This guide includes the following sections:

- Purpose
- Assessment Design
- Reporting Categories
- Test Administration
- Sample Test Items
- Resources

UPDATE INCLUDED 8/12/19

- Added Test Design Table and Added Additional Test Design Information

PURPOSE

This document is designed to assist Louisiana educators in understanding the LEAP 2025 Science assessment for grade 7.

Introduction

All students in grades 3–8 and high school will take the LEAP 2025 Science assessments, which provide

- questions that have been reviewed by Louisiana educators to ensure their alignment to the Louisiana Student Standards and appropriateness for Louisiana students;
- measurement of the full range of student performance, including the performance of high- and low-performing students; and
- information for educators and parents about student readiness in science and whether students are "on track" for college and careers.

New Vision for Science Standards and Assessments

The Louisiana Student Standards for Science (LSS for Science) were created by over eighty content experts and educators with input from parents and teachers from across the state. Educators envisioned what students should know and be able to do to compete in our communities and created standards that would allow students to do so. The LSS for Science provide appropriate content for all grades or courses, maintain high expectations and create a logical connection of content across and within grades. The LSS for Science represent the knowledge and skills needed for students to successfully transition to postsecondary education and the workplace. The standards call for students to

1) apply content knowledge;
2) investigate, evaluate, and reason scientifically; and
3) connect ideas across disciplines.

ASSESSMENT DESIGN

Supporting Key Shifts in Science Instruction

The spring 2020 operational test will assess a student's understanding of the grade 7 LSS for Science reflecting the multiple dimensions of the standards.

Shift: Apply content knowledge and skills (Disciplinary Core Idea, DCI)

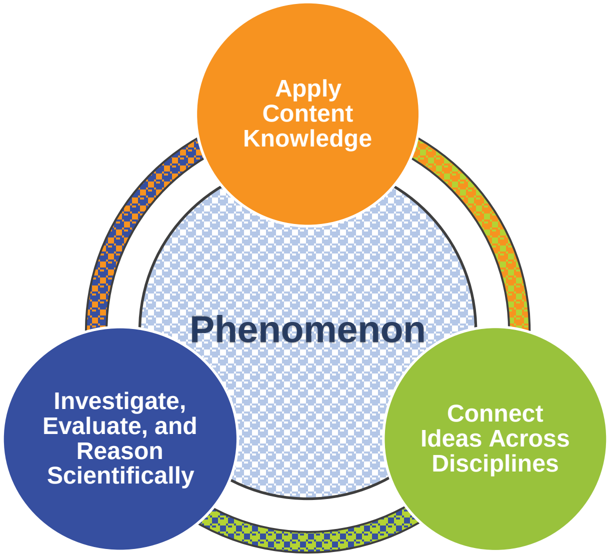
In the classroom, students develop skills and content knowledge reflected in the Performance Expectations (PE) and detailed in the Disciplinary Core Ideas (DCI), the key skills and knowledge students are expected to master by the end of the course.

On the test, students answer questions which require content knowledge and skills aligned to PE bundles (groupings of like PEs) and the corresponding DCIs.

Shift: Investigate, evaluate, and reason scientifically (Science and Engineering Practice, SEP)

In the classroom, students do more than learn about science; they "do" science. Simply having content knowledge and scientific skills are not enough; students must investigate and apply content knowledge to scientific phenomena. Phenomena are real world observations that can be explained through scientific knowledge and reasoning (e.g., water droplets form on the outside of a water glass, plants tend to grow toward their light source, different layers of rock can be seen on the side of the road). Science instruction must integrate the practices, or behaviors, of scientists and engineers as students investigate real-world phenomena and design solutions to problems.

On the test, students do more than answer recall questions about science; they apply the practices, or behaviors, of scientists and engineers as students investigate each real-world phenomenon and design solutions to problems.



Shift: Connect ideas across disciplines (Crosscutting Concept, CCC)

In the classroom, students develop a coherent and scientifically-based view of the world, they must make connections across the domains of science (life science, physical science, earth and space science, environmental science, and engineering, technology, and applications of science). These connections are identified as crosscutting concepts (CCC).

On the test, sets of questions assess student application of knowledge across the domains of science for a comprehensive picture of student readiness for their next grade or course in science.

Set-Based Design

The tests include item sets, task sets, and standalone items. A scientific **phenomenon** provides the anchor for each set or standalone item. Stimulus materials, related to the scientific phenomenon, provide context and focus for sets. A variety of stimulus materials provide context for each described phenomenon. Art is used to help convey information in a simplified form, examples include maps, charts, data tables, bar or line graphs, diagrams, pictures, photographs, or artist's renderings. In addition to the information presented in the stimulus materials, the questions require students to bring in content knowledge from the course to demonstrate their understanding of science. Some **item sets** culminate with a short constructed-response and the **task** culminates with an extended-response item. Each test includes a few **standalone items** which are not part of an item set or task.

Item Types

- **Selected Response (SR)**: includes traditional multiple-choice (MC) questions with four answer options and only one correct answer, as well as multiple-select (MS) questions with five answer options and more than one correct answer. For MS items, the question identifies the number of correct answers, unless it is part of a Two-part Dependent (TPD). In a TPD, the question in Part B will then be worded to "select all that apply." All SR items are worth one point each.
- **Technology Enhanced (TE)**: uses technology to capture student comprehension in authentic ways, previously difficult to score by machine for large-scale assessments. TE items are worth up to two points and may include item types such as, but not limited to, drag and drop, dropdown menus, and hot spots. The Online Tools Training allows students to experience TE items and practice answering them to prepare for the computer-based test.
- **Two-part item**: requires students to answer two related questions, worth two points. Two-part items may combine SR and TE item types.
  - **Two-part Dependent (TPD)**: the first part must be correct in order to earn credit for the second part.
  - **Two-part Independent (TPI)**: each part is scored independently.
- **Constructed Response (CR)**: requires a brief response provided by the student and will be scored using a 2-point rubric. These items may require a brief paragraph, a few sentences, and/or completion of a chart.
- **Extended Response (ER)**: asks students to write a response that expresses the students' ability to apply all three dimensions of the LSS for Science and will be scored using a 9-point rubric.

Test Design

After reviewing the science assessment data and feedback from the past year of operational testing, the Department is reducing the grades 5 through 8 science assessments from 3 sessions to 2 sessions by eliminating four stand-alone items and the embedded field-test portion of the tests. The operational LEAP 2025 grade 7 science assessment contains 5 item sets, 1 task, and 12 standalone items. Additionally, rather than requiring **all** students and schools to participate in field testing annually, a **sample** of students at grades 5-8 will be required to participate in a short field-test session during the existing window. Additional information will be shared in the winter with the schools participating in grades 5-8 field testing.

Science Grade 7			
Test Session	**Component**	**Points**	**Time Allowed**
Session 1	3 Item Sets	18	90 minutes
	6 Standalone Items	8	
Session 2	Task	15	90 minutes
	2 Item Sets	12	
	6 Standalone Items	8	
Total Operational	5 Item Sets, 1 Task, 12 Standalones	61	180 minutes

REPORTING CATEGORIES

All Louisiana Student Standards for Science are eligible for assessment. The LEAP 2025 science assessments examine students' performance of scientific and engineering practices (SEPs) in the context of disciplinary core ideas (DCIs) and crosscutting concepts (CCCs). Although these SEPs are described separately, they generally function in concert. This overlap of SEPs means that assessment items must be designed around a bundle of related performance expectations (PEs) and not tested in isolation from one another. The task set, which contains the extended-response question, may assess any of the LSS for science from year to year. The table below shows the reporting category titles and descriptions as well as the PEs associated with each reporting category.

Grade 7		
Reporting Category	**Description**	**Content**
Investigate	Ask Questions, Define Problems, and Plan Investigations	7-MS-PS3-4, 7-MS-ESS2-5, 7-MS-ESS3-5
Evaluate	Analyze and Interpret Data, Use Mathematics and Computational Thinking, and Engage in Argument from Evidence	7-MS-PS1-2, 7-MS-LS1-3, 7-MS-LS2-4
Reason Scientifically	Develop and Use Models, Construct Explanations, and Design Solutions	7-MS-PS1-4, 7-MS-PS1-5, 7-MS-ESS2-4, 7-MS-ESS2-6, 7-MS-LS1-6, 7-MS-LS1-7, 7-MS-LS2-5, 7-MS-LS3-2, 7-MS-LS4-4

7-MS-LS4-5 may be assessed and would be reported as part of the overall score. This particular PE does not fit neatly into any one of the three categories; rather, it partly touches all three categories.

Achievement-Level Definitions

Achievement-level definitions briefly describe the expectations for student performance at each of Louisiana's five achievement levels:

- **Advanced:** Students performing at this level have **exceeded** college and career readiness expectations and are well prepared for the next level of studies in this content area.
- **Mastery:** Students performing at this level have **met** college and career readiness expectations and are prepared for the next level of studies in this content area.
- **Basic:** Students performing at this level have **nearly met** college and career readiness expectations and may need additional support to be fully prepared for the next level of studies in this content area.
- **Approaching Basic:** Students performing at this level have **partially met** college and career readiness expectations and will need much support to be prepared for the next level of studies in this content area.
- **Unsatisfactory:** Students performing at this level have **not yet met** the college and career readiness expectations and will need extensive support to be prepared for the next level of studies in this content area.

TEST ADMINISTRATION

The **computer-based testing window opens March 30, 2020, and runs through May 1, 2020**. Your school or district test coordinator will communicate your school's testing schedule. All LEAP 2025 assessments are **timed**. No additional time is permitted, except for students who have a documented extended time accommodation (e.g., an IEP).

Testing Materials

All students should receive scratch paper and two pencils from their test administrator.

Scheduling Requirements for Computer-Based Testing

Computer-based testing allows school systems some flexibility in scheduling. However, to reduce incidences of testing irregularities, school systems must adhere to the following scheduling and administration practices:

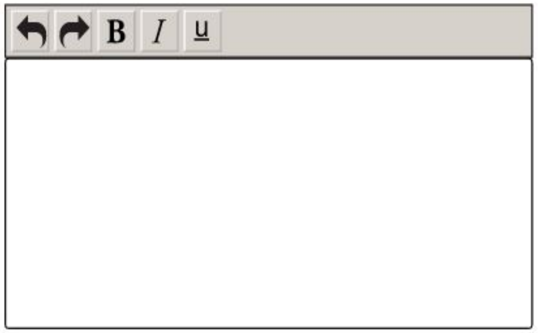
- Testing students in the same grade level across the school at or very close to the same time
- Completing makeup testing for students immediately upon their return
- Limiting student interaction during breaks between test sessions
- Isolating students who have not completed testing for the day (e.g., students with extended time accommodation)
- Preventing interaction between groups of students taking the same tests at different times within a testing day
- Requiring the completion of a session once it is opened (i.e., limiting the reopening of test sessions)
- Taking the sessions within a content area in the correct order (e.g., ELA Session 1 taken before ELA Session 2)

We also recommend

- limiting sessions to no more than three in one day for a student; and
- administering no more than one session that includes an extended-response task or writing prompt (i.e., grades 5-8 Social Studies Session 2, ELA Session 1 and Session 2) in a day to an individual student.

For more information about the scheduling of the test and online administration policies, refer to the CBT Guidance document, found in the LDOE Assessment library.

Testing Platform



Students will enter their answers into the online testing system. When composing their written responses for science constructed- or extended-response item, students will type their responses into an answer box, like the one shown.

The toolbar at the top of the response box allows students to undo or redo and action; and add boldface, italics, or underlining to their response. There is a limit to the amount of characters that can be typed into the response box; however, it is set well beyond what a student might produce given the LEAP 2025 expectations for written responses and timing. The character count is not included on the response box so students focus on the quality of their responses rather than the amount of writing.

The following online tools allow students to select answer choices, "mark" items, eliminate answer options, take notes, enlarge the item, and guide the reading of a text or an item line by line (similar to what a student can do on the paper-based tests). A help tool is also featured to assist students as they use the online system.

- Pointer tool
- Highlighter tool
- Cross-Off tool
- Sticky Note tool
- Magnifying tool
- Line Guide
- Help Tool

All students should work through the Online Tools Training, available through INSIGHT, to practice using the online tools so students are well prepared to navigate the online testing system.

SAMPLE TEST ITEMS

This section includes sample test items. With each item, item set, and task, is a table containing alignment information and the answer key, where possible. Additionally, analyses of the multi-dimensional alignment for the item set and the task are included. Rubrics for CRs and ERs are included with the items.

Standalone Items

Item Type	PE	DCI	SEP	CCC	Points
TEI	7-MS-ESS2-5	MS.ESS2C.b		C/E	1
MC	7-MS-PS1-2	MS.PS1B.a	4. DATA		1
TEI	7-MS-LS2-4	MS.LS2C.a	7. ARG		2
MS	7-MS-LS2-5	MS.LS4D.a	6. E/S		1

SEP = blue; DCI = orange; CCC = green   An asterisk (*) denotes correct answer(s).

Technology-Enhanced Item

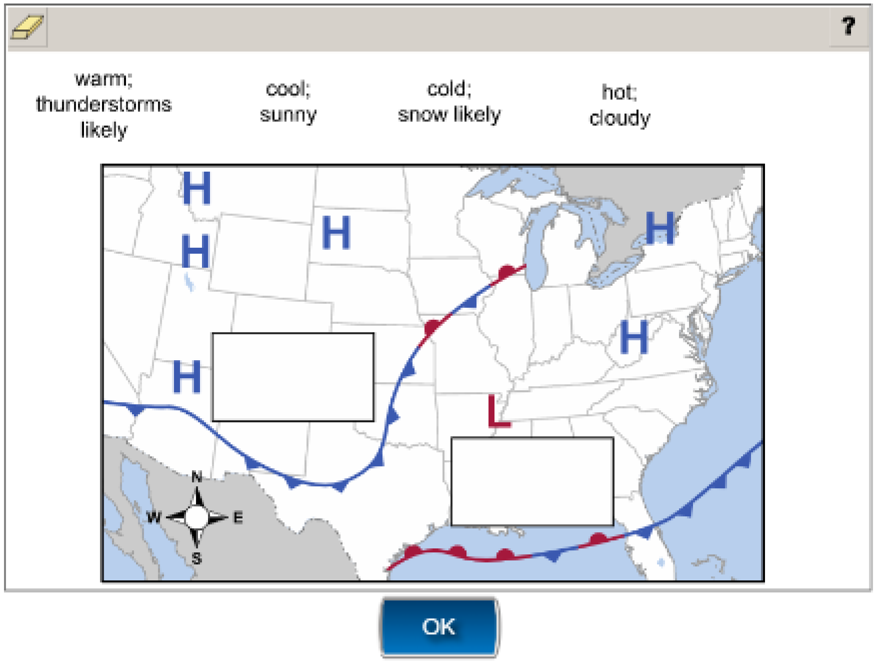
Performance Expectation: **7-MS-ESS2-5** Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

The map shows warm and cold fronts and high- and low-pressure areas in the United States on a summer day. Two areas are identified. Use the information on the map to predict how the weather in **each** area will be affected by the interaction of the air masses shown.

Drag the weather condition that is most likely to be found in **each** area into the correct box on the map.

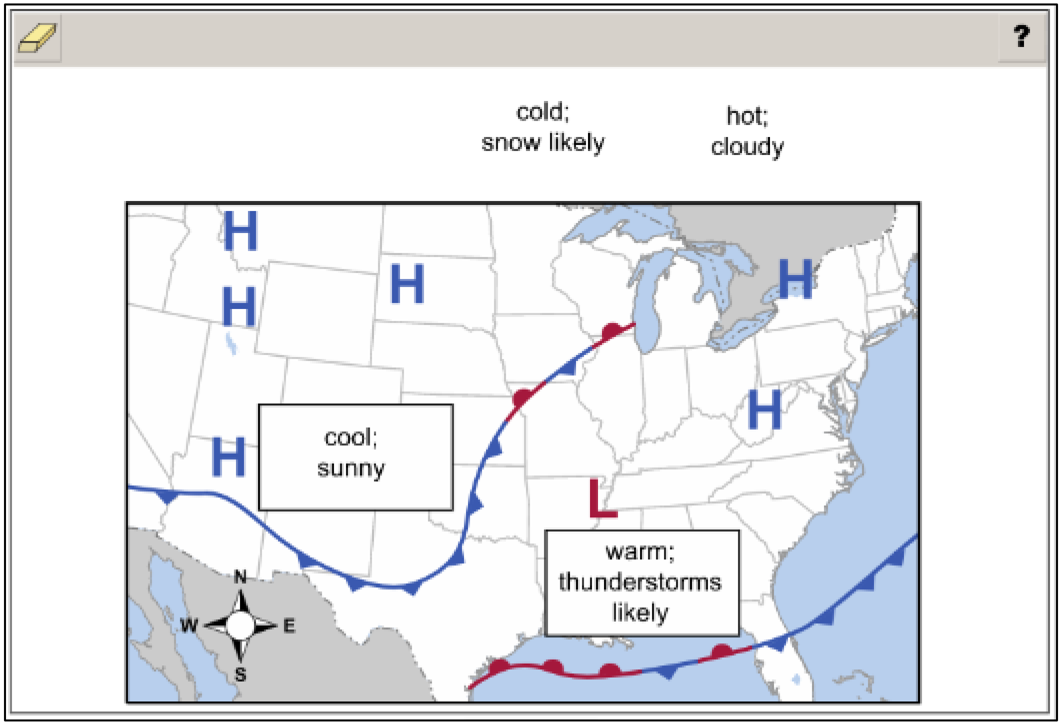
Not all weather conditions will be used.

Not all effects will be used.



Multi-Dimensional Alignment: The item requires the student to apply knowledge of how changes and movement of water within the atmosphere are major determinants of local weather patterns to demonstrate an understanding of cause and effect relationships.

Scoring Information



Multiple-Choice Item

Performance Expectation: **7-MS-PS1-2** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

A scientist places a strip of zinc metal (Zn) in a beaker of hydrochloric acid (HCl) and observes the beaker. Some of the scientist's observations are shown.

- Bubbles form on the surface of the zinc metal.
- The metal slowly disappears.
- The masses of the zinc and the hydrochloric acid are greater than the masses of the resulting products that remain in the liquid.
- The volume of liquid in the beaker decreases slightly as the zinc metal disappears.

Which statement **best** describes the change that occurs when zinc metal is added to hydrochloric acid?

A. A chemical reaction occurs, because a solid dissolves into a liquid, indicating a change of state.

B. The change is physical, because bubbles form on the metal, indicating a temperature change.

C. The change is physical, because the volume of liquid decreases slightly, indicating that the liquid dissolved the solid.

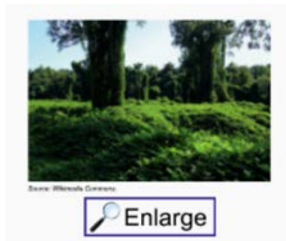
D. A chemical reaction occurs, because the mass of the substances in the beaker is less after the metal dissolves, indicating that a gas was produced.*

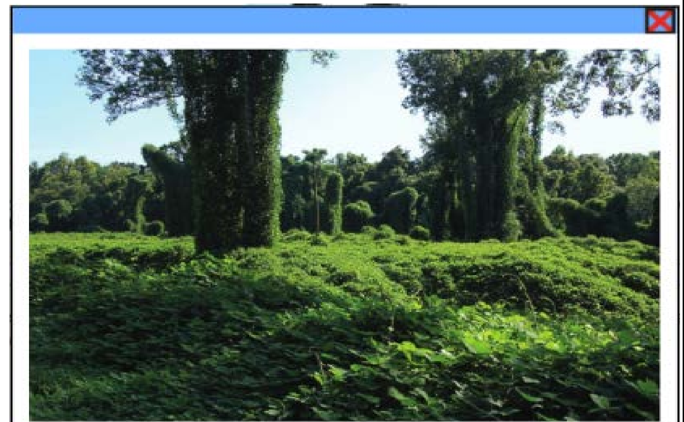
Multi-Dimensional Alignment: While effectively applying the science practice of **interpreting data** by **using quantitative analysis in investigations**, the student demonstrates knowledge of **how substances are regrouped into different substances during chemical reactions and these new substances have different properties from those of the reactants**.

Technology-Enhanced Item

Performance Expectation: **7-MS-LS2-4** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Kudzu is a non-native, invasive vine that grows in the forests of the American Southeast. Kudzu grows quickly, covering native plants and trees. Kudzu can grow up to a foot each day and can reproduce in two ways: by flowers and seeds, or by growing roots from where the vine contacts the soil. The picture shows an area covered in kudzu.





Source: Wikimedia Commons.

One student claims that because the introduction of kudzu has increased the producer population, kudzu is good for forest ecosystems. Based on the information provided about kudzu and your knowledge of ecosystems, select the correct answer from **each** drop-down menu to complete the sentences to support or refute the student's claim.

The introduction of kudzu [▼] native plant populations because kudzu [▼] for resources. The other organisms in

- increases
- decreases
- has no effect on

- competes
- does not compete

the ecosystem [▼] be affected by the changes caused by kudzu in the forest ecosystem because kudzu [▼] in the ecosystem.

- will
- will not

- creates new habitats
- destroys existing habitats
- has no effect on habitats

Multi-Dimensional Alignment: While effectively applying the science practice of engaging in argument from evidence by selecting appropriate evidence to support an explanation, the student demonstrates knowledge of how ecosystems are dynamic in nature and disruptions to biological components of an ecosystem can lead to shifts in all of its populations.

Scoring Information

The introduction of kudzu [decreases ▼] native plant populations because kudzu [competes ▼] for resources.

The other organisms in the ecosystem [will ▼] be affected by the changes caused by kudzu in the forest ecosystem because kudzu [destroys existing habitats ▼] in the ecosystem.

Multiple-Select Item

Performance Expectation: **7-MS-LS2-5** Undertake a design project that assists in maintaining diversity and ecosystem services.

Desertification is a process that causes fertile land to become a desert over time. Some natural processes, such as drought, fire, and climate change, can cause desertification. Humans can also cause desertification by poor management practices in farming, ranching, water use, and land use.

Additional processes that cause desertification include:

- Inefficient watering
- Erosion of topsoil by heavy livestock use
- Overgrazing by livestock (cows, goats, horses)
- Depleting soil nutrients by overuse of farmland
- Removing trees and plants that hold soil in place

Based on the information provided on desertification, which solutions would help minimize the risk of desertification in an area?

Select the **two** correct answers.

A. planting large trees around the edges of a field*

B. keeping livestock in a bare field to help fertilize the field

C. collecting rainwater for use when water resources are scarce*

D. placing a mixture of different types of livestock in a pasture each year

E. planting fast-growing crops to maximize the growing season each year

Multi-Dimensional Alignment: While effectively applying the engineering practice of designing solutions by selecting a solution that meets specific design criteria, the student demonstrates knowledge of how changes in biodiversity impact humans' resources as well as ecosystem services upon which humans rely.

ITEM SET: Reintroduction of the Takhi

Performance Expectations:

7-MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
7-MS-LS4-5 Gather, read, and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Item Type	PE	DCI	SEP	CCC	Points
MC	7-MS-LS4-5	MS.LS4B.b	8. INFO		1
TEI	7-MS-LS4-4	MS.LS4B.a	6. E/S		1
TPD	7-MS-LS4-4	MS.LS4B.a	6. E/S	C/E	2
CR	7-MS-LS4-5	MS.LS4B.b		C/E	2

SEP = blue; DCI = orange; CCC = green   An asterisk (*) denotes correct answer(s).

Stimulus Materials

Use the information about the reintroduction of the takhi and your knowledge of science to answer the questions.

Reintroduction of the Takhi

Nearly all species of horses today, including the wild American mustang, are members of the domesticated horse species *Equus caballus*. Domesticated horses have been bred by humans for thousands of years to have desired traits. The process of selecting certain traits as the basis for breeding is known as *artificial selection* or *selective breeding*. Through the process of selective breeding, the genetic variation within a breed is greatly reduced. Thoroughbreds, for example, are a type of racehorse that is selectively bred for speed and stamina. Some of the traits desired by humans result in breeds of domestic horses that are less capable of surviving in the wild.

There is one species of horse not descended from *Equus caballus*—the takhi. The takhi, also known as Przewalski's horse, is native to the Mongolian steppe in central Asia. The Mongolian steppe is a cold, dry, grassy plain with long winters and short summers. Winter temperatures can reach as low as –45°C, and summer temperatures can reach as high as 30°C. Takhi have never been domesticated by humans but are well adapted to life on the Mongolian steppe. Picture 1 shows takhi in their native environment.

Picture 1. Takhi in the Wild

Source: Pete Oxford/Minden Pictures/Getty Images, Inc.

Takhi became endangered over time, mainly due to human activity. By 1969, takhi were extinct in the wild, and only a few hundred takhi remained in zoos. A captive breeding program was started, which included twelve males (stallions) chosen for their genetic diversity.

In the 1990s, captive takhi from the breeding program were reintroduced to selected areas in the Mongolian steppe. In the first few years after reintroduction, many horses died. Those that did survive were able to thrive. Today the wild takhi population has more than 2,000 individuals. Takhi are one of the first animal species to be successfully reintroduced to the wild after living in zoos for many generations.

Multiple-Choice Item

Selective breeding programs, such as those that produce thoroughbreds, and captive breeding programs, such as those used to increase the takhi population, have different outcomes. Which statement both describes an outcome of one type of breeding program and is supported by the information about the takhi?

A. Long-term selective breeding for specialized traits produces high-quality genes that improve a species's chances of continued survival.

B. Long-term selective breeding for specialized traits can make it less likely that individuals will express desired traits.

C. The takhi captive breeding program has proven that only a few individuals are necessary to produce a population with traits that ensure survival.

D. The takhi captive breeding program has demonstrated that populations with genetic diversity have a greater likelihood that some individuals will have traits that favor survival.*

Multi-Dimensional Alignment: While effectively applying the science practice of **evaluating, obtaining, and communicating information** by **evaluating information for accuracy**, the student demonstrates knowledge of **how genetic engineering techniques have changed the way humans influence the inheritance of desired traits in organisms**.

Technology-Enhanced Item

The table lists some effects that the reintroduction of the takhi has had on the genetic diversity of the population. Each effect has a cause.

Drag the statement that **best** explains the cause of **each** effect into the appropriate box.

Not all statements will be used.

?

Only a small population of captive-bred takhi remained in 1969.

Twelve breeding stallions were chosen based on their genetic diversity.

Takhi have never been domesticated by humans.

Takhi are not members of *Equus caballus*.

Cause	Effect
	Breeding was done in a way that led to a diverse group of offspring to rebuild a wild population.
	If there had not been takhi in captivity, the species would have become extinct.
	The genetic diversity of the takhi has not been artificially altered to favor traits that might be harmful in the wild.

OK

Multi-Dimensional Alignment: While effectively applying the science practice of constructing explanations by identifying relationships between variables that describe phenomenon, the student demonstrates an understanding of how natural selection leads to the predominance of certain traits in a population and suppression of others.

Scoring Information

Cause	Effect
Twelve breeding stallions were chosen based on their genetic diversity.	Breeding was done in a way that led to a diverse group of offspring to rebuild a wild population.
Only a small population of captive-bred takhi remained in 1969.	If there had not been takhi in captivity, the species would have become extinct.
Takhi have never been domesticated by humans.	The genetic diversity of the takhi has not been artificially altered to favor traits that might be harmful in the wild.

Two-Part Dependent Item (Part A: Multiple-Choice Item, Part B: Multiple-Choice Item)

Takhi and domesticated horses share many traits, but there are some traits that are unique to takhi. For example, takhi are smaller than domestic horses and have thicker fur coats.

Part A
Which statement identifies the **main** cause of takhi tending to be smaller and having thicker coats than domestic horses?

A. All takhi developed from a single individual that had those traits.
B. All takhi change which genes they choose to express in an environment.
C. Takhi were exposed to many different environments over time.
D. Takhi are native to an area with cold, dry grasslands.*

Part B
Which statement **best** supports the answer to Part A?

A. Takhi tend to have the same traits because they have very limited genetic diversity.
B. Takhi have a wide range of survival traits because of their high degree of genetic diversity.
C. Individual takhi with certain traits had a survival advantage over individuals without those traits.*
D. Individual takhi were able to change their traits to improve their chances of survival in various environments.

Multi-Dimensional Alignment: The item requires the student to apply the science practice of constructing explanations by identifying the relationship between variables to describe phenomena and knowledge of how natural selection leads to the predominance of certain traits in a population and suppression of others to demonstrate an understanding of cause and effect relationships.

Constructed-Response Item

Thoroughbreds are an example of a type of horse that results from selective breeding. However, not all thoroughbreds have the traits that are most desired.

Part A
Explain how the process of selective breeding increases the probability that offspring will have a desired trait.

Part B
Explain why not all individual thoroughbreds express the desired traits and what that means about the thoroughbred gene pool.

Multi-Dimensional Alignment: The item requires the student to apply knowledge of how genetic engineering techniques have changed the way humans influence the inheritance of desired traits in organisms to demonstrate an understanding of cause and effect relationships.

Scoring Guide

Scoring Information	
Score	**Description**
2	Student's response correctly explains how the process of selective breeding increases the probability that offspring will have a desired trait **and** correctly explains why not all individual thoroughbreds express the desired traits and what that means about the thoroughbred gene pool.
1	Student's response correctly explains how the process of selective breeding increases the probability that offspring will have a desired trait **or** correctly explains why not all individual thoroughbreds express the desired traits and what that means about the thoroughbred gene pool.
0	Student's response does **not** explain how the process of selective breeding increases the probability that offspring will have a desired trait **and** does **not** explain why not all individual thoroughbreds express the desired traits or what that means about the thoroughbred gene pool.

Sample Response:

Part A
The process used in selective breeding is to select and breed individuals that have the desired trait with the hope that the trait is passed on to offspring.

Part B
All individuals that have been selectively bred do not express the desired trait because sometimes the individual receives genes from its parents that result in the expression of an undesired trait, indicating that there is still some diversity among the thoroughbred gene pool.

Accept other reasonable answers.

TASK: Properties of Water

Performance Expectations:

7-MS-PS1-4 Develop a model that predicts and describes changes in particle motion, temperature, and the state of a pure substance when thermal energy is added or removed.

7-MS-PS3-4 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

Item Type	PE	DCI	SEP	CCC	Points
TEI	7-MS-PS1-4	MS.PS1A.d; MS.PS1A.c	2. MOD		2
MC	7-MS-PS1-4	MS.PS1A.d; MS.PS3A.c	2. MOD		1
TPD	7-MS-PS3-4	MS.PS3B.b; MS.PS3A.d		SPQ	2
MC	7-MS-PS3-4	MS.PS3A.d; MS.PS3B.b		SPQ	1
ER	7-MS-PS3-4; 7-MS-PS1-4	MS.PS3A.d; MS.PS3A.c; MS.PS3B.b; MS.PS3B.c; MS.PS1A.f	3. INV	SPQ; C/E	9

SEP = blue; DCI = orange; CCC = green An asterisk (*) denotes correct answer(s).

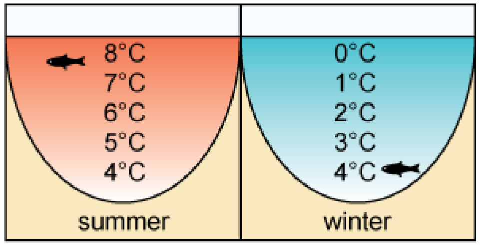
Stimulus Materials

Use the information about properties of water and your knowledge of science to help answer the questions.

Properties of Water

A student examines Figure 1. It shows how the water temperatures at different depths compare in summer and in winter. The student wonders why, in summer, warmer water sits on top of cooler water, but in winter, water that is frozen (0°C) floats on top of warmer water.

Figure 1. Summer and Winter Water Temperatures at Different Depths in a Lake



The student learns that water has many unique properties that make it different from most other substances. Water is one of the few substances that exists on Earth's surface in all three phases of matter (solid, liquid, and gas).

Another unique property of water is that, unlike most other substances, it is less dense in the solid phase than in the liquid phase. This helps explain why ice cubes float near the top of a glass of water and why ice forms on the surface of a pond or a lake in winter. This also means that a mass of water in the solid phase takes up more volume than the same mass of liquid water.

Technology-Enhanced Item

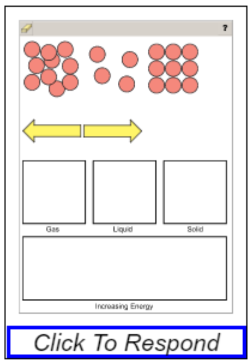
The student investigates how the arrangement of water molecules in each phase of matter affects the properties of water in each phase.

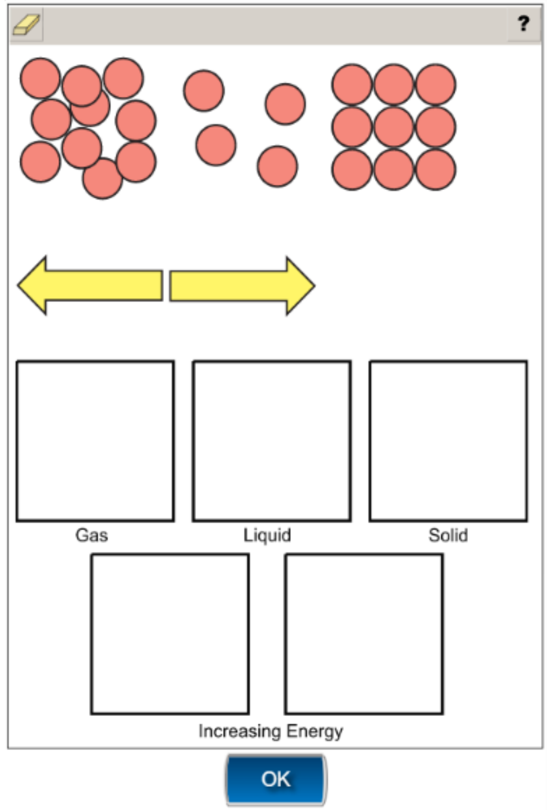
Complete the model by following the **two** steps.

Step 1: Drag the arrangement of particles that best represents **each** phase into the box labeled with that phase.

Step 2: Drag **two** energy arrows into the boxes labeled "Increasing Energy" to show the direction in which energy increases when moving from gas to liquid and liquid to solid.

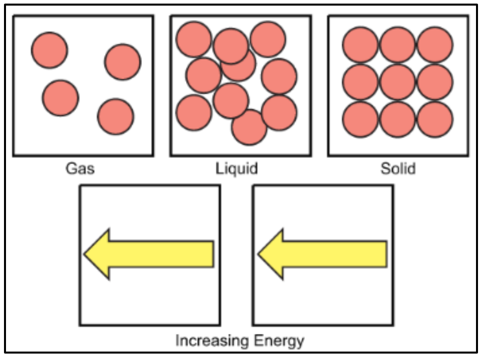
Each arrow may be used more than once.





Multi-Dimensional Alignment: While effectively applying the science practice of developing and using models by describing a phenomenon, the student demonstrates knowledge of how molecules in liquids are in constant motion and contact with each other, molecules in a gas are widely spaced except when they happen to collide, and molecules in a solid are closely spaced and may vibrate in position but do not change relative locations, and how gases and liquids are made of molecules or atoms that are moving about relative to each other.

Scoring Information



Multiple-Choice Item

Another student wants to develop a model to help explain what causes solid water to float on the surface of liquid water. Which information should the student's model include to help explain what causes solid water to float?

A. The model should include that the size of the particles increases as water changes from a liquid to a solid.

B. The model should include that the particles in the solid are slightly farther apart than the particles in the liquid.*

C. The model should include that the temperature of the particles changes as water changes from a liquid to a solid.

D. The model should include that the total number of particles in a solid is slightly less than the total number of particles in a liquid.

Multi-Dimensional Alignment: While effectively applying the science practice of **developing and using models** by **identifying elements of a model to describe phenomena**, the student demonstrates knowledge of

- **how molecules in liquids are in constant motion and contact with each other and molecules in a solid are closely spaced and may vibrate in position but do not change relative locations**, and
- **how the total thermal energy of a system is dependent on the temperature, number of atoms, and state of matter**.

Two-Part Dependent Item (Part A: Technology-Enhanced Item, Part B: Multiple-Select Item)

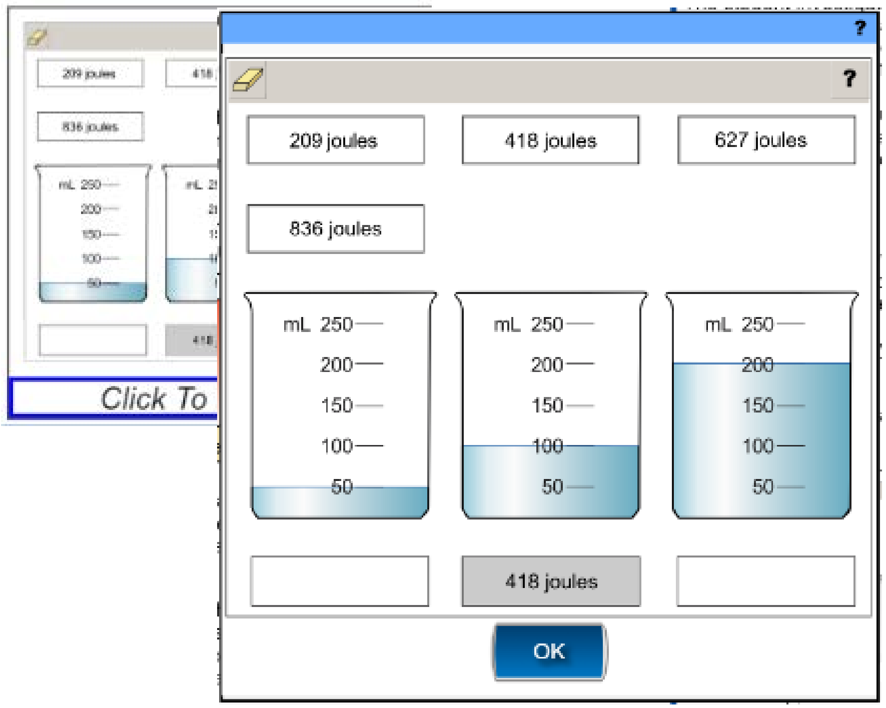
The student investigates the heat capacities of different samples of water. Heat capacity is the amount of energy needed to raise the temperature of a sample of water by 1° C. The student will measure the amount of energy, in joules, needed to raise the temperature of the water in three different beakers by 1° C.

Part A

The amount of energy needed to heat 100 mL of water is shown. Predict the amount of heat energy needed to heat the water in the other two beakers.

Drag each heat energy value to the appropriate beaker.

Each value may be used more than once. Not all values will be used.



Part B

Which statements support the answer to Part A?

Select **all** that apply.

A. Each beaker contains the same substance, so the total amount of energy needed to raise the temperature by 1°C is the same for each beaker.

B. As the amount of water in the beaker increases, the total amount of thermal energy required to raise the temperature by 1°C increases.*

C. As the amount of water in the beaker increases, the total amount of thermal energy required to raise the temperature by 1°C decreases.

D. The relationship between the mass of a substance and the amount of thermal energy required for a given temperature increase is directly proportional.*

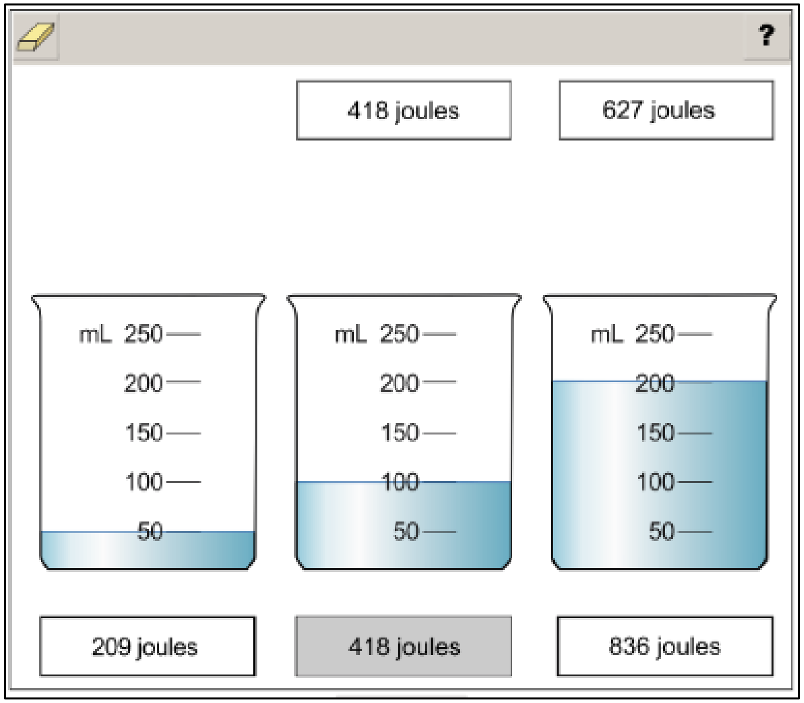
E. There is no relationship between the mass of a substance and the amount of thermal energy required for a given temperature increase.

Multi-Dimensional Alignment: The item requires the student to apply knowledge of

- the relationship between temperature and the total energy of a system depends on the types, states, and amounts of matter present, and
- the amount of energy transfer needed to change temperature is dependent on the nature of the matter, the mass of the sample, and the environment

to demonstrate an understanding of scale, proportion, and quantity.

Scoring Information for Part A

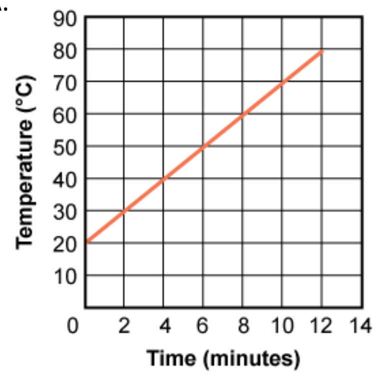


Multiple-Choice Item

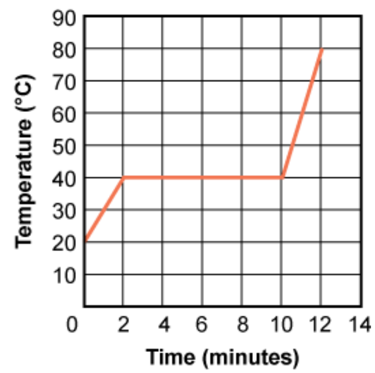
The student wants to examine the relationship between thermal (heat) energy input and the time a volume of water takes to heat. The student will place 250 mL of water with a starting temperature of 20°C into a beaker and apply a constant amount of thermal energy. The student will record the temperature of the water every 2 minutes. The student plans to analyze the amount of time it will take to raise the temperature of the water from 20°C to 80°C.

Which graph **best** represents how the temperature of the water will change over time as a constant amount of thermal energy is applied?

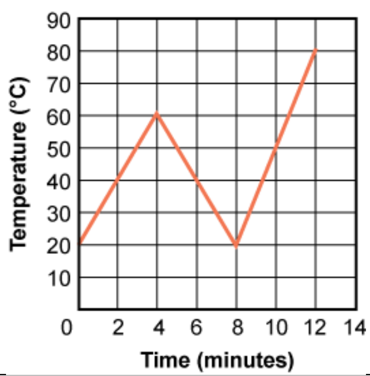
A. *



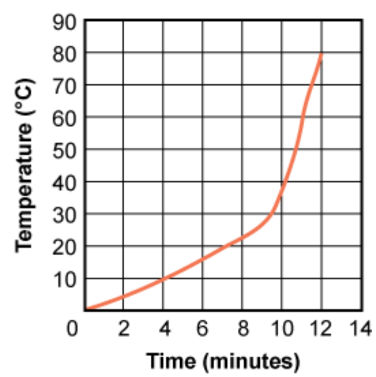
B.



C.



D.



Multi-Dimensional Alignment: The item requires the student to apply knowledge of the relationship between temperature and the total energy of a system depends on the types, states, and amounts of matter present, and the amount of energy transfer needed to change temperature is dependent on the nature of the matter, the mass of the sample, and the environment to demonstrate an understanding of scale, proportion, and quantity.

Extended-Response Item

The student plans to investigate how the input of thermal energy (heat) affects the average kinetic energy of the water molecules in different masses of ice over time. The experiment must be completed in one day. The table shows the masses of the three different ice samples that the student will use.

Ice Sample	Mass (g)
1	100
2	200
3	400

As you respond to Part A and Part B, follow the directions below.

- Address all of the instructions in each prompt.
- Use evidence from the information provided and your own knowledge of science to support your responses.

Part A

Design an investigation that will help the student determine how thermal energy input is affected by mass as each sample of ice is converted, first to liquid, then completely into water vapor. In your response,

- identify what tools you will need;
- identify the independent and dependent variables;
- describe the steps you will follow in the investigation; and
- explain what measurements you will need to take and how you will take those measurements.

Part B

Explain what will happen to the average kinetic energy of the water molecules in each sample over time as thermal energy is added to the ice samples with different masses during the investigation. In your explanation, compare the average kinetic energies of the water molecules in the samples when:

- all of the samples are in the same phase at the same temperature
- all of the samples are at the same temperature

Multi-Dimensional Alignment: The item requires the student to apply the science practices of planning and conducting investigations by identifying the variables and controls, tools needed, and measurements needed, and knowledge of:

- of the relationship between the temperature a system and the average kinetic energy of the system;
- the amount of energy needed to changes the temperature of a sample depends on the nature of the matter and the mass of the sample;
- energy is spontaneously transferred out of hotter regions and into colder ones;
- the total thermal energy of the system depends on the temperature, number of atoms, and the state of the material; and
- the change of state that occur with variations in temperature can be described and predicted using temperature models of matter

to demonstrate an understanding of cause and effect and scale, proportion, and quantity.

Score Points

An ER item may contain a single part or multiple parts. For multiple-part items: The student's score is the sum total of all the points earned across all parts (up to an item-maximum of 9 points) of the item. No response (blank) or a response that does not address the prompt earns 0 points.

Part A (5 points maximum)

- 1 point for identifying what tools are needed
- 2 points for identifying the independent and dependent variables
  - Score 2 points: identify independent variable **and** dependent variable

  OR
  - Score 1 point: identify independent variable **or** dependent variable
- 1 point for description of the steps needed in the investigation
- 1 point for explanation of what measurements need to be taken and how to take those measurements

Part B (4 points maximum)

- 1 point for explanation of the relationship between mass and amount of thermal energy needed
- 1 point for explanation of average kinetic energy over time
- 2 points for comparison of samples
  - Score 2 points: comparison of samples in the same phase at different temperatures **and** at the same temperature

  OR
  - Score 1 point: comparison of samples in the same phase at different temperatures **or** the same temperature

Sample Response:

Part A

In order to measure how the average kinetic energy of the water molecules is affected by the addition of heat, I will need a thermometer, hot plates, samples of ice, and a timer/stopwatch. My independent variable is the mass of ice (in grams) exposed to the heat. My dependent variable is the time it takes for each sample of ice to convert from a solid to a liquid, and finally from a liquid to water vapor. I will place each ice sample in a beaker and place the beakers on a hot plate. I will record the length of time it takes for the ice in each sample to turn completely into a liquid and then completely into water vapor (gas).

Accept any other plausible explanation of how to design an investigation to determine how thermal energy is affected by mass that can occur in one day.

Part B

The average kinetic energy of water molecules is directly related to temperature. The temperature rise caused by a given amount of heat input depends on the mass of the sample. A greater mass needs a greater amount of thermal energy to have the same change in the average kinetic energy as a smaller mass. Adding heat energy to ice will transfer energy to the water molecules and increase their average kinetic energy, but at different rates, due to the mass differences of the samples. As the heat energy is added, ice undergoes a phase change to water. Adding more heat energy will cause the liquid water to change into a gas. When all three samples are in the same phase, the average kinetic energies of the samples may not be the same because their temperatures could be different even though they are in the same phase. When all three samples are at the same temperature, the average kinetic energies of the samples will be the same because kinetic energy is dependent upon temperature.

Accept any other plausible explanation of the kinetic energy of the water molecules as thermal energy is added over time.

RESOURCES

Assessment Guidance Library

- Assessment Development Educator Review Committees: describes the item development process and the associated committees, includes information on applying for participation

Practice Test Library

- LEAP 2025 Science Grade 7 Practice Test Answer Key: includes answer keys, scoring rubrics, and alignment information for each task on the practice test
- LEAP 2025 Science Practice Test Guidance: provides guidance on how teachers might better use the practice tests to support their instructional goals
- Practice Test Quick Start Guide: provides information regarding the administration and scoring process needed for the online practice tests

Assessment Library

- 2019-2020 Louisiana Assessment Calendar: includes information on testing windows for test administrations
- LEAP Accessibility and Accommodations Manual: provides information about accessibility and accommodations
- LEAP 2025 Technology Enhanced Item Types: provides a summary of technology enhanced items students may encounter

DRC INSIGHT Portal (eDIRECT)

- includes access to tutorials, manuals, and user guides

INSIGHT™

- LEAP 2025 Science Grade 7 Practice Test: helps prepare students for the test
- Online Tools Training: provides the opportunity to become familiar with the online testing platform and its available tools

K-12 Science Planning Resources Library

- K-12 Louisiana Student Standards for Science (2017): provides the performance expectations and three-dimensional learning for all grades
- Grade 7 Sample Scope and Sequence: includes sample units to assist educators in transitioning to the new science standards
- Grades 6-8 Science Teacher Toolbox: contains resources and supporting instructional materials

Contact Us

- assessment@la.gov for assessment questions
- classroomsupporttoolbox@la.gov for curriculum and instruction questions
- AskLDOE for general questions
- ldoecommunications@la.gov to subscribe to newsletters; include the newsletter(s) you want to subscribe to in your email

Newsroom: archived copies of newsletters including the LDOE Weekly School System Newsletter and the Teacher Leader Newsletter

APPENDIX

Update Log		
Date	**Page**	**Summary of Changes**
8/12/19	1	Added Appendix to list of internal links
	3	Added Test Design table and additional test design information