- immune system
- muscular system
- nervous system
- reproductive system
- respiratory system
- skeletal system

Links to National Standards

2009 NAEP Framework: L8.1

National Science Education Standards: Life Science Content Standard C, pgs. 155-158.

AAAS Science Literacy Benchmarks

Explanation

Relationships

- Similar cells interact to form tissues that interact to form organs that interact to form organ systems.
- The various levels of organization can be described by their particular functions.

Interactions & Change

- Organ systems interact and change based on the activities of the organism (e.g. running increases respiration and circulation based on muscular needs).

Content Connections from Previous Grades

5.1L.1, 6.1L.1

Sample Items

Some students are taking part in a community running race. Five minutes into the race, what happens in the students' circulatory system?

A. The heart pumps more blood into the legs.
B. The muscles start to tighten.
C. Fluids pour into the stomach.
D. The lungs need more air.

Answer Key: A

Ten minutes into the race, the students are perspiring or sweating. Which human body system is now involved?

A. Nervous system
B. Respiratory system
C. Skeletal system
D. Excretory system

Answer Key: D

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Core Standard 6.2 Interaction and Change, Score Reporting Category 2/6

The related parts within a system interact and change.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.2L.2 Explain how individual organisms and populations in an ecosystem interact and how changes in populations are related to resources.

*Academic Vocabulary**

- energy pyramid
- food chain
- food web
- niche
- mutualism
- symbiosis

Links to National Standards

2009 NAEP Framework: L8.4-8.7

National Science Education Standards: Life Science Content Standard C, pgs. 155-158.

AAAS Science Literacy Benchmarks

Explanation

Populations of Organisms

- A population is a group of organisms of a single given species.
- Population size changes with growth, stability (equilibrium), or decline.
- Carrying capacity is the population size determined by the limiting factors found in a particular habitat.

Interactions Among Populations can be Described

- Energy interactions occur between different populations: predator, prey; producer, consumer; parasite, host.
- Relationships (beneficial, harmful, competitive, shared)

Changes in Populations are Related to Resources

- Ecosystems consist of biotic and abiotic factors (e.g. quantity of light & water, range of temperatures, soil composition).
- Limiting resources/factors are those that restrict the growth and size of populations (e.g. food supply, disease, predation).

Content Connections from Previous Grades

4.2L.1, 5.2L.1

Sample Items

An example of a predator-prey relationship would be

A. tree-water.
B. cow-grass.
C. hawk-mouse.
D. tick-dog.

Answer Key: C

The Friends of Nature Youth Club has been studying a local forest area for several years. The plants and land shapes in the area have changed very little, except that a very strong wind about a year ago blew down nearly all the large dead trees. Some of the other things the club has learned are shown in the table below.

ANIMAL	MAIN FOOD SOURCE	NESTING AREA	POPULATION 4 YEARS AGO	POPULATION 2 YEARS AGO	POPULATION NOW
Fox	Mice, rabbits, ducks, a few squirrels	Dens dug into side of slopes	10	12	2
Rabbit	Grass, seeds	Burrows	70	90	130
Squirrel	Nuts, seeds	Hollow trees	40	45	15
Duck	Water plans, grass near stream	In weeds near stream bank	30	28	35

The food supply that may be reduced if current population trends continue is

A. grass.
B. nuts.
C. rabbits.
D. water plants.

Answer Key: A

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Core Standard 6.2 Interaction and Change, Score Reporting Category 2/7

The related parts within a system interact and change.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.2E.1 Explain the water cycle and the relationship to landforms and weather.

*Academic Vocabulary**

- altitude
- biome
- elevation
- latitude
- ozone
- sedimentation
- solubility
- thermal
- transpiration

Links to National Standards

2009 NAEP Framework: E8.14

National Science Education Standards: Earth and Space Science Content Standard D, pgs. 158-161.

AAAS Science Literacy Benchmarks

Explanation

Water Cycle Processes

- Evaporation
- Condensation
- Cloud Formation
- Precipitation
- Run-off
- Transpiration

Landforms

- Rain Shadow
- Climate

Weather

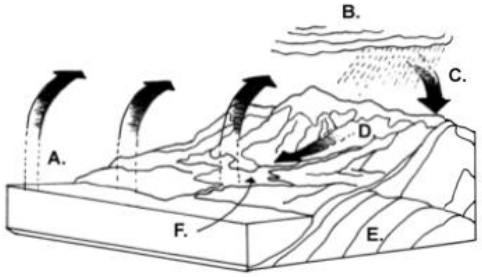
- Humidity, Dew Point and temperature
- Air Pressure
- Precipitation

Content Connections from Previous Grades

3.2E.1, 5.2E.1

Sample Items

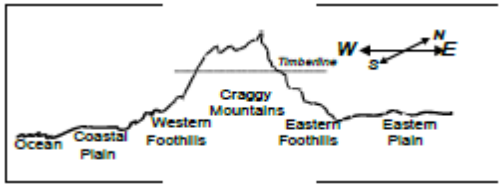
Identify the processes in the water cycle and answer the following question. At Point A, what process in the water cycle is taking place?



A. Condensation
B. Precipitation
C. Run-off
D. Evaporation

Answer Key: D

The diagram below shows a range of mountains near an ocean, then a lower plain farther from the ocean.



Use the picture above and your knowledge of the water cycle and of factors that affect climate to answer the question below. The foothills to the west of the mountains probably receive the most precipitation when the winds blow from the

A. north.
B. east.
C. south.
D. west.

Answer Key: D

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Core Standard 6.3 Scientific Inquiry, Score Reporting Category 3/8

Scientific inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses, and developing procedures for questioning, collecting, analyzing, and interpreting accurate and relevant data to produce justifiable evidence-based explanations.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.3S.1 Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct an investigation that uses appropriate tools and techniques to collect relevant data.

*Academic Vocabulary**

- relevant data

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Science as Inquiry Content Standard A, pgs. 143-148.

AAAS Science Literacy Benchmarks

Explanation

Scientific Investigation

- Propose questions or hypotheses.
- Use observations and scientific principles.
- Design a scientific investigation.
- Identify appropriate tools and techniques.
- Collect data relevant to the question or hypothesis.

Content Connections from Previous Grades

3.3S.1, 4.3S.1, 5.3S.1

Sample Items

You observe the following over a month during the winter.

- When it is clear at night, there tends to be frost in the morning.
- When it is cloudy at night, there is usually dew on the ground in the morning.

What might be the BEST question that could be investigated based on both observations?

A. Why is it warmer when there are clouds at night?
B. How does frost form?
C. What causes dew to form?
D. What is the difference between frost and dew?

Answer Key: A

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Core Standard 6.3 Scientific Inquiry, Score Reporting Category 3/8

Scientific inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses, and developing procedures for questioning, collecting, analyzing, and interpreting accurate and relevant data to produce justifiable evidence-based explanations.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.3S.2 Organize and display relevant data, construct an evidence-based explanation of the results of an investigation, and communicate the conclusions.

*Academic Vocabulary**

- evidence-based

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Science as Inquiry Content Standard A, pgs. 143-148

AAAS Science Literacy Benchmarks

Explanation

Results of an investigation

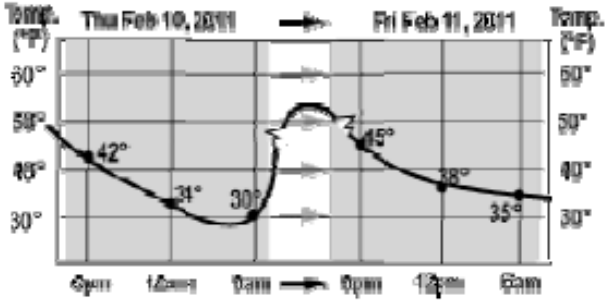
- Relevant data is organized and displayed (e.g. tables, graphs).
- Explanation of results is based on evidence obtained from the investigation.
- Conclusions are communicated in a manner that relates to the original questions or hypothesis.

Content Connections from Previous Grades

4.3S.2, 5.3S.2

Sample Items

The following is a sample of the data that you are given of temperatures in a certain area. What can you conclude about the temperature in this area? [Transcriber's note: original table is very low resolution.)



A. The lowest temperatures occur just after the sun sets
B. The lowest temperatures occur in the morning
C. The highest temperatures occur at mid-day
D. The highest temperatures occur at the same time each day

Answer Key: B

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Core Standard 6.3 Scientific Inquiry, Score Reporting Category 3/8

Scientific inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses, and developing procedures for questioning, collecting, analyzing, and interpreting accurate and relevant data to produce justifiable evidence-based explanations.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.3S.3 Explain why if more than one variable changes at the same time in an investigation, the outcome of the investigation may not be clearly attributable to any one variable.

*Academic Vocabulary**

- variable
- control

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Science as Inquiry Content Standard A, pgs. 143-148.

AAAS Science Literacy Benchmarks

Explanation

Variables

- Investigation should deal with only one variable at a time.
- More than one variable may yield an outcome that is not clearly related to or caused by any individual variable.
- Independent variable (manipulated variable)
- Dependent variable/responding variable

Content Connections from Previous Grades

5.3S.3

Sample Items

You and your partner are investigating the impact that friction has on how far a toy car will travel. You use a raised ramp to provide energy to allow the car to move.

Which of the following should be the only variable that is changed?

A. Height of the ramp
B. Starting point of the car
C. Surface the car travels along
D. Person who starts the car

Answer Key: C

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Core Standard 6.4 Engineering Design, Score Reporting Category 4/8

Engineering is a process of identifying needs, defining problems, developing solutions, and evaluating proposed solutions.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.4D.1 Define a problem that addresses a need and identify science principles that may be related to possible solutions.

*Academic Vocabulary**

- criteria
- constant

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Science and Technology Content Standard E, pgs. 161-166.

AAAS Science Literacy Benchmarks

Explanation

Problems/Solutions

- A need is identified and a problem defined to address that need
- Related scientific principles are identified that relate to possible solutions.

Content Connections from Previous Grades

3.4D.1, 4.4D.1, 5.4D.1

Sample Items

A student collected a bucket of polluted water from a nearby stream. The student then gathered the following materials to test with: large sponges, detergent, bacteria and absorbent paper. What problem is the student attempting to solve?

A. Erosion prevention
B. Alternative fuel creation
C. Oil spill cleanup
D. Dumping of solid waste

Answer Key: C

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Core Standard 6.4 Engineering Design, Score Reporting Category 4/8

Engineering is a process of identifying needs, defining problems, developing solutions, and evaluating proposed solutions.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.4D.2 Design, construct, and test a possible solution to a defined problem using appropriate tools and materials. Evaluate proposed engineering design solutions to the defined problem.

*Academic Vocabulary**

- design
- materials
- test

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Science and Technology Content Standard E, pgs. 161-166.

AAAS Science Literacy Benchmarks

Explanation

Test a solution

- A solution (or possible solutions) to the defined problem should be designed, constructed, and then tested.
- Appropriate tools and materials are identified.
- The design solutions are evaluated as to how well they solve the problem.

Content Connections from Previous Grades

4.4D.2, 4.4D.3, 5.4D.2

Sample Items

You live in an area which experiences frequent earthquakes. You have many secured bookshelves with objects which tend to fall off during these earthquakes.
Which of the following would provide the most effective and least costly solution to the problem, and still allow you easy access to the objects?

A. Tape everything to the shelf
B. Place non-skid materials under each item on the shelf
C. Stretch netting in front of each item on the shelf
D. Use hook and loop fasteners to attach objects to shelves

Answer Key: B

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Core Standard 6.4 Engineering Design, Score Reporting Category 4/8

Engineering is a process of identifying needs, defining problems, developing solutions, and evaluating proposed solutions.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

6.4D.3 Describe examples of how engineers have created inventions that address human needs and aspirations.

*Academic Vocabulary**

- aspiration

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Science and Technology Content Standard E, pgs. 161-166

AAAS Science Literacy Benchmarks

Explanation

Necessary and desired inventions

- Various descriptions of inventions created by engineers to address human needs and/or aspirations

Content Connections from Previous Grades

3.4D.2, 3.4D.3

Sample Items

A space shuttle re-entered Earth's atmosphere at 17,000 miles per hour. When the shuttle encountered Earth's atmosphere an enormous amount of heat was generated due to friction.

What did engineers do to the shuttle to accommodate the large amount of heat?

A. Attach parachutes
B. Attach reverse thrusters
C. Attach insulating tiles
D. Attach air braces

Answer Key: C

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Core Standard 7.1 Structure and Function, Score Reporting Category 1/5

Living and non-living systems are composed of components which affect the characteristics and properties of the system.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.1P.1 Explain that all matter is made of atoms, elements are composed of a single kind of atom, and compounds are composed of two or more different elements.

*Academic Vocabulary**

- mixture
- molecule
- solution

Links to National Standards

2009 NAEP Framework: Science Practices

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Composition of matter

- Atom is the basic unit of matter.
- Compounds are combinations of elements that cannot be physically separated (vs. mixture).
- Elements are one type of atom.

Content Connections from Previous Grades

none

Sample Items

What is the smallest unit of an element that still has the properties of that element?

A. an atom
B. a compound
C. an electron
D. a molecule

Massachusetts Release Item #31 pg. 448

Answer Key: A

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Core Standard 7.1 Structure and Function, Score Reporting Category 1/6

Living and non-living systems are composed of components which affect the characteristics and properties of the system.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.1L.1 Compare and contrast sexual and asexual reproduction. Explain why reproduction is essential to the continuation of every species.

*Academic Vocabulary**

- budding
- clone
- diversity
- fertilization
- generation/regeneration

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Life Science Content Standard C, pgs. 155-158

AAAS Science Literacy Benchmarks

Explanation

Differences Between Sexual and Asexual Reproduction

- Sexual reproduction results in genetic variation of offspring.
- Asexual reproduction results in genetically identical offspring.

Reproduction is Essential to Every Species

- Asexual reproduction results in the passing on of adaptive features (e.g. inheritance of disease resistance).
- Sexual reproduction passes along adaptive features, but also provides the variations necessary for adaptation to changing conditions.
- In both types of reproduction, genetic variation can result from mutation.

Content Connections from Previous Grades

3.2L.1, 6.2L.1

Sample Items

Many plants reproduce asexually. How does the genetic material (DNA) compare between the new plan and the parent plant in this type of reproduction?

A. It is similar but not identical.
B. It depends on the plant the parent is crossed with.
C. It depends on the climate it is grown in.
D. It is identical.

Answer Key: D

The diagrams below represent forms of reproduction (not to scale). In which form of reproduction will the offspring differ MOST from the parent?

A. 

B. 

C. 

D. 

Massachusetts Released Item #10 pg. 440.

Answer Key: C

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Core Standard 7.1 Structure and Function, Score Reporting Category 1/6

Living and non-living systems are composed of components which affect the characteristics and properties of the system.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.1L.2 Distinguish between inherited and learned traits, explain how inherited traits are passed from generation to generation, and describe the relationships among phenotype, genotype, chromosomes, and genes.

*Academic Vocabulary**

- DNA
- heredity
- probability
- RNA

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Life Science Content Standard C, pgs. 155-156

AAAS Science Literacy Benchmarks

Explanation

Inherited vs. Learned Traits

- Inherited traits are those which are genetically determined while learned or acquired traits are the result of environmental influences (e.g. bleached hair vs. natural hair color).
- Inherited traits are passed along to offspring through the genetic material from the parent generation.

Relationships of Genetic Expression

- Punnett squares are used as tools for the prediction of the outcomes of various genetic crosses.
- Modification of genetic materials occurs due to an alteration of generation material (DNA) by such events as mutation.
- Genes, carried on chromosomes as homozygous or heterozygous allele pairs, make up the genotype of an individual.

Content Connections from Previous Grades

7.1L.1

Sample Items

Which of the following characteristics are you MOST likely to inherit from a parent?

A. Weight
B. Temper
C. Eye color
D. Food preference

Answer Key: C

In mice, dark brown (B) coloration is dominant over light brown (b) coloration. It is not sex-linked. A dark brown male is crossed with a light brown female. They produce a litter of three dark brown baby mice.
Suppose the parents have a second litter of baby mice. The second litter contains 2 dark brown offspring and 2 light brown offspring. Based on this and the previous information, what is the genotype of the father?

A. bb
B. Bb
C. BB

Answer Key: B

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Core Standard 7.2 Interaction and Change, Score Reporting Category 2/5

The components and processes within a system interact.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.2P.1 Identify and describe types of motion and forces and relate forces qualitatively to the laws of motion and gravitation.

*Academic Vocabulary**

- force
- mass
- speed

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Motion and Forces

- Descriptive rather than calculated
- Newton's laws (inertia, acceleration, momentum) (e.g. use of vehicle seatbelts, amusement park rides, which object would have greater momentum—soccer ball/bowling ball)
- Mass
- Velocity
- Friction

Content Connections from Previous Grades

5.2P.1

Sample Items

Which of the following would NOT help bike riders coast farther on a level surface?

A. Crouching low over their bikes while coasting
B. Swerving their bikes from side to side
C. Pumping more air into their tires
D. Oiling the wheel bearings

Answer Key: B

A student used the same force in the same way to push on three boxes. The boxes weighed 3 kg, 5 kg, and 10 kg. Which box moved most quickly, and which moved most slowly?

A. The 10 kg box moved most quickly; the 3 kg box moved most slowly.
B. The 5 kg box moved mostly quickly; the 10 kg box moved mostly slowly.
C. The 10 kg box moved most quickly; the 5 kg box moved most slowly.
D. The 3 kg box moved most quickly; the 10 kg box moved most slowly.

Answer Key: D

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Core Standard 7.2 Interaction and Change, Score Reporting Category 2/6

The components and processes within a system interact.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.2L.1 Explain how organelles within a cell perform cellular processes and how cells obtain the raw materials for those processes.

*Academic Vocabulary**

- cell membrane
- cell wall
- chloroplasts
- glucose
- nucleus
- passive transport
- photosynthesis
- protein synthesis
- respiration
- ribosome
- mitochondria
- selectively permeable
- stomata

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Life Science Content Standard C, pgs. 155-158.

AAAS Science Literacy Benchmarks

Explanation

Processes of Organelles

- Organelles perform specific processes.

Cellular processes within a cell

- The organelles work together to perform cell functions (e.g. photosynthesis, cellular respiration, osmosis/diffusion, active transport, waste removal)
- Organelles use raw materials (e.g. nutrients, water, gases, sunlight) to perform various functions.
- Cells obtain raw materials in different ways (e.g. chloroplasts help use the energy from the sun; how cells in roots obtain water).

Content Connections from Previous Grades

6.1L.1

Sample Items

Which organelle is necessary to transform the sun's energy into energy a cell can use?

A. Chloroplast
B. Ribosome
C. Nucleus
D. Cell membrane

Answer Key: A

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Core Standard 7.2 Interaction and Change, Score Reporting Category 2/6

The components and processes within a system interact.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.2L.2 Explain the processes by which plants and animals obtain energy and materials for growth and metabolism.

*Academic Vocabulary**

- cellular respiration
- metabolism

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Life Science Content Standard C, pgs. 155-158.

AAAS Science Literacy Benchmarks

Explanation

Plants Obtain Energy through Photosynthesis

- Photosynthesis involves using energy from sunlight to power a process to combine water and carbon dioxide to produce glucose and oxygen.
- Photosynthesis occurs in the chloroplasts which contain the photosynthetic pigment, chlorophyll.

Animals Obtain Energy from Materials Consumed

- Materials may be consumed from plants or other animals.
- Digestion/absorption provides cells with energy-containing materials.
- Inside animal cells, cellular metabolism converts materials into new cell products, such as proteins and sugars, and cellular respiration releases carbon dioxide and energy.
- Food chains/food webs (producers, consumers, scavengers, decomposers) transfer energy, originally from sunlight, to plants and animals.

Content Connections from Previous Grades

5.2L.1, 6.1L.1, 6.2L.1

Sample Items

Which processes do plants use to capture energy?

A. Digestion
B. Photosynthesis
C. Respiration

Answer Key: B

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Core Standard 7.2 Interaction and Change, Score Reporting Category 2/7

The components and processes within a system interact.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.2E.1 Describe and evaluate the environmental and societal effects of obtaining, using, and managing waste of renewable and non-renewable resources.

*Academic Vocabulary**

- disposable
- disposal
- landfill
- limited resource
- nuclear
- runoff
- societal

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Earth and Space Science Content Standard D, pgs. 158-161.

AAAS Science Literacy Benchmarks

Explanation

Renewable resources

- Solar energy
- Hydroelectric energy
- Wind energy
- Wave energy
- Geothermal
- Other types of renewable energy
- Benefits and drawbacks

Non-Renewable resources

- Nuclear energy
- Fossil fuels
- Benefits and drawbacks

Obtaining resources

- Mining
- Recycling

Using resources

- How they are used
- Transformations of energy

Managing waste

- Incinerating
- Garbage dumps
- Recycling

Content Connections from Previous Grades

1.1E.1, 4.1E.1

Sample Items

Which can have a NEGATIVE impact on the environment?

A. Mining
B. Recycling
C. Using solar power
D. Using composted material

Answer Key: A

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Core Standard 7.2 Interaction and Change, Score Reporting Category 2/7

The components and processes within a system interact.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.2E.2 Describe the composition of Earth's atmosphere, how it has changed over time, and implications for the future.

*Academic Vocabulary**

- Exosphere
- Ionosphere
- Mesosphere
- Stratosphere
- Thermosphere
- Troposphere

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Earth and Space Science Content Standard D. pgs. 158-161.

AAAS Science Literacy Benchmarks

Explanation

Earth's Atmosphere

- The atmosphere of the Earth has several layers.
- The Layers of the atmosphere have different compositions.

Past

- The current atmosphere is different than the early atmosphere of the Earth.
- The early atmosphere had no oxygen.
- Early life changed the atmosphere and the rocks of the Earth (e.g. banded iron formations showing rust).
- Plants interact with the atmosphere and the atmosphere interacts with plants.
- Animals interact with the atmosphere and the atmosphere interacts with plants.

Future

- Human civilization has an impact on the atmosphere (e.g. smog, ozone layer).
- Natural cycles change the atmosphere over long periods of time (e.g. ice ages, warming/cooling).

Content Connections from Previous Grades

1.1E.1

Sample Items

Which of the following gasses is the result of life forms being present on Earth?

A. Oxygen
B. Carbon dioxide
C. Water vapor

Answer Key: A

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Core Standard 7.2 Interaction and Change, Score Reporting Category 2/7

The components within a system interact.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.2E.3 Evaluate natural processes and human activities that affect global environmental change and suggest and evaluate possible solutions to problems.

*Academic Vocabulary**

- carbon footprint
- combustion
- fuel efficiency
- solar-electric
- wind power

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Earth and Space Science Content Standard D, pgs. 158-161.

AAAS Science Literacy Benchmarks

Explanation

Natural Processes

- Natural cycles affect global climate (e.g. Milankovitch cycles, cycles involving Earth's rotation and carbon cycle).
- Natural cycles can lead to cooling, warming or other environmental effects (e.g. Ice Ages, volcanic activity, meteorite impact).

Human Activities

- Human activity/use has environmental impacts (e.g. deforestation, farming, fossil fuels, chemicals released into the atmosphere).
- Human activity/use can have a positive or negative impact on the environment.

Global vs. Regional Changes

Content Connections from Previous Grades

5.1E.1

Sample Items

Which of the following creates global environmental change due to human activity?

A. Volcanic ash
B. Burning fossil fuels
C. Building dams

Answer Key: B

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Core Standard 7.2 Interaction and Change, Score Reporting Category 2/7

Force, energy, matter, and organisms interact within living and non-living systems.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.2E.4 Explain how landforms change over time at various rates in terms of constructive and destructive forces.

*Academic Vocabulary**

- hurricane/typhoon
- sedimentary
- tsunami
- uniformitarianism

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Earth and Space Science Content Standard D, pgs. 158-161.

AAAS Science Literacy Benchmarks

Explanation

Constructive Forces

- Volcanoes
- Deposition
- Uplift
- Mountain building

Destructive Forces

- Weathering
- Erosion (wind, water, ice, gravity, waves, people)

Landforms

- Landforms can be created by constructive forces (e.g. dunes, delta, moraines).
- Landforms can be created by destructive forces (e.g. arches, cirque, v-shaped valley, sea stack).

Content Connections from Previous Grades

3.2E.1, 4.2E.1

Sample Items

Which of the following is most likely to make a rock crack and crumble?

A. Dew evaporating on the rock
B. Leaves decaying on the rock
C. Snow melting in the crack on the rock
D. Water freezing in a crack on the rock

Massachusetts Released item #3 pg. 411

Answer Key: D

The gray color of the exposed rock in a new road-cut changes to an orange-red color after several months. Which statement below best identifies the probably long-term change that the material underwent?

A. The gray color of the rock was washed away exposing the orange-red.
B. A layer of orange-red colored rock was deposited on top of the gray rock.
C. The gray rock contained iron that chemically weathered or oxidized.
D. The orange-red color came from the physical weathering of the gray rock.

Answer Key: C

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Core Standard 7.3 Scientific Inquiry, Score Reporting Category 3/8

Scientific inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses, designing procedures for questioning, collecting, analyzing, and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.3S.1 Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct a scientific investigation that uses appropriate tools and techniques to collect relevant data.

*Academic Vocabulary**

- accuracy
- conclusions
- control
- dependent variable
- independent variable
- modifications
- procedure
- variable

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Science as Inquiry Content Standard A, pgs. 143-148.

AAAS Science Literacy Benchmarks

Explanation

Scientific Investigation

- Questions or hypotheses proposed based on observations and scientific principles
- Scientific investigations are designed and conducted.
- Appropriate tools and techniques are used.
- Data collected must be relevant to the proposed question or hypothesis.

Content Connections from Previous Grades

4.3S.1, 5.3S.1, 6.3S.1

Sample Items

Students placed 250 milliliters of water in three containers. Container 1 had a tightly sealed lid and was placed on a classroom counter. Container 2 had no lid and was placed on a classroom table. Container 3 had no lid and was placed on a table outside in the shade. The students measured the amount of water in each container at the end of each day for four days. Their results are shown in the data table below.

Volume of Water in Three Containers

Container	Starting Volume (mL)	End of Day 1 (mL)	End of Day 2 (mL)	End of Day 3 (mL)	End of Day 4 (mL)
1	250	250	250	250	248
2	250	242	219	203	188
3	250	219	172	125	63

What question is this investigation designed to answer?

A. How do water levels affect evaporation?
B. Which container best holds evaporating water?
C. Does evaporation of water affect the atmosphere?
D. In which environment does water evaporate the fastest?

Maryland Released Item #7, pg. 10

Answer Key: D

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Core Standard 7.3 Scientific Inquiry, Score Reporting Category 3/8

Scientific inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses, designing procedures for questioning, collecting, analyzing, and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.3S.2 Organize, display, and analyze relevant data, construct an evidence-based explanation of the results of an investigation, and communicate the conclusions including possible sources of error.

*Academic Vocabulary**

- calculation

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Science as Inquiry Content Standard A, pgs. 143-148.

AAAS Science Literacy Benchmarks

Explanation

Results of an investigation

- Relevant data should be organized and displayed (e.g. tables, graphs).
- Analysis of data should yield an explanation or conclusion based on evidence from the investigation.
- Conclusions should be communicated and include possible sources of error.

Content Connections from Previous Grades

5.3S.2, 6.3S.2

Sample Items

You are measuring the temperature of a beaker of H_2O as the sun goes across the sky.

Which information would be BEST placed on the y-axis of a graph.

A. Temperature
B. Time
C. Angle of light

Answer Key: A

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Core Standard 7.3 Scientific Inquiry, Score Reporting Category 3/8

Scientific inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses, designing procedures for questioning, collecting, analyzing, and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.3S.3 Evaluate the validity of scientific explanations and conclusions based on the amount and quality of the evidence cited.

*Academic Vocabulary**

- analyze
- range
- trial

Links to National Standards

2009 NAEP Framework Science Practice

National Science Education Standards: Science as Inquiry Content Standard A, pgs. 143-148.

AAAS Science Literacy Benchmarks

Explanation

Validity of an investigation

- Valid scientific explanations and conclusions are based on evidence cited from the investigation.
- Both the amount and quality of the evidence are important in determining validity.

Content Connections from Previous Grades

4.3S.3, 5.3S.3, 6.3S.3

Sample Items

You measured the amount of water lost when a piece of potato was placed in a strong salt solution.

Which will have the GREATEST impact on the validity of your data?

A. The amount of data gathered.
B. Which lab partner placed the potato.
C. What time of day your data was gathered.

Answer Key: A

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Core Standard 7.4 Engineering Design, Score Reporting Category 4/8

Engineering design is a process of identifying needs, defining problems, identifying constraints, developing solutions, and evaluating proposed solutions.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.4D.1 Define a problem that addresses a need and identify constraints that may be related to possible solutions.

*Academic Vocabulary**

- constraints

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Science and Technology Content Standard E, pgs. 161-166.

AAAS Science Literacy Benchmarks

Explanation

Problem, solutions and constraints

- Identify a need and define a problem that addresses that need.
- Identify the constraints involved in each of any possible solutions.

Content Connections from Previous Grades

5.4D.1, 5.4D.2, 6.4D.1

Sample Items

You are designing a better carrot peeler. What is a significant constraint that must be addressed when building the carrot peeler?

A. Where the carrot was grown
B. The materials used to make the peeler
C. The other vegetables it can peel

Answer Key: B

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Core Standard 7.4 Engineering Design, Score Reporting Category 4/8

Engineering design is a process of identifying needs, defining problems, identifying constraints, developing solutions, and evaluating proposed solutions.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.4D.2 Design, construct, and test a possible solution using appropriate tools and materials. Evaluate the proposed solutions to identify how design constraints are addressed.

*Academic Vocabulary**

- benefit
- evaluate
- prototype

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Science and Technology Content Standard E, pgs. 161-166.

AAAS Science Literacy Benchmarks

Explanation

Test a solution

- A possible solution should be designed, constructed, and then tested.
- Appropriate tools and materials are identified and utilized.
- A proposed solution is evaluated to see how well design constraints are addressed.

Content Connections from Previous Grades

5.4D.2, 6.4D.2, 7.4D.1

Sample Items

You have built a better carrot peeler. What would be the MOST effective way to test whether your design will be successful?

A. Use several carrots to see if it works.
B. Use it on a carrot, a potato, and a stalk of celery.
C. Use several people, each person peeling several carrots.
D. All tests need to be done before it is marketed.

Answer Key: D

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Core Standard 7.4 Engineering Design, Score Reporting Category 4/8

Engineering design is a process of identifying needs, defining problems, identifying constraints, developing solutions, and evaluating proposed solutions.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

7.4D.3 Explain how new scientific knowledge can be used to develop new technologies and how new technologies can be used to generate new scientific knowledge.

*Academic Vocabulary**

- exploit
- technology

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Science and Technology Content Standard E, pgs. 161-166

AAAS Science Literacy Benchmarks

Explanation

New scientific knowledge and technologies

- Scientific knowledge is often used to develop new technologies.
- These new technologies can, in turn, be used to generate new scientific knowledge.

Content Connections from Previous Grades

5.4D.3, 6.4D.3

Sample Items

Galileo used a spyglass to look at the night sky. This led Galileo to the development of which technology?

A. Glasses
B. Binoculars
C. Telescope
D. Microscope

Answer Key: C

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Core Standard 8.1 Structure and Function, Score Reporting Category 1/5

Systems and their components function at various levels of complexity.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.1P.1 Describe the atomic model and explain how the types and arrangements of atoms determine the physical and chemical properties of elements and compounds.

*Academic Vocabulary**

- electron cloud
- molecule

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Atomic Model

- Particles in an atom and where they are located (i.e., electrons orbit around a nucleus of protons and neutrons)
- Different atoms have different numbers of particles and different atomic masses

Qualitative description of bonding

- The outermost electrons are involved to join atoms together
- Different numbers of atoms join together to create different compounds (e.g. oxygen joins with 2 hydrogen to form a new compound with different properties than the original elements, sodium plus chlorine makes salt).

Content Connections from Previous Grades

6.1P.1, 8.1P.1

Sample Items

In an atom, electrons are located

A. in the nucleus.
B. in a cloud around the nucleus.
C. in orbits like planets.
D. embedded on the nucleus.

Answer Key: B

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Core Standard 8.1 Structure and Function, Score Reporting Category 1/5

Systems and their components function at various levels of complexity.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.1P.2 Explain how the Periodic Table is an organization of elements based on their physical and chemical properties.

*Academic Vocabulary**

- family
- period

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Periodic Table

- A tool for organizing elements based on properties and characteristics
- Metal/nonmetals/metalloids are areas on the Periodic Table and those elements share common characteristics.
- Noble gasses are stable elements.
- Atomic number gives us information about the atom.
- Atomic mass is an average mass of the isotopes of that type of atom.
- Rows and columns have meaning.
- Different atoms have different numbers of particles and different atomic masses

Content Connections from Previous Grades

6.1P.1, 7.1P.1

Sample Items

Carbon (C), Silicon (Si), and Germanium (Ge) are all in the same column of the Periodic Table. What do they all have in common?

A. Similar chemical and physical properties
B. Similar atomic masses
C. Same number of protons
D. Same number of neutrons

Answer Key: A

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Core Standard 8.1 Structure and Function, Score Reporting Category 1/5

Systems and their components function at various levels of complexity.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.1P.3 Explain how the motion and spacing of particles determines states of matter.

*Academic Vocabulary**

- density

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Particle motion

- Is related to energy
- Increased energy leads to increased movement leads to increased spacing
- Decreased energy leads to decreased movement leads to decreased spacing (except water to ice)
- The closer particles are to each other the denser a substance will be.

Content Connections from Previous Grades

6.1P.1, 8.1P.1

Sample Items

Although an object may change density when particles in an object move faster, the particles' density

A. increases.
B. decreases.
C. remains the same.

Answer Key: B

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Core Standard 8.1 Structure and Function, Score Reporting Category 1/6

Systems and their components function at various levels of complexity.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.1L.1 Explain how genetics and anatomical characteristics are used to classify organisms and infer evolutionary relationships.

*Academic Vocabulary**

- embryo

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Classification and Anatomical Characteristics

- Organisms can be classified or grouped according to the similarities of their anatomical characteristics
- Organisms having similar structures are part of the evidence that they have a common origin (ancestry).
- Example: vertebrates are all animals with a vertebral column, while invertebrates lack a vertebral column.

Classification and Genetics

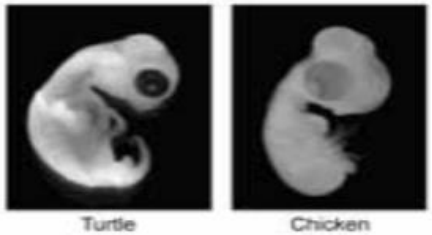
- Organisms with similar genetic makeup are more closely related and thus will have more similar anatomical characteristics.
- The degree or percentage of similarity of the DNA is a measure of how closely organisms are related.
- Evolutionary diagrams show the relative distance vs. closeness of evolutionary relationships

Content Connections from Previous Grades

3.1L.1, 5.2L.1, 7.1L.2

Sample Items

The drawings below show a turtle embryo and a chicken embryo.

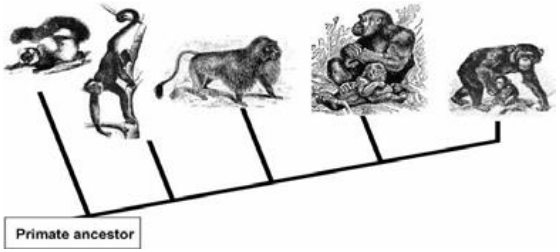


Which of the following statements is supported by the similarities between these embryos?

A. The turtle is more advanced than the chicken.
B. The chicken has more offspring than the turtle.
C. The turtle and the chicken are similar as adults.
D. The chicken and the turtle share a common ancestor.

Massachusetts Release Item pg. 450 #36

Answer Key: D



Based on the diagram, which of the following statements is true?

A. Lemurs were the most recent to evolve.
B. Gorillas evolved directly from chimpanzees.
C. Spider monkeys and lemurs evolved at the same time.
D. Gorillas and baboons evolved from a common ancestor.

Massachusetts Released item #8, pg. 439

Answer Key: D

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Core Standard 8.2 Interaction and Change, Score Reporting Category 2/5

Systems interact with other systems.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.2P.1 Compare and contrast physical and chemical changes and describe how the law of conservation of mass applies to these changes.

*Academic Vocabulary**

- molecular
- reaction
- suspension
- system

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Physical

- Tearing paper, phase change, creating a mixture (e.g., trail mix)

Chemical

- Burning, rusting, forming compounds (e.g., baking cookies)
- Qualitative description of how mass is conserved: reactants equals products

Indicators of chemical change

- Change in temperature
- Electrical potential
- Color change
- Gas produced
- Solid produced
- Light produced
- Change in smell
- Etc.

Content Connections from Previous Grades

6.1P.1, 8.1P.1

Sample Items

You are given a flask with a mixture of salt and water and asked to separate the two.

You could

A. Use an electric current to separate the salt from the water
B. Evaporate the water and collect the salt
C. Put it under the microscope to separate the salt and water
D. Let the salt settle out and pour off the pure water from the top.

Answer Key: B

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Core Standard 8.2 Interaction and Change, Score Reporting Category 2/5

Systems interact with other systems.

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Content Standard

8.2P.2 Explain how energy is transferred, transformed, and conserved.

*Academic Vocabulary**

Forms of energy:

- Chemical
- Electrical
- Electromagnetic
- Mechanical
- Nuclear
- sound
- thermal

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Energy

- transformation (e.g. conduction, radiation, convection)
- transformed (e.g. mechanical energy from a river to electrical energy)
- Law of Conservation of Enery
- Potential vs. kinetic energy (e.g. pendulum)

Content Connections from Previous Grades

4.1P.1, 6.1P.2

Sample Items

A heated metal object measures 120°C. It is dropped into a bucket filled with water measuring 10°C.
Which of the following is most likely to occur?

A. Both the water and metal will adjust to the same temperature below 10°C.
B. The water and metal will adjust to different temperatures above 120°C.
C. The water will remain the same temperature, but the metal will cool to 10°C.
D. The water and metal will adjust to the same temperature between 10°C and 120°C.

Massachusetts Released Item #29, pg. 449

Answer Key: D

Your body uses food as an energy source to move your muscles. This is an example of what type of energy conversion?

A. Chemical to mechanical
B. Mechanical to electrical
C. Mechanical to chemical
D. Electrical to mechanical

Answer Key: A

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Core Standard 8.2 Interaction and Change, Score Reporting Category 2/6

Systems interact with other systems.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.2L.1 Explain how species change through the process of natural selection. Describe evidence for evolution.

*Academic Vocabulary**

- Adaptation
- Evolution
- Homologous structures
- niche
- random

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard C, pgs. 155-158.

AAAS Science Literacy Benchmarks

Explanation

Species Change Over Time

- Fossil record shows changes in related species over time.
    - Example: dinosaur bone structures show many similarities to fossil and modern birds, suggesting that birds have evolved from dinosaurs through gradual change.
- Closely related living species also demonstrate that changes have occurred in some of their anatomical features.
    - Example: Darwin's Finches are closely related but have different bill structure depending on their adaptation to particular food supplies.

Species Change as a Result of Natural Selection

- Variations occur in the population of a species through changes in their genetic material (DNA on chromosomes).
- More offspring are produced than can survive due to limiting factors in their environment.
- Natural selection factors, such as changes in environment, food supply, predators, or disease, will select for those individuals of the species best able to survive, and these, in turn, will pass along their genetics to their offspring.
    - Example: when antibiotics are applied to a population of bacteria, most of the bacteria die, but some are resistant to the antibiotic and pass on this resistance to their offspring.
- Failure of a species to have variations needed for survival under changing conditions can lead to extinction.

Content Connections from Previous Grades

5.2L.1, 7.1L.2, 8.1L.1

Sample Items

Shown below are 4 species of finches, derived from a common ancestor. These species inhabit the same island. Which of the following BEST explains the appearance of these birds' beaks?

A. Predation by the larger birds on the smaller birds led to a decreased population of the smaller birds
B. Competition for limited food resources led to an increased similarity among species
C. Predation by the larger birds on the smaller birds led to an increased fitness of the smaller birds.
D. Competition for limited food resources led to an increased diversity among species.

Answer Key: D

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Core Standard 8.2 Interaction and Change, Score Reporting Category 2/7

Systems interact with other systems.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.2E.1 Explain how gravity is the force that keeps objects in the solar system in regular and predictable motion and describe the resulting phenomena. Explain the interactions that result in Earth's seasons.

*Academic Vocabulary**

- equator
- hemisphere
- latitude

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 149-155.

AAAS Science Literacy Benchmarks

Explanation

Gravity

- Law of Gravitation
- Orbiting objects

Seasons

- Axis tilt
- Differential heating
- Equinox and solstice
- Length of daylight
- Directness of sunlight

Earth/Moon Cycles

- Lunar and solar eclipses
- Tides
- Rotation
- Revolution
- Moon phases

Content Connections from Previous Grades

K.2E.1, 2.2E.1, 3.2E.1, 5.1E.1, 6.1E.2

Sample Items

The Earth has seasons because the

A. Equator and poles receive different amounts of energy.
B. Earth is closer to the sun in the summer.
C. Earth's axis is tilted

Answer Key: C

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Core Standard 8.2 Interaction and Change, Score Reporting Category 2/7

Systems interact with other systems.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.2E.2 Describe the processes of Earth's geosphere and the resulting major geological events.

*Academic Vocabulary**

- cementation
- crystallization
- divergent/convergent/transform
- fossilization
- magnetic reversals
- Metamorphism
- minerals
- Pangaea
- plateau
- ridges & trenches
- subduction

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 158-161.

AAAS Science Literacy Benchmarks

Explanation

Rock Cycle

- Igneous rocks
- Sedimentary rocks
- Metamorphic rocks

Plate Tectonics

- Continental drift
- Seafloor spreading
- Lithospheric (crustal) plates
- Plate boundaries (constructive, destructive)
- Convection currents

Volcanoes

- Patterns
- Causes

Earthquakes

- Stresses
- *Seismic Waves*
- *Fault zones*
- *Effects*

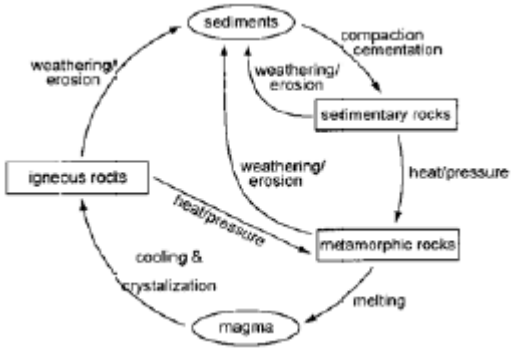
Mountain Building and Erosion

- Uplift
- Folded Mountains
- Faultblock Mountains
- Volcanic

Content Connections from Previous Grades

1.E1.1, 4.1E.1, 6.1E.1, 7.2E.4

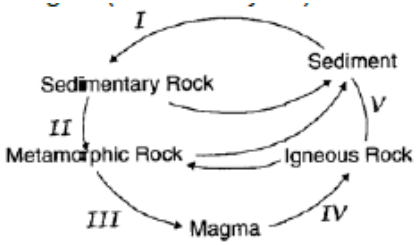
Sample Items



Between which two stages in the Rock Cycle will volcanoes MOST likely occur?

A. Between igneous and sedimentary stages
B. Between sedimentary and metamorphic stages
C. Between magma and igneous stages
D. Between magma and metamorphic stages

Answer Key: C



The erosion and deposition phase of the rock cycle is shown by which numeral?

A. II
B. III
C. IV
D. V

Answer Key: D

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Core Standard 8.2 Interaction and Change, Score Reporting Category 2/7

Systems interact with other systems.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.2E.3 Explain the causes of patterns of atmospheric and oceanic movement and the effects on weather and climate.

*Academic Vocabulary**

- Airmass
- Differential
- Elevation
- Jet stream
- Leeward
- Prevailing
- Relative humidity
- Saturated
- windward

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 158-161.

AAAS Science Literacy Benchmarks

Explanation

Atmospheric Movement

- Differential heating
- Coriolis effect
- Wind
- Air pressure
- Convection
- Rain shadow

Oceanic Movement

- Convection
- Ocean Currents
  - Deep
  - Surface
  - upwelling

Weather vs. Climate

Types of Weather Fronts

- Conditions
- Types

Content Connections from Previous Grades

K.1E.1, 2.2E.2, 3.2E.1, 5.2E.1, 6.2E.1

Sample Items

Which arrow BEST represents the direction of the jet stream that influences weather across the continental United States?

A. Arrow 1
B. Arrow 2
C. Arrow 3
D. Arrow 4

Massachusetts Released Item #32, pg. 427

Answer Key: A

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Core Standard 8.2 Interaction and Change, Score Reporting Category 2/7

Systems interact with other systems.

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Content Standard

8.2E.4 Analyze evidence for geologic, climatic, and environmental life form changes over time.

*Academic Vocabulary**

- Absolut age
- Core sample
- Deposits
- extinction

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 158-161.

Explanation

Geologic Evidence

- Fossils
- Relative age dating
- Superposition
- Radioactive dating
- Rock cycle

Climatic Evidenc

- Ice core analysis
- Climate change
- El Niño/La Niña

Environmental Evidence

- Change in Habitat

Life Form Evidence

- *Evolution*
- *Fossils*

Content Connections from Previous Grades

7.2E.4

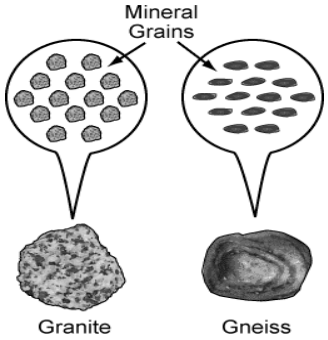
Sample Items

While digging, a person found that most of the rocks were igneous rock. What can be concluded?

A. The rocks were probably carried there by ancient people
B. The area was once covered by an ocean.
C. A glacier passed through at one time
D. A volcano was nearby at one time

Answer Key: D

Various processes are involved in the formation of different types of rocks. The diagram below illustrates changes in rock as granite forms gneiss.



In addition to heat, which of the following changes granite to gneiss?

A. Acid
B. Erosion
C. Pressure
D. Water

Massachusetts Released item #4, pg. 242

Answer Key: C

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Core Standard 8.3 Scientific Inquiry, Score Reporting Category 3/8

Scientific Inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses and designing procedures for questioning, collecting, analyzing, and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations and new explorations.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.3S.1 Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct a scientific investigation that uses appropriate tools, techniques, independent and dependent variables, and controls to collect relevant data.

*Academic Vocabulary**

- relevant

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 143-148

AAAS Science Literacy Benchmarks

Explanation

Variables

- Independent
- Dependent

Experimental Controls including

- temperature
- Light
- Size
- Shape
- mass

Appropriate Tools and Techniques including

- Microscope
- Scale
- Thermometer

Content Connections from Previous Grades

5.3S.1, 6.3S.1, 7.3S.1

Sample Items

Thermometers are measuring the temperature of the center of the soil samples. Which of the following is a cause of the measured difference in the temperature of the two solids?

A. Conduction within different soil types
B. Condensation within different soil types.
C. Radiation emitted by different soil types.
D. Convection in the air above different soil types.

Massachusetts Released Item #6, pg. 255

Answer Key: A

Which of the following statements explains why this demonstration cannot be used to prove that matter is conserved during a change of phase?

A. The change of phase is incomplete.
B. Water is changing both phase and temperature.
C. Water in the gas phase is lighter than liquid water.
D. The change of phase is taking place in an open system.

Massachusetts Released Item #16, pg. 260

Answer Key: D

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Core Standard 8.3 Scientific Inquiry, Score Reporting Category 3/8

Scientific Inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses and designing procedures for questioning, collecting, analyzing, and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations and new explorations.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.3S.2 Organize, display, and analyze relevant data, construct an evidence-based explanation of the results of a scientific investigation, and communicate the conclusions including possible sources of error. Suggest new investigations based on analysis of results.

*Academic Vocabulary**

- Approximation
- Estimation
- investigation

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 143-148.

AAAS Science Literacy Benchmarks

Explanation

Results of an investigation

- Display of results to aid in analysis
- Communicate sources of error
- Analyze results and suggest new investigations

Content Connections from Previous Grades

5.3S.2, 6.3S.3, 7.3S.2

Sample Items

The racers performed an experiment with all important variable controlled. The table below shows their results

Average Time to Travel Five Miles

TIRE	ROSE	DAVID	BOTH RACERS
A	26.2 min.	25.7 min.	25.95 min.
B	25.8 min.	26.3 min.	26.05 min.

From this experiment, they can report to their racing club that

A. Tire A is definitely the tire they should all be using
B. Tire B is definitely the tire they should all be using
C. Tire A will work best for most boys while tire B will work best for most girls.
D. Results are inconclusive and more tests are needed.

Answer Key: D

To see which is the best all-around tire for a variety of road races, the racers should

A. Conduct multiple identical tests, but first ride on tire B.
B. Get more riders to use the tires on asphalt surfaces in multiple tests.
C. Request more promotional literature from the tire companies.
D. Try both tires in multiple tests on all types of road-racing surfaces.

Answer Key: B

*Academic Vocabulary is a list of terms related to the content standard and may be used in test items without explanation. Vocabulary and concepts within the Explanation are assessable and not exclusive.

Core Standard 8.3 Scientific Inquiry, Score Reporting Category 3/8

Scientific Inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses and designing procedures for questioning, collecting, analyzing, and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations and new explorations.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.3S.3 Explain how scientific explanations and theories evolve as new information becomes available.

*Academic Vocabulary**

- theory

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 143-148.

AAAS Science Literacy Benchmarks

Explanation

History of Science

- Evolution
- Impact of new technologies on current thinking

Role of Evidence in Explanations

Content Connections from Previous Grades

4.3S.3, 5.3S.3, 7.3S.3

Sample Items

Which statement represents the MOST RECENT knowledge gained about microbes?

A. Microbes are only visible with a microscope
B. Some microbes are killed by heat
C. Microbes can become resistant to antibiotics
D. Some microbes can cause disease

Answer Key: C

*Academic Vocabulary is a list of terms related to the content standard and may be used in test items without explanation. Vocabulary and concepts within the Explanation are assessable and not exclusive.

Core Standard 8.4 Engineering Design, Score Reporting Category 4/8

Engineering Design is a process of identifying needs, defining problems, identifying design criteria, developing solutions, and evaluating proposed solutions.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.4D.1 Define a problem that addresses a need, and using relevant science principles investigate possible solutions given specified criteria, constraints, priorities, and trade-offs.

*Academic Vocabulary**

- structural

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 161-166.

AAAS Science Literacy Benchmarks

Explanation

Possible design solutions need to address specified:

- criteria
- constraints
- priorities
- trade-offs

Examples of Structural Engineering

- bridge construction
- engineering design features
- earthquake resistant buildings

Content Connections from Previous Grades

6.4D.1, 7.4D.1

Sample Items

For a technology project, Kyle came up with an idea to build a model bridge. He wants his bridge to span 50 cm and to support a 1 kg object. According to the engineering design process, which of the following should be Kyle's next step?

A. Construct prototypes of different kinds of bridges
B. Research the different designs of bridges
C. Gather the materials needed to build the bridge
D. Make a drawing to show how to build the bridge

Massachusetts Released item #16, pg. 443

Answer Key: B

*Academic Vocabulary is a list of terms related to the content standard and may be used in test items without explanation. Vocabulary and concepts within the Explanation are assessable and not exclusive.

Core Standard 8.4 Engineering Design, Score Reporting Category 4/8

Engineering Design is a process of identifying needs, defining problems, identifying design criteria, developing solutions, and evaluating proposed solutions.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.4D.2 Design, construct, and test a proposed engineering design solution and collect relevant data. Evaluate a proposed design solution in terms of design and performance criteria, constraints, priorities, and trade-offs. Identify possible design improvements.

*Academic Vocabulary**

- Durability
- Redesign
- retest

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 161-166.

AAAS Science Literacy Benchmarks

Explanation

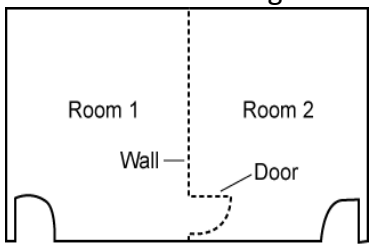
Propose a Solution
Design a prototype solution
Test and evaluate a solution in terms of-

- design and performance criteria
- constraints
- priorities
- trade-offs

Identify improvements that may be possible for the design
Content Connections from Previous Grades
6.4D.2, 7.4D.2

Sample Items

During a remodeling project, homeowners want to remove a wall that separates two rooms in their house. The wall and the two rooms are shown in the diagram below.



According to building codes, the homeowners must add a beam in the ceiling when they remove the existing wall. Which statement **best** explains **why** the homeowners must do this?

A. The wall provides heat insulation for the rooms.
B. The wall provides structural support for the house.
C. The wall provides a sound barrier between the rooms.
D. The wall provides a place to hang objects in the house.

Massachusetts Released Item #20, pg. 446

Answer Key: B

A manufacturer wants to produce a container for food storage that does not break easily and is airtight, inexpensive, and microwave-safe. Which of the following is the best material to use to make the container?

A. Glass
B. Metal
C. Paper
D. Plastic

Massachusetts Release item #4, pg. 438

Answer Key: D

*Academic Vocabulary is a list of terms related to the content standard and may be used in test items without explanation. Vocabulary and concepts within the Explanation are assessable and not exclusive.

Core Standard 8.4 Engineering Design, Score Reporting Category 4/8

Engineering Design is a process of identifying needs, defining problems, identifying design criteria, developing solutions, and evaluating proposed solutions.

It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

Content Standard

8.4D.3 Explain how creating a new technology requires considering societal goals, costs, priorities, and trade-offs.

*Academic Vocabulary**

- Revolution (technology)

Links to National Standards

2009 NAEP Framework

National Science Education Standards: Physical Science Content Standard B, pgs. 161-166.

AAAS Science Literacy Benchmarks

Explanation

Technologies need to consider:

- Societal goals
- Costs (not just monetary)
- priorities
- trade-offs
- impacts (societal, environmental)

Content Connections from Previous Grades

7.4D.3

Sample Items

NASA is phasing out the shuttle system to take people to the International Space Station.
Which is a significant trade-off in creating a new method of reaching the space station?

A. We don't have the technology to develop a new system.
B. It will take time to invent something new and so we will not have a way to travel to and from the space station.
C. The new method allows you to take off like a plane and takes longer to get into orbit.

Answer Key: C

*Academic Vocabulary is a list of terms related to the content standard and may be used in test items without explanation. Vocabulary and concepts within the Explanation are assessable and not exclusive.

Item Specifications

Oregon Assessment of Knowledge and Skills (OAKS) is a multiple choice and computer scored constructed response statewide assessment. It is a required assessment that provides the base for the state accountability system.

Criteria for All OAKS Test Questions

Test items must:

- be appropriate for students in terms of grade-level difficulty, cognitive complexity, reading level, interests and experience.
- be free of age, gender, ethnic, religious, socioeconomic, or disability stereotypes or bias.
- provide clear and complete instructions to students.
- ensure each Score Reporting Category will have items with a range of difficulty and complexity levels.
- ensure each multiple choice test item will measure only one Score Reporting Category.

Graphics Criteria

Graphics are used in OAKS to provide both necessary and supplemental information. Some graphics contain information that is necessary for answering the question, while other graphics illustrate or support the context of the question.

- Graphic displays, their corresponding items and answer choices will appear on the same screen for online items.
- Shading and color will be minimized. It will be used to make a figure's size, shape or dimensions clear, and not solely for artistic effect.
- Graphics used for computer scored constructed response items are displayed within a work space and allow students to manipulate answer graphics and answer choices.

Item Style and Format Criteria for Multiple Choice Items

- Test items will be in the form of questions or sentences that require completion.
- Each item will have three, four or five answer choices. Students will be told in the test directions to choose the best answer from among the choices.
- Answer choices will be arranged one of three ways beneath the test item: vertically, horizontally, or in two columns (i.e., A and B in the left column, C and D in the right column).
- Neither "None of the above" nor "All of the above" will be used as one of the answer choices. "There is not enough information" is an allowed answer choice, but infrequently used.
- Test items may be worded in the negative ("Which of these is NOT …"), but this structure will be used only when it offers substantial advantages for the item construction.

- Items should be free of absolute wording, such as "always" and "never," and have qualifying words (e.g., least, most, except) printed in small caps for emphasis.
- Masculine pronouns should NOT be used to refer to both sexes. Plural forms should be used whenever possible to avoid gender-specific pronouns (For example, instead of "The student will make changes so that he ..," it is best to use "The students will make changes so that they...").
- An equal balance of male and female names should be used including names representing different ethnic groups.
- Test items aligned to standards may contain extraneous information.
- Stacked English-Spanish test items are used on electronic tests for the English-Spanish OAKS.

Item Style and Format Criteria for Computer Scored Constructed Response

- Test items will be in the form of questions or instructions that require at least one object to be created or matched to an existing picture,
- Each item may have many correct answer choices.
- Test items may be worded so that not all answer choices are used to construct the correct response.
- An equal balance of male and female names should be used including names representing different ethnic groups.
- Test items aligned to standards may contain extraneous information but only to enhance the students' understanding of the question.
- Side-by-side English-Spanish test items are under development.
- Students using Braille will not receive constructed response items but will receive similar content items appropriate for students using Braille.

Criteria for SCIENCE OAKS Test Reporting

Student information from 2017-18 OAKS Online Science will be reported through six Score Reporting Categories (SRC) including three Science Core Standards and three Science subjects as sub categories. Scientific Inquiry (SRC 3) and Engineering Design (SRC 4) scores will be combined and reported together as SRC 8 (Science Processes) for 2017-18.

- **Structure and Function (SRC 1):** Understand living and non-living things have characteristics, form and function, and are composed of components that function together to form systems.
- **Interaction and Change (SRC 2):** Understand components in a system can interact in dynamic ways, within or without that system, and may result in change.
- **Physical Science (SRC 5):** Understand structures and properties of matter, forms of energy, and changes that occur in the physical world.
- **Life Science (SRC 6):** Understand structures, functions, and interactions of living organisms and the environment.

- **Earth and Space Science (SRC 7):** Understand physical properties of the Earth and how those properties change. Understand Earth's relationship to other objects in the Universe.
- **Scientific Inquiry (SRC 3) and Engineering Design (SRC 4) reported as (SRC 8):** Understand science process concepts and skills that characterize the nature and practice of science. Scientific Inquiry is a systematic process that includes proposing testable hypotheses, collecting, analyzing, and interpreting data to produce evidence-based explanations and new explorations. Engineering Design is a process of formulating problem statements, identifying criteria and constraints, testing solutions, and incorporating modifications based on test data and communicating the recommendations.

The Test Items

- Each Structure and Function or Interaction and Change test item will also report out to one subject Score Reporting Category but only count once for a student's total score.
- Each Core Score Reporting Category will have items with a range of difficulty levels. This range of difficulty will be approximately the same across the Core reporting categories.
- Test items are designed to be appropriate for students in the assigned test grade in terms of reading level, interests, and experience.
- Test items will be stated in the clearest manner possible.

Criteria for SCIENCE OAKS Modules

A portion of each test will be incorporated into modules. A module is defined as a stimulus containing scientific information, accompanied by two to five knowledge and skills questions. The remaining test items on each test will be discrete/stand-alone knowledge and skills items. Students will not refer to a stimulus when answering those questions.

- The stimulus for each module will vary in length, format and character. It could be one or a combination of any of the following: data table, diagram, chart, drawing, photo or reading text.
- Each Knowledge and Skills test item within a module measures one Core Score Reporting Category (SRC). Within a module, though, items may measure different SRCs.
- Each stimulus will be free of age, gender, and other bias, as evaluated by the Oregon Assessment Sensitivity Panel.
- Although the stimulus for each module will provide scientific information, students will be required to draw on prior knowledge to answer many of the items. In other words, there may not be sufficient information in the stimulus to answer all associated test questions. The stimulus may simply provide a context for some test questions.
- Each module will often include a title, which will serve to identify the accompanying items as a set.

Science Test Blueprint

Introduction

The blueprints used to construct Knowledge and Skills Tests for Science prescribe the:

- Score Reporting Categories (SRC) included on each test,
- the cognitive demand and difficulty level of items as distributed on a test form,
- the number and percentages of test items from each SRC included on each test, and
- the total number and percentages of operational and field test items included for each test.

Teachers and other educators have historically played a vital role in the development of these specifications and blueprints by serving on Content and Assessment Panels and other review groups. These groups have advised the Department as content standards have been developed, and have helped establish priorities on which standards to assess and the weighting of the strands within each content area assessment.

Alignment of Test Items to Content Standards

Test items are carefully aligned to content standards at the appropriate grade level through a rigorous process at two points in the test item development process:

1. At item development workshops, item writers are provided with adopted content standards to which they must write test items; during a peer review process, this alignment is verified by another grade level item developer.
2. Alignment of items to the content standards is further verified during a review by members of a Content and Assessment Panel, who ensure items not only match the content standards, but also verify overall quality and appropriateness. Reviewers either accept items as a strong match to the targeted standards, edit items to achieve a strong match, or reject items which do not strongly match the standards.

The Appendix to this document includes additional evidence describing procedures ensuring alignment during item, development, including descriptions of the Item Development Process and the Life of an Item.

Content Coverage

Prior to item writing activities, item databases are reviewed to determine the extent that the available items represent the emphasis and content in the standards. If any grade level standards are underrepresented in the item pool, they are identified and targeted specifically for additional item development. This assures that every year; the proportion of items in the item pool is comparable in both emphasis and content to the content standards. The table on the following page describes the emphasis given to each content strand; this emphasis is reflected in both the item pool and administered tests.

All tests and the item pool from which they are constructed follow the weighting of each content strand as reflected in the tables on the following pages. Items within a strand, or SRC, are selected to provide a range of difficulty so that the progressive nature of the test is maintained as students of varied ability levels are presented with items most appropriate to their ability from that pool. Although a student may not see an item addressing every one of the assessable standards in a single test event, the item pool contains multiple items for each content standard at a variety of difficulty levels.

Adaptive Algorithm

In addition, the adaptive algorithm specifically considers alignment criteria when drawing test items. As a result, we accomplish the dual purpose of creating a test form that is appropriately developed for each student and meets the criteria set forth for alignment (e.g., balance of representation, depth of knowledge).

Additional Test Design Criteria

Each item assesses content aligned at one grade within the grade level standards.

Item Availability

Online-adaptive test opportunities provide a range and breadth of items within each Core SRC and Subject SRC. Each grade level test pool has approximately 900 items available for testing.

Key Placement

Key placement cannot be controlled for online-adaptive assessments, so to ensure more random correct keys, item writers are instructed to rotate the correct key for their items during item authoring.

Modules

Modules**,** or items that have a stimulus and have 1-6 questions, are designed to be presented together on the same test. Between one third and one half of the items from each SRC in each test pool are Modules.

Spanish Test Pool

The English test blueprints provide the criteria for all English-Spanish tests. Each Spanish test pool has the same items as the English test pool.

Science Score Reporting Categories

This table diagrams the science unifying concepts and processes to be reported.

<table>
<tr><td colspan="2" rowspan="3">Score Reporting Categories</td><td colspan="3">Unifying Concepts and Processes</td></tr>
<tr><td colspan="2">Big Ideas</td><td colspan="2">Science Processes</td></tr>
<tr><td>*Structure and Function (SRC 1)</td><td>*Interaction and Change (SRC 2)</td><td>**Scientific Inquiry (SRC 3)</td><td>**Engineering Design (SRC 4)</td></tr>
<tr><td rowspan="4">Science Disciplines or Subjects</td><td>*Physical Science (SRC 5)</td><td>Structure and Function in Physical Science</td><td>Interaction and Change in Physical Science</td><td colspan="2" rowspan="3"></td></tr>
<tr><td>*Life Science (SRC 6)</td><td>Structure and Function in Life Science</td><td>Interaction and Change in Life Science</td></tr>
<tr><td>*Earth and Space Science (SRC 7)</td><td>Structure and Function in Earth and Space Science</td><td>Interaction and Change in Earth and Space Science</td></tr>
<tr><td colspan="3">**Scientific Inquiry and Engineering Design (SRC 8)</td></tr>
</table>

*Test items aligned to SRC 1 and SRC 2 will also be reported to a subject SRC of Physical Science, Life Science, or Earth and Space Science. But, each test item in SRC 1 or SRC 2 will only be counted **once** toward a student's summary science score.

Weighting of Score Reporting Categories

The 2009 science content standards are organized under four Core Standards. The Core Standard statements describe the unifying concepts and processes in science. Core Standards One, **Structure and Function**, and Two**, Interaction and Change**, describe the big ideas in the three science disciplines or subjects of **Physical, Life, and Earth and Space Science**. Core Standards Three, **Scientific Inquiry**, and Four, **Engineering Design**, describe the science process skills and understandings that characterize the nature and practice of science and engineering.

The chart below shows the score reporting categories (SRC) for each grade tested and the percentage of questions on a given test administration that would asses that category. Test items aligned to SRC 1 and SRC 2 will also be reported to a subject SRC of Physical Science, Life Science, or Earth and Space Science. But, each test item in SRC 1 or SRC 2 will only be counted once toward a student's summary science score. In 2011-12, test items aligned to SRC 3 and SRC 4 will be reported only once as SRC 8.

For example, at grade 5, 25% of the items on a test will assess Structure and Function, which equals about 11 items on a 45-item test. Those 11 items will also be reported as they align to a Subject SRC, for reporting purposes only.

Targeted Percent of Questions by Core SRC					Targeted Percent of Questions by Subject SRC			
	SRC 1	**SRC 2**	**SRC 3***	**SRC 4***	**SRC 5**	**SRC 6**	**SRC 7**	**SRC 8***
	Structure and Function	Interaction and Change	Scientific Inquiry	Engineering Design	Physical Science	Life Science	Earth and Space Science	Science Processes
Grade 5	25%	50%	13%	12%	25%	25%	25%	25%
Grade 8	30%	45%	13%	12%	25%	25%	25%	25%
High School	30%	45%	13%	12%	24%	27%	24%	25%
* Scores from SRC3 and SRC 4 are combined and reported as SRC 8 for 2017-18								

Science Test Blueprint-Grade 8 Test

Content Coverage and Weighting

Score Reporting Categories		Testable content codes	Target % of Questions Assessed per Test*		Online Test Pool Size
Structure and Function	Physical Science	6.1P.1, 7.1P.1, 8.1P.1, 6.1P.2. 8.1P.2, 8.1P.3	25%		380+
	Life Science	6.1L.1, 7.1L.1, 8.1L.1, 7.1L.2,			
	Earth and Space Science	6.1E.1, 6.1E.2			
Interaction and Change	Physical Science	6.2P.1, 7.2P.18.2P.1, 6.2P.2, 8.2P.2	50%		830+
	Life Science	6.2L.1, 7.2L.1, 8.2L.1, 6.2L.2, 7.2L.2			
	Earth and Space Science	6.2E.1, 7.2E.1, 8.2E.1, 7.2E.2, 8.2E.2, 7.2E.3, 8.2E.3, 7.2E.4, 8.2E.4			
Science Processes (SI and ED)	Scientific Inquiry	6.3S.1, 7.3S.1, 8.3S.1, 6.3S.2, 7.3S.2, 8.3S.2, 6.3S.3, 7.3S.3, 8.3S.3	25%		185+
	Engineering Design	6.4D.1, 7.4D.1, 8.4D.1, 6.4D.2, 7.4D.2, 8.4D.2, 6.4D.3, 7.4D.3, 8.4D.3			
Operational Item Total					Approx. 1395
Field Test Item Total					300
Total items on Test			100%		

*During an individual student testing session, the test algorithm selects items from each SRC, targeting the percentages indicated. Furthermore, items are selected to match the target item difficulty level, determined by the student's performance on previous items, and also to match the Cognitive Demand Distribution Goals for the test. The numbers of items available in the item pool for each SRC are sufficient to allow three tests per student each year without the student seeing any item more than once.

Target Cognitive Demand and Item Pool Distribution by Difficulty

The science test pools are designed so that a range of cognitive demand items and a range of difficult items are included for each student's test opportunity. The target item pool difficulty distribution for the Grade 8 test is outlined in the chart. A target range of cognitive demand item delivery is also included. (See Appendix A, Cognitive Demand and Target Item Pool Difficulty Distribution for all grades).

The three Cognitive Demand levels used to qualify Oregon's test items are:

- Recall: Item requires a student to recall a fact, information or procedure.
- Skill/Concept: Item requires a student to use skill or concept, including thinking that requires two or more steps.
- Strategic Thinking: Item requires a student to use reason, develop a plan or use a sequence of steps.

Adaption and RIT Scores

Online adaptive tests provide students with questions at the beginning of the test at or about the mean RIT level and as the student responds, the test item delivery system makes adjustments by selecting appropriate items for each student based upon their correct and incorrect responses. Student scores on each test will vary due to performance and the set of unique test items issued to the student. Generally, students will earn scores between the maximum high and minimum low range. The following are the possible high and low RIT student scores for grade 8 tests, within one or two points, based on a given year's item pool.

High RIT= 295

Low RIT= 167

Difficulty Criteria for Grade 8 level:

Grade 8 Science	**Target Item Pool Difficulty Distribution**
RIT by Difficulty	
213-231	33%
232-240	33%
241-257	33%
RIT Range	213-257
Mean RIT	235
Cognitive Demand	**Target for Item Delivery**
Recall	20%
Skill/Concept	50%
Strategic Thinking	30%

Achievement Level Descriptors

Achievement Level Descriptors describe what students know and can do based on their performance on statewide knowledge and skills tests in the various content areas. These may be used by educators to target instruction and inform parents and students of the expectations for students to be considered proficient at a particular grade level.

The Achievement Level Descriptors are based on a sampling of a larger set of testable content outlined in the Oregon Content Standards. Results for individual students are only one indicator of student ability as measured at the time of testing. These statements give a general description of what most students know and can do within a particular band of achievement and are presented in the order of the way they are reported rather than by importance or test emphasis. Students who score at or within a particular level of achievement possess the bulk of abilities described at that level and generally have mastered the skills described in the preceding achievement levels.

Achievement Level Descriptors for each subject area were developed by groups of parents, educators and business people who worked with state officials to establish the minimum scores required for Exceeds, Meets, Nearly Meets, and Does Not Yet Meet.

Achievement Level Descriptors (ALDs)

General Policy Definitions (apply to all grades and subjects)

- Does Not Yet Meet: Students do not demonstrate mastery of grade-level knowledge and skills required for proficiency.
- Nearly Meets: Students demonstrate partial mastery of grade-level knowledge and skills required for proficiency.
- Meets: Students demonstrate mastery of grade-level knowledge and skills required for proficiency
- Exceeds: Students demonstrate mastery of grade-level knowledge and skills exceeding the requirement for proficiency.

Science Policy Definitions (apply to all grade questions)

- Does Not Yet Meet: Students demonstrate limited mastery of science, scientific inquiry and engineering design knowledge and skills, through the application of the basic concepts with occasional success.
- Nearly Meets: Students demonstrate partial mastery of science, scientific inquiry, and engineering design knowledge and skills, through the application of basic concepts with regular success.
- Meets: Students demonstrate mastery of science, scientific inquiry and engineering design knowledge and skills, through the interpretations and application of grade-level concepts with consistent success.
- Exceeds: Students demonstrate mastery of science, scientific inquiry and engineering design knowledge and skills, through the interpretation and application of advanced concepts with consistent success.

Structure and Function Domain Specific Achievement Level Descriptors

Physical Science

Does Not Yet Meet:

- Identify that physical or chemical properties of matter are different for different kinds of matter and that tools can be used to measure them.
- Identify that matter has mass and takes up space.
- Identify atomic model and that elements and compounds are made of atoms.
- Identify forms of energy.
- Recognize that the Periodic Table has organizational features.
- Recognize that matter is made up of particles with different motion and spacing.

Nearly Meets:

- Identify physical and chemical properties of matter and the tools that can be used to measure them.
- Identify that matter is made of atoms, and that elements and compounds are different.
- Identify features of the atomic model and relate the types and the arrangement of atoms to physical and chemical properties of elements and compounds.
- Recognize the characteristic properties of forms of energy.
- Describe some of the organizational features of the periodic table.
- Relate the states of matter to the motion and spacing of particles.

Meets:

- Describe physical and chemical properties of matter and how they can be measured.
- Explain that matter is made of atoms, elements are composed of a single kind of atom and compounds are composed of two or more different elements.
- Describe the atomic model and explain how the types and arrangement of atoms determine the physical and chemical properties of elements and compounds.
- Compare and contrast the characteristic properties of forms of energy.

- Explain how the Periodic Table is an organization of elements based on their physical and chemical properties.
- Explain how the motion and spacing of particles determines states of matter.

Exceeds:

- Relate the physical and chemical properties of matter to their uses.
- Explain how matter is made of atoms, and that two or more elements combine to form compounds that cannot be physically separated.
- Select an atomic model and explain how it supports the physical and chemical properties of common elements and compounds.
- Explain how the characteristic properties of forms of energy influence how they are used. Utilize the organization of the Periodic Table to identify the physical and chemical properties of groups of elements.
- Explain the effect of changes in energy on the motion and spacing of particles in matter.

Life Science

Does Not Yet Meet:

- Recognize there are differences among types of cells and different cells have different functions.
- Recognize that there are different ways of reproducing and that all living things reproduce.
- Identify characteristics that scientists consider when classifying organisms.
- Distinguish between inherited and learned traits.

Nearly Meets:

- Identify types and components of cells and describe the differences between cells, tissues, organs, and organ systems.
- Distinguish between sexual and asexual reproduction. Recognize that reproduction is essential to all life.
- Recognize that genetic and anatomical characteristics are used to classify organisms.
- Describe how traits of an organism are passed from generation to generation. Use a Punnett Square to determine genotype.

(Structure and Function Domain Specific ALDs Continued)

Life Science

Meets:

- Compare and contrast the types and components of cells. Describe the functions and relative complexity of cells, tissues, organs and organ systems.
- Compare and contrast sexual and asexual reproduction. Explain why reproduction is essential to the continuation of every species.
- Explain how genetics and anatomical characteristics are used to classify organisms and infer evolutionary relationships.
- Distinguish between inherited and learned traits, explain how inherited traits are passed from generation to generation, and describe the relationships between phenotype, genotype, chromosomes, and genes.

Exceeds:

- Identify the contributions that various cell components make to the survival of the cell and organism.
- Explain the advantages and disadvantages of sexual or asexual reproduction for a species.
- Infer evolutionary relationships based on genetics and anatomical characteristics.
- Explain the effect of alteration of genetic material by such events as mutation.
- Differentiate between co-dominant and blended dominant gene pairings and resultant phenotypes.

Earth and Space Science

Does Not Yet Meet:

- Recognize that Earth has layers with different properties.
- Identify objects in the solar system and the position of sun in the solar system.

Nearly Meets:

- Identify some layers of the Earth. Partially describe properties and composition of the layers of the Earth.
- Identify properties of objects in the solar system and differentiate between the solar system, our galaxy, and universe.

(Structure and Function Domain Specific ALDs Continued)

Earth and Space Science

Meets:

- Describe and compare the properties and composition of the layers of Earth.
- Describe the properties of objects in the solar system and the position of the sun within the solar system, galaxy, and universe.

Exceeds:

- Describe in detail Earth's structure and composition.
- Compare and contrast the properties of objects in the solar system and relate the position and scale of the sun to other objects in the solar system, our galaxy, and the universe.

Interaction and Change Achievement Level Descriptors

Domain Specific Descriptors

Physical Science

Does Not Yet Meet:

- Identify types of waves and that they interact with matter.
- Identify examples of electricity (static and current), magnetism, and electrical circuits (series or parallel).
- Identify examples of motion and forces, and recognize that forces are related to motion and gravitation.
- Recognize physical and chemical changes.
- Recognize that energy is transferred, transformed, and conserved.

Nearly Meets:

- Describe types and properties of waves as they interact with matter.
- Recognize there are relationships between: electricity and magnetism, or static and current electricity, or series and parallel circuits.
- Identify some types of motion and forces, and relate these forces qualitatively to the laws of motion and gravitation.
- Distinguish between physical and chemical changes and recognize that matter is conserved in these changes.
- Identify examples of energy being transferred, transformed and conserved.

Meets:

- Describe and compare types and properties of waves and explain how they interact with matter.
- Describe the relationships between: electricity and magnetism, static and current electricity, and series and parallel circuits.
- Identify and describe types of motion and forces, and relate forces qualitatively to the laws of motion and gravitation.
- Compare and contrast physical and chemical changes and describe how the law of conservation of mass applies to these changes.
- Explain how energy is transferred, transformed and conserved.

(Interaction and Change Domain Specific ALDs Continued)

Physical Science

Exceeds:

- Utilize the types and properties of waves to predict how they will interact with matter.
- Explain events based on the relationships between: electricity and magnetism, static and current electricity, and series and parallel electrical circuits.
- Describe various types of motion and forces, and predict the effects of these forces qualitatively to the laws of motion and gravitation.
- Explain how physical and chemical changes occur.
- Trace energy through a system as it is transferred, transformed and conserved.

Life Science

Does Not Yet Meet:

- Differentiate between cells, tissues, organs and organ systems.
- Differentiate an organism from a population and identify the resources each utilizes.
- Recognize that cellular processes occur in organelles and require raw materials.
- Recognize that processes occur in plants and animals to obtain energy and materials for growth and metabolism.
- Identify similarities between the fossil record and modern organisms. Recognize that species change over time.

Nearly Meets:

- Recognize that the various levels of cell and tissue organization can be described by their particular functions.
- Recognize that changes in resources will result in changes in populations
- Identify cellular processes within an organelle and the raw materials needed.
- Identify the processes that plants and animals use to obtain energy and materials needed for growth and metabolism.
- Identify factors involved in natural selection and the characteristics of an organism that might be affected as a result.

(Interaction and Change Domain Specific ALDs Continued)

Life Science

Meets:

- Describe the relationships and interactions between and among cells, tissues, organs and organ systems.
- Explain how individual organisms and populations in an ecosystem interact and how changes in populations are related to resources.
- Explain how organelles within a cell perform cellular processes and how cells obtain the raw materials for those processes.
- Explain the processes by which plants and animals obtain energy and materials for growth and metabolism.
- Explain how species change through the process of natural selection. Describe evidence for evolution.

Exceeds:

- Explain the relationship and interaction of organ systems and the functions of many organ systems in terms of cells, tissues, and organs.
- Predict how a population will change when a resource is changed in type or amount.
- Describe the results of cell processes and the effect of limited raw materials on those processes.
- Identify the products of cellular metabolism and describe how those products are used by plants and animals.
- Explain the process of natural selection as a mechanism for evolution.

(Interaction and Change Domain Specific ALDs Continued)

Earth and Space Science

Does Not Yet Meet:

- Name the processes of the water cycle and types of weather.
- Distinguish between renewable and non-renewable resources and the need for managing waste from these resources.
- Identify gravity as the force keeping objects in motion around the sun, and identify the seasons.
- Recognize that the atmosphere has layers and has changed over time.
- Recognize that there are processes of Earth's geosphere that can result in major geological events.
- Identify an example of global environmental change.
- Recognize that there are patterns of atmospheric and oceanic movement and that they have effects on weather and climate.
- Recognize that landforms change over time and at various rates.
- Identify examples of geological, climatic, environmental and life form changes on Earth over time.

Nearly Meets:

- Recognize that water cycles and how that relates to weather.
- Identify the environmental effects of obtaining, using, and managing waste of renewable and non-renewable resources.
- Identify gravity as the force that keeps objects in the solar system in regular motion, and associate Earth's tilt and motion with seasons.
- Identify layers of the atmosphere and identify how they have changed over time.
- Identify the processes of Earth's geosphere and types of resulting major geological events.
- Identify examples of global environmental change, whether they are caused by human activities or natural processes, and suggest possible solutions.
- Identify patterns of atmospheric and oceanic movement, and examples of the effects on weather and climate.
- Identify examples of how landforms change over time at various rates and some of the forces involved.
- Describe evidence for geological, climatic, environmental and life form changes over time.

(Interaction and Change Domain Specific ALDs Continued)

Earth and Space Science

Meets:

- Explain the water cycle and the relationship to landforms and weather.
- Describe and evaluate the environmental and societal effects of obtaining, using, and managing waste of renewable and non-renewable resources.
- Explain how gravity is the force that keeps objects in the solar system in regular and predictable motion, and describe the resulting phenomena. Explain the interaction that result in Earth's seasons.
- Describe the composition of Earth's atmosphere, how it has changed over time, and implications for the future.
- Describe the processes of Earth's geosphere and the resulting major geological events.
- Evaluate natural processes and human activities that affect global environmental change and suggest and evaluate possible solutions problems
- Explain the causes of patterns of atmospheric and oceanic movement and the effects on weather and climate.
- Explain how landforms change over time at various rates in terms of constructive and destructive forces.
- Analyze evidence for geological, climatic, environmental and life form changes over time.

Exceeds:

- Explain the processes of the water cycle and describe the interactions of landforms, weather, and climate.
- Evaluate and predict the environmental and societal effects of obtaining, using and managing waste from renewable and non-renewable resources.
- Explain how gravitational force affects the orbital motion of objects in the solar system in terms of periods and paths. Explain the seasonal cycle in terms of Earth's tilt and motion in relation to intensity of sunlight.
- Based on examples of how the atmosphere has changed over time, predict future impact of human actions and of natural disasters on atmospheric composition.
- Explain and analyze how the processes of Earth's geosphere result in major geological events.

(Interaction and Change Domain Specific ALDs Continued)

Earth and Space Science

Exceeds (continued):

- Based on measured evidence and trends, predict the rate of global environmental change, and estimate the impact of human efforts to solve environmental problems.
- Predict how changes in patterns of atmospheric and oceanic movement could affect weather and climate.
- Evaluate and predict rates of change in landforms over time, and describe the particular constructive and destructive forces involved
- Analyze evidence for geological, climatic, environmental and life form changes over time, and predict future changes.

Scientific Inquiry Achievement Level Descriptors

Does Not Yet Meet:

- Based on observations, propose questions or hypotheses
- Design and conduct an investigation that uses appropriate tools and techniques to collect relevant data.
- Collect and display data and communicate a conclusion.
- Recognize that scientific explanation and theories change.

Nearly Meets:

- Based on observations, propose questions or hypotheses that can be tested.
- Design and conduct a scientific investigation that uses appropriate tools, techniques, and variables to collect relevant data.
- Organize and display relevant data, construct an evidence-based explanation of the results of an investigation, and communicate the conclusions.
- Identify examples of scientific explanations and theories that have changed.

Meets:

- Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation.
- Design and conduct a scientific investigation that uses appropriate tools, techniques, independent and dependent variables, and controls to collect relevant data
- Organize, display, and analyze relevant data, construct an evidence-based explanation of the results of a scientific investigation, and communicate the conclusions including possible sources of error. Suggest new investigations based on analysis of results.
- Explain how scientific explanations and theories evolve as new information becomes available.

(Scientific Inquiry ALDs Continued)

Exceeds:

- Based on observations and science principles, propose and justify questions or hypotheses that can be examined through scientific investigation.
- Justify the tools, techniques, independent and dependent variables, and controls used in the design of a scientific investigation.
- Organize, display, and analyze relevant data, justify an evidence-based explanation of the results of a scientific investigation, and communicate the conclusions including significant sources of error. Justify new investigations based on analysis of results.
- Justify changes in scientific explanations based on the accumulation of additional data and/or discovery of new information.

Engineering Design Achievement Level Descriptors

Does Not Yet Meet:

- State a problem that addresses a need and identify factors that affect possible solutions.
- Design, construct, and test a possible solution to a defined problem.
- Relate proposed engineering design solutions to the defined problem.
- Recognize the connection between new scientific knowledge and new technology.

Nearly Meets:

- Define a problem that addresses a need and identify constraints and criteria that affect possible solutions.
- Design, construct, and test a possible solution using appropriate tools and materials.
- Describe a possible solution in terms of design and performance criteria and constraints.
- Recognize the connection between societal goals and new technology.

Meets:

- Define a problem that addresses a need and using relevant science principles investigate possible solutions given specified criteria, constraints, priorities, and trade-offs.
- Design, construct, and test a proposed solution and collect relevant data.
- Evaluate a proposed solution in terms of design and performance criteria, constraints, priorities, and trade-offs.
- Explain how creating a new technology requires considering societal goals, costs, priorities, and trade-offs.

Exceeds:

- Explain how a proposed solution to a need uses science principles and satisfies given criteria and constraints.
- Design, construct, and test a plausible solution and collect sufficient data.
- Evaluate to what extent a proposed solution addresses the design and performance criteria, constraints, priorities, and trade-offs. Identify possible design improvements.
- Explain how changing societal goals and priorities justify the demand for and acceptance of new technologies.

Local Assessments Required by OAR 581-22-2115 Assessment of Essential Skills

Local Performance Assessment

School districts and public charter schools that offer instruction at grades 3 through 8 or high school must administer annual local performance assessments for students in grades 3 through 8 and at least once in high school for the skill areas of writing, speaking, mathematics problem solving, and scientific inquiry. The purpose of the local performance assessment requirement is to ensure that students in grades 3 through high school are afforded opportunities to learn and to receive feedback regarding their progress toward meeting specific state standards throughout their years in public schools.

A local performance assessment is a standardized measure (e.g., activity, exercise, problem, or work sample scored using an official state scoring guide), embedded in the school district's or public charter school's curriculum that evaluates the application of students' knowledge and skills. Local performance assessments must be designed to closely align with state standards and to promote independent, individual student work.

School districts and public charter schools may either use a work sample scored using an official state scoring guide or a comparable measure adopted by the school district or public charter school to satisfy the local performance assessment requirement. *Section 6.0 Local Performance Assessment Requirement* of the 2016-17 Essential Skills and Local Performance Assessment Manual provides guidance for those school districts and public charter schools choosing to use a work sample to satisfy this requirement.

Assessment of Proficiency in the Essential Skills

As part of the new graduation requirements, high school students must demonstrate proficiency in a set of Essential Skills, which are defined as process skills that cross academic disciplines and are embedded in the content standards. Students may demonstrate proficiency in these Essential Skills using any of the assessment options approved by the State Board of Education.

Students may demonstrate proficiency using Oregon's Statewide Assessments, Smarter Balanced, or other standardized assessment listed in section 3.2 of the 2016-17 Essential Skills and Local

Performance Assessment Manual. Another approved option of the Essential Skills of Writing, Speaking, and Mathematics is the completion of work samples scored locally using an official state scoring guide. Section3.4: Local Assessment Option of the 2016-17 Essential Skills and Local Performance Assessment Manual provides guidance for those school districts and public charter schools choosing to use a work sample to satisfy this requirement.

Three of the essential skills are established as requirements for graduation including: Reading, Writing, and Mathematics. Science Inquiry is not a requirement for graduation as of the 2017-18 school year.

Appendices

Included in this section are:

Appendix A: Target Cognitive Demand and Item Pool Distribution Goals for all Grades

Appendix B: Item Development Process

Appendix A: Target Cognitive Demand and Item Pool Distribution by Difficulty

Oregon recognizes the importance of Cognitive Demand as part of test specification. To that end, we are implementing a strategy to overtly incorporate a test design process that includes the three dimensions of content, difficulty and Depth of Knowledge.

- The first step in the process was convening content panels to ask for their determination as to the appropriate allocation of Cognitive Demand, given the newly adopted content standards.
- The second step was to analyze the gap between the Cognitive Demand and Level of Complexity of all items in the current pools against the content panel's recommendations.
- The third step involved engaging item writers to write items to fill in the critical gaps. These items were reviewed and field tested through our standard processes.

The three Level of Complexity levels to be addressed are:

- Recall: Item requires a student to recall a fact, information or procedure.
- Skill/Concept: Item requires a student to use a skill or concept, including thinking that requires two or more steps.
- Strategic Thinking: Item requires a student to use reason, develop a plan or use a sequence of steps.

Target Cognitive Demand and Item Pool Distribution by Difficulty

Grade 5	Target Item Pool Difficulty Distribution
Difficulty	
204-223	33%
224-231	33%
232-249	33%
Cognitive Demand	
Recall	25%
Skill/Concept	50%
Strategic Thinking	25%
RIT Range	204-249
Mean RIT	228

Grade 8	Target Item Pool Difficulty Distribution
Difficulty	
213-231	33%
232-240	33%
241-257	33%
Cognitive Demand	
Recall	20%
Skill/Concept	50%
Strategic Thinking	30%
RIT Range	213-257
Mean RIT	235

High School	Target Item Pool Difficulty Distribution
Difficulty	
213-233	33%
234-241	33%
242-258	33%
Cognitive Demand	
Recall	20%
Skill/Concept	50%
Strategic Thinking	30%
RIT Range	213-258
Mean RIT	237

Appendix B: Item Development Process

Oregon's item development process is consistent with industry practice and takes approximately two years, including writing, reviewing, and field-testing new items. Just as the development of Oregon's content and performance standards is an open, consensus-driven process, the development of test items and prompts to measure those constructs is grounded in a similar philosophy.

Item Writing

For the Knowledge and Skills (multiple-choice) tests and the Writing Performance Assessment, most item writing takes place during either on site, remote and/or online item writing workshops, in which Oregon teachers across the five main content areas write and review items. The process remains the same regardless of workshop format.

Item writers are typically Oregon teachers who have received training in item construction, are familiar with test specifications, and have demonstrated skill in writing items that pass content and sensitivity panel review. Item writers receive professional development compensation for their time and travel expenses. Among other security precautions, ODE requires item writers to sign confidentiality forms assuring that they will work with the items in a secure manner.

All items are written to measure specific subdomains of the content standards at a variety of specified levels of cognitive complexity. Cognitive complexity is represented by the following classification, developed from Bloom's (1956) educational taxonomy:[1]

- **Recall:** Recall, label, or locate information; define or describe facts or processes.
- **Skill/Concept (Basic Application):** Use information or conceptual knowledge, often requiring two or more steps; summarize, classify, or explain information or processes; make predictions or generalizations; solve problems.
- **Strategic thinking:** Analyze, critique, compare or contrast; create new information; or organize presented information.
- **Extended thinking:** Make connections and extensions (exclusively assessed in the Writing Performance Assessment and local performance assessments).

During the item writing workshop, writers draft items, document rationale of distracters, and conduct peer reviews of each other's items. Examples of items are provided, and facilitators provide process guidance and additional review. Writers and reviewers evaluate the strength and clarity of the match between the drafted item and the standard it measures. All issues are worked out or solved multiple times

[1] Bloom, B. S. (ed.), Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of educational objectives: Handbook I: Cognitive domain*. New York: David McKay.

by multiple reviewers who verify that distractors are plausible, that answers are correct, and that each items has only a single correct answer.

Following item writing workshops, items are entered into the Item Tracking System (ITS). Oregon's original graphics are initially entered into the ODE's Comprehensive Item Management System (CIMS) and then transferred to ITS. Within ITS and CIMS, each item is given a unique item identification number to facilitate the monitoring and tracking of changes to and usage of the item throughout the review process and each item's history. ITS provides authorized users with access to each item's alignment and attributes, field-test results and use, response rationales, and previous versions.

Although item writing workshops may still occur annually, ODE has recently moved toward distributed item writing in which consistently strong item writers author additional items throughout the year. Items still go through the review process previously described. Item writers are trained on the use of secure item entry using ITS, and graphic drafts are scanned by the item writers and securely transmitted to ODE.

Fig. 1 Sample Oregon Writing Form

Writer ID	Grade	Correct Key	Key Words	Sample Content Area
☐☐☐☐				
☒ General Population	☐ K-2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ HS ☐ X Extended	Estimated Item Difficulty: ☐ Easy ☐ Medium ☐ Hard	Level of Complexity: ☐ R – Recall ☐ S/C – Skill & Concept ☐ ST– Strategic Thinking	Graphic M☐☐☐☐☐
SRC ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5		☐ MC ☐ _____	Standard Code ☐.☐.☐☐☐	Item ID M☐☐☐☐☐☐
				Related Essential Skill(s) # (See pg. 8 in notebook)

	Foils	Rationale (Why a student might select this option)
A		
B		
C		
D		

Committee/Panel Review

ODE convenes a series of advisory groups to advise ODE both on assessment-related policy and on item development. ODE seeks to ensure that membership on these advisory groups reflects the demographics of Oregon's student population. Each advisory group has approximately 15–35 members who serve three-year terms with one-third of the members rotating out each year and being replaced by new representatives. The following table describes the structure of these groups. Panel members commit up to 6 school days of service with an additional 3 or 4 days during the summer. However, panels will be convened remotely rather than in person as secure technology improvements allow distributed work. Although committee members on district contracts are not compensated for their service, they do receive travel reimbursement for committee travel of more than 70 miles, and substitute teachers are provided for service during the school year. When classroom teacher members work for ODE during non-contract time, they are compensated at an hourly wage as temporary employees.

Structure of ODE Assessment-Related Advisory Groups

Committee/Panel	Number of Members	Meeting Frequency	Who Nominates Members?
Assessment Policy Advisory Committee	15–20	2-3 times a year	School districts, COSA, OSBA, OEA, ESDs, and OPTA
Sensitivity Panel	15–20	4–6 times a year	School districts, OEA, ESDs (application process)
English/Language Arts Content and Assessment Panel	35	4-6 times a year	School districts, OEA, ESDs, and self-nominate (application process)
Mathematics Content and Assessment Panel	35	4 - 6 times a year	School districts, OEA, ESDs, and self-nominate (application process)
Science Content and Assessment Panel	35	4- 6 times a year	School districts, OEA, ESDs, and self-nominate (application process)
Social Sciences Content and Assessment Panel	25	1 - 2 times a year	School districts, OEA, ESDs, and self-nominate (application process)
English Language Proficiency Content and Assessment Panel	35	1 – 2 times a year	School districts, OEA, ESDs, and self-nominate (application process)

Oregon's Accommodations and Modifications Review Panel is not described here.

The Assessment Policy Advisory Committee consists of representatives from Oregon school districts, schools, and ESDs who are knowledgeable about assessment-related issues. The purpose of the Committee is to advise ODE on both procedural and policy implications of Oregon's assessment system, as well as the feasibility of proposed improvements to Oregon's assessment system. Committee members provide input regarding the various elements of the state assessment system such as educational technology, electronic reporting, operational assessment issues, and test administration.

In addition to seeking advice on assessment-related policy, ODE requires that all items generated for use on Oregon statewide assessments must pass a series of rigorous reviews before they can be used in field and operational tests. All items go through both a content and a sensitivity review as part of the item development process; only those items that measure the grade-level expectations and meet both overall quality and sensitivity criteria are carried forward to the field-test stage.

ODE Content and Assessment Panels exist for each of the content areas for which statewide tests are given: English/Language Arts (this panel reviews Writing and Reading/Literature assessment items), Mathematics, Science, Social Sciences, and English Language Proficiency.

Most members of these panels are classroom teachers, with some representation from higher education, district curriculum and assessment personnel, and related businesses. Criteria for panel selection include the following:

Criteria For Panel Selection

- Knowledge of Oregon's content standards and expertise in the subject area and its eligible content
- Teaching experience at the grade level or benchmark to which the individual will be assigned
- Geographical location to ensure that all regions of Oregon are represented
- Gender and ethnic diversity to ensure that the panel represents the diversity of Oregon's student population

Current item writers are not allowed to serve on item review committees. However, in some cases, content and assessment panel experts may be utilized as item writing facilitators.

Items are accepted, rejected, or modified by the Content and Assessment Panel to make sure they represent the constructs embodied in grade-specific content standards and test specifications. In addition to judgements of content relevance, the panels appraise the technical quality of items, looking for items that are free from such flaws as (a)inappropriate readability level, (b)ambiguity, (c)incorrectly keyed answers and distracters, (d)unclear instructions, and (e)factual inaccuracy. The panels for each content area use the following review process.

Content Area Review Process

1. Three content panel members review each item independently and complete an Item Review Form (IRF) (figure 1) using a pre-assigned reviewer ID.

2. Then, the three content panel members review the item collectively, and item reviewers make a recommendation for each item on the IRF to either (a) accept the item as written, (b) accept the item with revisions, or (c) reject the item (sometimes an alternate question is offered that entails a simple revision).

3. When all three reviewers agree that an item should be accepted or rejected, no further discussion is needed. If one or more of the reviewers feel that an item should be revised, then they attempt to reach a consensus and produce a "master copy" of their recommendation. The same is true if one or two of the reviewers reject an item that another reviewer finds acceptable with or without revisions.

4. In most cases, recommendations are followed and revisions are made, or items are eliminated. The ODE assessment specialist can override the recommendation, but this occurs rarely and only for compelling reasons.

Specific Checks

The content panels perform specific checks on items to confirm that:

- the SRC and subcategory match.
- the key is correct.
- alternate valid interpretations making the distracters correct do not exist.
- the item is grade-level appropriate in content and reading levels.
- the item is of overall high quality (wording and grammar, graphic quality, curricular importance, etc).
- the identified level of difficulty (i.e., easy, medium, hard) is correct.
- Reading/Literature passages are appropriate in content and reading levels. Science and Social Sciences stimuli align to appropriate content and reading skills.

- the level of cognitive complexity (i.e., recall, skill/concept or strategic thinking) is appropriate to the item and correctly identified.

Following review by the content panel, and according to panel feedback, ODE assessment specialists edit and revise items in ITS in preparation for review by the Sensitivity Panel.

Sensitivity Panel

All items that pass review by the content specialist are next presented to the sensitivity panel. The sensitivity panel reviews convenes day-long meetings, four to six times a year. The panel reviews items from all grade levels and content areas for bias, controversial content, and overly emotional issues.

In general, the sensitivity panel ensures that items:

- present racial, ethnic, and cultural groups in a positive light.
- do not contain controversial, offensive, or potentially upsetting content.
- avoid content familiar only to specific groups of students because of race or ethnicity, class, or geographic location.
- aid in the elimination of stereotypes.
- avoid words or phrases that have multiple meanings.

Following the sensitivity panels and according to panel feedback, ODE assessment specialists edit and revise items in the ITS system.

Expert Review

Next, ODE assessment specialists submit the new items for review by experts that have experience in the roles of item writer and content and assessment panel member. Expert reviewers add an additional quality control check for the online assessments. Experts have received extensive professional development in ITS to review items in a web-preview format providing the exact rendering provided in the online assessments. Experts review each item and confirm that:

- the key is correct.
- alternate valid interpretations making the distracters correct do not exist.
- the item is grade-level appropriate in content and reading levels.
- the item is of overall high quality (wording and grammar, graphic quality, curricular importance, etc).

Following the expert review in most cases, recommendations are followed and revisions are made, or items are eliminated. The ODE assessment specialist can override the recommendation, but this occurs rarely and only for compelling reasons.

Field Testing

Once the items have been reviewed by the content and assessment panel, the sensitivity panel, and an expert reviewer, all Mathematics, Reading/Literature, Science, and Social Sciences test items are field tested. Field test items

identified by the ODE assessment specialists are embedded in the operational tests by content area. As students take the operational tests, they also respond to field test items embedded in the test.

ODE then receives data files of the student responses, which ODE analyzes to determine whether the field test items are behaving as expected. The ODE assessment specialists eliminate those items which the data analysis indicate performed weakly. ODE assessment staff calibrate the difficulty level for those items that performed successfully in preparation for using the item operationally.

Translation of Items Into Spanish

Concurrent with the field testing of items in English, all Mathematics, Science, and Social Sciences test items are translated into Spanish. All required grade-level and benchmark- level statewide tests for Mathematics and Science are offered in English-Spanish tests. English-Spanish tests are also available for Social Sciences. Stacked English-Spanish items are used on electronic tests. Side-by-side English-Spanish and English- Russian Paper/Pencil assessments are available in Mathematics and Science.

Following translation by ODE's translation vendor, the translated items are reviewed by ODE's Spanish- and Russian-speaking experts to ensure that each item accurately conveys the intent of the English text. While the procedure described below specifically addresses Spanish translation, ODE follows a similar procedure for translation of Paper/Pencil items into Russian.

The following linguistic guidelines are used by ODE's translation vendor and Spanish-speaking experts:

- Students are expected to have subject knowledge and use proper terminology/vocabulary for that subject. In other words, what is expected from English-speaking students is also expected from Spanish-speaking students.
- ODE uses formal Spanish (usted, not tú) for test items and includes proper verb conjugation.
- ODE strives to use Global Spanish language that will be interpreted and understood by all Spanish speakers from anywhere in the world. Global Spanish language includes words used worldwide by most Spanish speakers.

After the ODE Spanish reviewers complete a review of the newly translated items, extensive research is conducted by a small group of reviewers on any word that has not met group consensus. Every attempt is made to choose the most correct translation based upon grade level and cultural relevance. A variety of resources are used for selecting the proper translated words including: dictionaries from Mexico, South America and Spain.

Additional Expert Review of Items

On an annual basis, ODE assessment specialists review items from the field test pool for inclusion within the operational test. This level of review acts as an additional quality control for the online assessments. In addition, whenever ODE

transitions to a different test delivery system, ODE submits all of its Reading/Literature, Mathematics, Science, and Social Sciences items for an additional level of expert review to ensure that all items appear consistently from year to year when presented to students.

Item Use and Release

Approximately every three years, ODE releases one sample test for each content area and grade-level and benchmark-level comprised of items used on previous test forms. These items are no longer secure and are taken out of the pool of eligible test items.

Released items are provided in the form of practice tests. Click here to access practice tests for Reading/Literature, Mathematics, Social Sciences, and Science are available on ODE's OAKS Portal. Click here to access Sample Writing Prompts ODE's Local Performance Assessment webpage.