Grade 8
Science

Short Constructed-Response Scoring Guide

Spring 2025

General Information

Beginning with the 2022–2023 school year, science assessments include short constructed-response questions at every assessed grade level. Students are asked to provide a short response to a question. Responses are scored using a prompt-specific, two-point rubric.

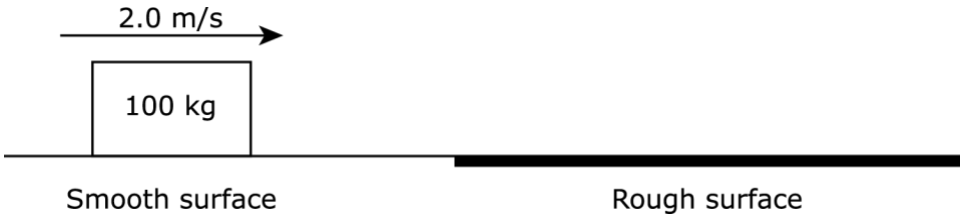
This State of Texas Assessments of Academic Readiness (STAAR®) constructed-response scoring guide provides student exemplars at all score points for short constructed-response questions from the STAAR grade 8 science operational test. The questions are presented as they appeared on the test, and responses were scored based on the two-point rubrics that were developed with the input of Texas educators. A response earns a specific score point based on the completeness of the response provided as measured against the rubric.

The responses in this guide are actual student responses submitted online during the testing window. To protect the privacy of individual students, all names and other references of a personal nature have been altered or removed. Otherwise, the responses appear as the students wrote them and have not been modified.

Grade 8 Science Short Constructed Response

Prompt

The diagram shows a 100-kilogram box moving at a constant velocity of 2.0 meters per second (m/s) across a smooth surface. As the box continues to move, it will enter an area with a rough surface.



When the box slides onto the rough surface, that surface applies a frictional force of 0.5 newtons (N) to the box.

What is the net force on the box before and after the box encounters the rough surface **AND** what is the effect of the net force on the motion of the box?

Look at the diagram carefully. Then enter your answer and explanation in the box provided.

Item-Specific Rubric

Score: 2

The response provides complete and correct understanding.

- Identifies the net force on the box before and after the box encounters the rough surface.
    - There was no net force on the box (or that the net force was zero) before the rough surface.

      AND

    - The net force after entering the rough surface was 0.5N.

  AND

- Identifies the effect of the net force on the motion of the box.
    - This had the effect of decreasing the box's velocity.

Score: 1

The student answers half of the question correctly. The response provides partial understanding.

- The student correctly identifies the net force before and after the box encounters the rough surface with a missing, incomplete, or incorrect identification of the effect.

  OR

- The student correctly identifies the effect of the net force on the motion of the box with a missing, incomplete, or incorrect identification of the net force before and after the box encounters the rough surface.

Score: 0

The response is incorrect or irrelevant. The response provides little to no understanding.

Sample Student Responses

Score Point 0

Response 1

The net force is 0 because the box is at a constant rate and then the net force because of the surface goes lower until it stops.

The response is incorrect or irrelevant and demonstrates little to no understanding. It includes neither of the required elements.

The writer provides an incomplete identification of the net force before and after the box encounters the rough surface. Only one net force is correctly identified ("net force is 0 because the box is at a constant rate and then the net force . . . goes lower until it stops"), while the net force after encountering the rough surface is unclear and unidentified. Correct identifications for both net forces are needed for credit for the first element.

The response incorrectly identifies the effect of the net force on the motion of the box ("the net force because of the surface goes lower until it stops"). The student states that the net force, not the motion of the box, goes lower until it stops, which does not correctly identify the effect for credit.

Response 2

The force before is 50 because 100/2=50. The force after is 49.5 and the motion will be 1.98 m/s.

The response is incorrect and demonstrates little to no understanding. It includes neither of the required elements.

An incorrect identification of both the net force before AND after the box encounters the rough surface is provided ("The force before is 50 because 100/2=50. The force after is 49.5"). While the student shows little understanding that friction opposes the box's motion and correctly subtracts 0.5 N from the incorrectly identified net force before of 50 N, the student does not earn credit for this element without correctly identifying both net forces.

An insufficient identification of the effect of the net force on the motion of the box is provided ("the motion will be 1.98 m/s"), as the velocity of the box is constantly decreasing due to the frictional force.

Response 3

Before the rough surface the net force on the box is 2 m/s and after it hits the rough surface the net force will be 1.5m/s. The effect of the net forces on the box is the speed of the box. The bigger the net for the faster the box will move. So the box will move faster on the smooth surface than the rough surface.

The response is incorrect or irrelevant and demonstrates little to no understanding. It includes neither of the required elements.

This response incorrectly identifies both the net force before AND after the box encounters the rough surface ("Before . . . net force . . . is 2 m/s and after . . . will be 1.5m/s"). The student shows no understanding of net force, which measures force, not velocity.

An incorrect identification of the effect of the net force on the motion of the box is provided ("The effect of the net forces . . . is the speed of the box. The bigger the net for the faster the box will move. So the box will move faster on the smooth surface than the rough surface"), as the frictional force will cause the box to move slower on the rough surface, not faster on the smooth surface.

Response 4

The net force for the box before it proceeds to slide onto the rough surface is 200 newtons . After the box slides on the rough surface the newtons are 250 . The effect on the box after it slid on the rough surface is very diffrent as to the smooth surface . The rough surface applied more frictional forces causing it to be heavier than when it was on the smooth surface .

The response is incorrect and demonstrates little to no understanding. It includes neither of the required elements.

The response incorrectly identifies both the net force before AND after the box encounters the rough surface is provided ("net force for the box before . . . is 200 newtons . After . . . the newtons are 250"). This demonstrates a misunderstanding of the numerical data provided in the prompt (mass, velocity, and frictional force) and how these values relate to the forces acting on the box.

The response incorrectly identifies the effect of the net force on the motion of the box ("The rough surface applied more frictional forces causing it to be heavier than when it was on the smooth surface"). The student has a misconception that friction, rather than gravity, causes objects to be heavier.

Score Point 1

Response 1

The net force after the box encounters the rough surface increases by 0.5, the effect after is that it slows down due to the rough surface.

The response addresses half of the question correctly and demonstrates partial understanding. It includes one of the two required elements.

The response correctly identifies the effect of the net force on the motion of the box ("the effect after is that it slows down"). An explanation of "due to the rough surface" is included, which is correct but not required for credit.

An incomplete identification of the net force before AND after the box encounters the rough surface is provided. Only one net force is correctly identified ("The net force after the box encounters the rough surface increases by 0.5"), while the net force before is missing. Correct identifications for both net forces are needed for credit for the first element.

Response 2

Before it went on the rough surface the net force was 0 as it moved on to the rough suface the net force increased and now the net force is 0.5

The response addresses half of the question correctly and demonstrates partial understanding. It includes one of the two required elements.

The response correctly identifies net force before AND after the box encounters the rough surface ("Before it went on the rough surface the net force was 0 as it moved on to the rough suface . . . now the net force is 0.5"). The inaccuracy in describing the magnitude of the change ("the net force increased") does not contradict the identification of the net force after and does not affect the score.

The response does not attempt to identify the effect of the net force on the motion of the box.

Response 3

The net force of the box before it encounters the rough surface is 50 N after the box encounters the rough surface is 50.5 N . The effect of the net force on the motion of the box is that it will slow down and it would have to apply more force on it.

The response addresses half of the question correctly and demonstrates partial understanding. It includes one of the two required elements.

The response correctly identifies the effect of the net force on the motion of the box ("The effect of the net force on the motion of the box is that it will slow down"). The inclusion of an irrelevant observation ("and it would have to apply more force on it") does not contradict the correct understanding of the effect and does not impact the score.

An incorrect identification of both the net force before AND after the box encounters the rough surface is provided ("net force of the box before it encounters the rough surface is 50 N after . . . is 50.5 N"). This demonstrates a misunderstanding of the numerical data provided in the prompt (mass, velocity, and frictional force) and how these values relate to the forces acting on the box.

Response 4

The box will slow down due to newtons law with force and acceleration the box will acclerate until the friction or force from the rough surface slows it down.

The response addresses half of the question correctly and demonstrates partial understanding. It includes one of the two required elements.

The response correctly identifies the effect of the net force on the motion of the box ("The box will slow down"). The student attempts an explanation ("due to newtons law with force and acceleration the box will acclerate until the friction or force from the rough surface slows it down") with some incorrect information, as the box would maintain a constant velocity, not accelerate, and then begin to decelerate. However, this does not contradict the correct understanding of the effect of the net force on the motion ("until the friction or force from the rough surface slows it down") and therefore does not impact the score.

The response does not attempt to identify the net force before AND after the box encounters the rough surface.

Score Point 2

Response 1

> The net force on the box before the rough surface is 0 newtons. After the box slides onto the rough surface, the net force is 0.5 newtons to the left. Newton's first law states that an object in motion will stay in motion unless acted on by an unbalanced force. Before the rough surface, the box was moving with nothing puhsing on it, so it kept moving at 2 meters per second. After the box slides onto the rough surface, the 0.5 newtons of friction pushing against the box's motion will slow it down until it stops completely.

The response demonstrates complete and correct understanding. It includes each of the two required elements.

The student correctly identifies the net force before AND after the box encounters the rough surface ("net force on the box before the rough surface is 0 newtons. After the box slides onto the rough surface, the net force is 0.5 newtons"). The student correctly identifies the effect of the net force on the motion of the box ("the . . . friction pushing against the box's motion will slow it down until it stops completely"). While it is unclear how long the rough surface is, the addition of "until it stops completely" is correct, although not required for credit.

The reference to Newton's First Law is correct ("an object in motion will stay in motion unless acted on by an unbalanced force"), but it is neither required nor sufficient as an answer for the second element.

Response 2

> Before entering the rough surface, there is no net force acting on the box, because the box is not accelerating. After entering the rough surface, the box has a net force of 0.5N to the left, which causes the box to decelerate.

The response demonstrates complete and correct understanding. It includes each of the two required elements.

The student correctly identifies net force before AND after the box encounters the rough surface ("Before entering the rough surface, there is no net force acting on the box . . . After entering the rough surface, the box has a net force of 0.5N"). The student correctly identifies the effect of the net force on the motion of the box ("the box has a net force . . . which causes the box to decelerate").

Response 3

The effect the net force put on the box is that it makes it slow down, eventully coming to a stop. There was not any net force before, but after there was a force of 0.5.

The response demonstrates complete and correct understanding. It includes each of the two required elements.

The student correctly identifies net force before AND after the box encounters the rough surface ("There was not any net force before, but after there was a force of 0.5"). The response correctly identifies the effect of the net force on the motion of the box ("The effect the net force put on the box is that it makes it slow down"). While it is unclear how long the rough surface is, the addition of "eventully coming to a stop" is correct but not required for credit.

Response 4

Before: 0N After: 0.5N The effect of the net force is slower movement because of the applied frictional force.

The response demonstrates complete and correct understanding. It includes each of the two required elements.

The student correctly identifies net force before AND after the box encounters the rough surface ("Before: 0N After: 0.5N") and correctly identifies the effect of the net force on the motion of the box ("The effect of the net force is slower movement").

Grade 8 Science Short Constructed Response

Prompt

A teacher performs these steps for a class demonstration, and students record their observations.

1. Put a small candle in a candleholder.
2. Light a match.
3. Use the flame from the match to light the candle.
4. Let the candle burn for 5 minutes.
5. Blow out the flame.
6. Let the students examine the candle after it has cooled.

What is an example of a physical change that occurred during the demonstration **AND** what is an example of a chemical change that occurred during the demonstration? Explain your reasoning.

Read the question carefully. Then enter your answer and explanation in the box provided.

Item-Specific Rubric

Score: 2

The response provides complete and correct understanding.

- The student selects ONE of the following as an example of a physical change that occurred during the demonstration:
  - Wax changing from solid to liquid
  - Wax changing from liquid to solid
- Reasoning for physical change includes the fact that there is no change in the basic characteristics of the wax.

AND

- The student selects ONE of the following as an example of a chemical change that occurred during the demonstration:
  - The match igniting
  - The match burning in air
  - The candle wick burning the candle wax
- Reasoning for chemical change includes the fact that the changes cannot be reversed by physical means OR that the chemical properties are altered.

Score: 1

The student answers half of the question correctly. The response provides partial understanding.

- The student correctly identifies both a physical change AND chemical change without reasoning.

  OR

- The student correctly identifies a physical OR chemical change AND provides correct reasoning.

Score: 0

The response is incorrect or irrelevant. The response provides little to no understanding.

Sample Student Responses

Score Point 0

Response 1

Lot's of physical changes happened during htis experment. Put the candle on the holder lighting a match, lighting the candle, and blowing it out are all physical changes. The chemical changes in experiment are the match being lit and the candle cooling.

The response is incorrect or irrelevant and demonstrates little to no understanding. It mixes correct and incorrect identifications for both physical and chemical changes, resulting in contradictory statements.

An incorrect attempt is made to identify a physical change during the demonstration ("Put the candle on the holder lighting a match, lighting the candle, and blowing it out are all physical changes") with no attempt to provide reasoning that includes the fact that there is no change in the basic characteristics of the wax. Note that "Put the candle on the holder" and "blowing it out" are physical actions, not physical changes, and the lighting examples are identifications of a chemical change, not physical, showing a lack of understanding of physical changes. However, looking at the whole response, the student indicates that "lighting a match" and "lighting the candle" refer to the physical actions, while the match "being lit" indicates the chemical change of the match igniting. Therefore, the inclusion of the lighting examples here does not contradict the student's potential understanding of chemical changes.

The student provides an incorrect identification of a chemical change with no reasoning ("chemical changes . . . the match being lit and the candle cooling"). This contradiction in identification shows a lack of understanding of chemical changes.

Response 2

a physical change is the match lighting because you use force to light it and a chemical is when the wick or the match burns.

The response is incorrect or irrelevant and demonstrates little to no understanding. It includes neither of the required elements.

An incorrect identification of a physical change during the demonstration with vague reasoning is provided ("a physical change is the match lighting because you use force to light it"). Note that "match lighting" is an identification of a chemical change, not physical. The reasoning "because you use force to light it" indicates the student is describing the physical action of lighting as the change, which also shows a lack of understanding of physical changes. However, this does not contradict the student's potential understanding of chemical changes (e.g., identifying the match being lit as the chemical change of the match igniting).

A correct identification of a chemical change during the demonstration is provided, but there is no attempt to provide reasoning ("chemical is when the wick or the match burns"). Although two examples are given, only one is needed, as either the match or wick going through combustion or burning is sufficient to identify a chemical change that occurred.

Response 3

the candle whould melt and the wik whould get smaller then the candle whould get back to a solid

The response is incorrect or irrelevant and demonstrates little to no understanding. It includes neither of the required elements.

The student describes changes during the demonstration ("the candle whould melt and the wik whould get smaller then the candle whould get back to a solid") but does not identify whether the change is physical or chemical, making it impossible to evaluate if a physical change ("the candle whould melt") with correct reasoning ("then the candle whould get back to a solid") was identified for credit for the first element.

Response 4

Thermal energy because when you light the candel it cause thermal energy then after you blow it out it causes mechanical energy.

The response is incorrect or irrelevant and demonstrates little to no understanding. It includes neither of the required elements.

The student describes changes during the demonstration ("when you light the candel it cause thermal energy then after you blow it out it causes mechanical energy") but does not identify whether the change is physical or chemical.

The attempt to include reasoning shows a lack of understanding of the difference between physical and chemical changes and changes in forms of energy. Within the context of the demonstration, mechanical energy would not be a correct form of energy because it relates to physical actions.

Score Point 1

Response 1

An example of a physical change was that the candle melted. This is a physical change because the candle did not change in substance, but it did change shape or size. One chemical change that occured was that the candle produced light and heat, which are characteristics of a chemical change.

The response addresses half of the question correctly and demonstrates partial understanding. It includes one of the two required elements.

The response correctly identifies a physical change during the demonstration ("physical change was that the candle melted") with reasoning that includes the fact that there is no change in the basic characteristics of the wax ("the candle did not change in substance, but it did change shape or size").

An incomplete identification of a chemical change during the demonstration is provided. The student includes correct reasoning that includes the fact that the chemical properties are altered ("One chemical change that occured was that the candle produced light and heat, which are characteristics of a chemical change"), but the example of the chemical change is missing. This pairing is incomplete for credit for the second element as the change that produced the new substances is not identified.

Response 2

An example of a physical change is step 6 when the flame melted the candle and now the candle is shorter than when it was not burned for 5 mins. And an example of a chemical change is the match lighting on fire.

The response addresses half of the question correctly and demonstrates partial understanding. The student correctly identifies both a physical change AND a chemical change but provides no explanation for the changes.

The student correctly identifies both a physical change ("physical change . . . when the flame melted the candle and now the candle is shorter") and a chemical change ("chemical change is the match lighting on fire") during the demonstration, but without reasoning. Note that the student provides two different descriptions to identify a physical change, but only one is needed. The description "now the candle is shorter" is only acceptable as it is attributed to the melting of the candle, and not the burning of the candle as "when it was not burned for 5 mins" is only given as a frame of reference for time. Additionally, the student's attempt to identify the physical change "is step 6" is vague—it is unclear if the student is referring to the examination of the candle (incorrect) or the cooling of the candle (correct), but it does not impact the score.

Response 3

The physical change is the candle melting because it's changing form, and the chemical change is the temperature change because it is heating up to melt candle then later cooling down. It may even have change in smell if it is scented candle.

The response addresses half of the question correctly and demonstrates partial understanding. It includes one of the two required elements.

The response correctly identifies a physical change during the demonstration ("physical change is the candle melting") with reasoning that includes the fact that there is no change in the basic characteristics of the wax ("it's changing form"). Note that the use of "form" is sufficient to indicate the student is referring to the physical state of matter.

An incorrect identification of a chemical change during the demonstration with no reasoning is provided ("chemical change is the temperature change because it is heating up to melt candle then later cooling down. It may even have change in smell if it is scented candle"). The temperature change of heat melting the candle and later the candle cooling are all part of the physical change identified earlier and do not address how temperature change can be an indication of a chemical change in the release of energy, not the chemical change itself. While an unexpected change in odor would be an indicator of a chemical change from materials burning, the student clarifies the change in smell is due to a scented candle, indicating the release of fragrance, which is a physical change as fragrance is dispersed as the wax melts. This shows no understanding of chemical changes.

Response 4

A physical change in the candle would be the size. This is because after a few minutes of burning, the candle has shrunk a little. A chemical change that occured would be in the match because it is struck against something to activate chemical energy stored in the match.

The response addresses half of the question correctly and demonstrates partial understanding. It includes one of the two required elements.

The student correctly identifies a chemical change during the demonstration of the match igniting ("chemical change . . . in the match because it is struck against something") with reasoning that includes the fact that the chemical properties are altered ("to activate chemical energy stored in the match"). While minimal, the reasoning is sufficient to indicate the release of chemical energy in the match head, leading to a chemical reaction producing new substances.

An incomplete identification of a physical change during the demonstration with no reasoning is provided ("A physical change in the candle would be the size. This is because after a few minutes of burning, the candle has shrunk a little"). While the change in size can be an example of a physical change, the student only states this is "after a few minutes of burning" and does not clarify whether the melting of the wax causes a physical change in the size or the burning of the candle wax causes a chemical change in size. As the demonstration is of a candle burning for 5 minutes, the student may either be referring to the wick burning or the wax/candle burning when using this phrasing.

Score Point 2

Response 1

A physical change is the wax of the candle melting due to the heat, even though the apperance changed no new substance was formed. A chemical change is the burning of the wick due to being lit by a flame, the wick is completley burnt away and cannot go back to its original form, the smoke that comes from the wick is evidience of this chemical change.

The response demonstrates complete and correct understanding. It includes each of the two required elements.

The student correctly identifies a physical change during the demonstration ("physical change is the wax of the candle melting"), with reasoning that there is no change in the basic characteristics of the wax ("no new substance was formed"). The response correctly identifies a chemical change during the demonstration ("chemical change is the burning of the wick"), with reasoning that the changes cannot be reversed by physical means ("the wick is completley burnt away and cannot go back to its original form") OR that the chemical properties are altered ("the smoke that comes from the wick is evidience of this chemical change").

Response 2

For the physical change that occured, melting the wax from a solid state to a liquid state and back to a solid state would show a physical change. The fire that occured would show a chemical change because it showed a change in temperature and gave off engergy in the form of heat.

The response demonstrates complete and correct understanding. It includes each of the two required elements.

The student correctly identifies a physical change during the demonstration ("physical change . . . melting the wax"), with reasoning that includes the fact that there is no change in the basic characteristics of the wax ("from a solid state to a liquid state and back to a solid state would show a physical change").

The response correctly identifies a chemical change during the demonstration ("The fire that occured would show a chemical change"), with reasoning that includes the fact that the chemical properties are altered ("gave off engergy in the form of heat").

Response 3

A physical change was the wax that melted because it is still the same wax and a chemical change was the match that is now burnt because you can't unburn it.

The response demonstrates complete and correct understanding. It includes each of the two required elements.

The response correctly identifies a physical change during the demonstration ("physical change was the wax that melted") with reasoning that includes the fact that there is no change in the basic characteristics of the wax ("it is still the same wax"). "Melted" is sufficient to indicate the physical change of wax changing from solid to liquid.

The student correctly identifies a chemical change during the demonstration ("chemical change was the match that is now burnt") with reasoning that includes the fact that the changes cannot be reversed by physical means ("you can't unburn it"). Indicating the match or wick ignited or went through combustion or burning is sufficient to identify a chemical change that occurred during the demonstration.

Response 4

A physical chnage that accoured was the wax melting because it can always be shaped back into a candle. A chemical chnage was the whick of the candle burning becuase it changed the chemical composition of the item.

The response demonstrates complete and correct understanding. It includes each of the two required elements.

The student correctly identifies a physical change during the demonstration ("physical chnage . . . the wax melting"), with reasoning that includes the fact that there is no change in the basic characteristics of the wax ("it can always be shaped back into a candle"). This reasoning sufficiently illustrates that the wax retains its basic characteristics and can return to its original form as changes in size or shape due to melting are physical changes.

The response correctly identifies a chemical change during the demonstration ("chemical chnage was the whick of the candle burning"), with reasoning that includes the fact that the chemical properties are altered ("it changed the chemical composition of the item"). While minimal, the reasoning is clear and sufficient to indicate the fact noted.