Louisiana Believes

Student Work Samples - Task

Science

Grade 6

DEPARTMENT of EDUCATION
Louisiana Believes

Introduction

The iLEAP test contains a task that promotes science literacy through the use of discipline-specific practices to collect, apply, and communicate content knowledge. The task reflects the rigor of Louisiana's content standards and applies English language arts standards for reading informational text (includes science and technical texts) and writing to a science context.

The task consists of four multiple-choice questions and one extended-response item. The items are based on one or two stimulus materials. The extended-response portion of the task requires students to provide a written response that will be scored using a 0-4 point rubric. The task asks students to incorporate science content knowledge with evidence from the stimulus materials.

For more information about the task and other sessions of the assessments, please refer to the Assessment Guidance on the Louisiana Department of Education's website.

Purpose of This Document

The Sample Student Work document provides teachers with actual student responses to the extended-response portion of the task. Annotations that explain the responses are provided to help teachers better understand reading informational text and writing to a science context in order to better prepare their students to read and respond to text.

This document includes the following:

- Task
- GLEs associated with the task
- Scoring Rubric
- Exemplar response
- Authentic student responses with annotations for each score point (0, 1, 2, 3, and 4)

Primary GLE(s)	**GLE 37**: Compare how heat is transferred by conduction, convection, and radiation (PS-M-C5) **GLE 38**: Identify conditions under which thermal energy tends to flow from a system of higher energy to a system of lower energy (PS-M-C5) **GLE 7**: Simulate how atoms and molecules have kinetic energy exhibited by constant motion (PS-M-A4) **GLE 26**: Describe and summarize observations of the transmission, reflection, and absorption of sound, light, and heat energy (PS-M-C1)

Task

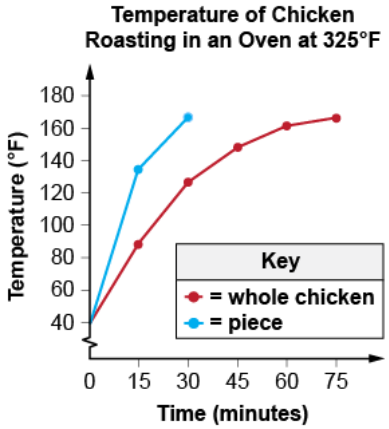
You are asked to read a letter about cooking dinner. Then you will answer five questions. The first four questions are multiple-choice. The last question requires you to write an extended-response.

Rachel wrote a letter about helping her father cook dinner. Read Rachel's letter. Then answer questions 1 through 5.

Dear Grandma,

Today Mr. and Ms. Rice came over for dinner, and Dad asked me to help cook. We made cornbread, baked chicken, broccoli, and a fruit salad. I helped with all of it except the fruit salad, which Dad made.

The first thing we worked on was the chicken, because Dad said it would take over an hour to bake. First I turned our electric oven on to 325°F. I took the plastic off the whole chicken, washed it, rubbed it inside and out with oil, salt, and seasonings, and put it in a pan. We put an extra piece of chicken in a separate pan to make sure we had enough. Then Dad told me to check the temperature of the chicken by inserting a thermometer into the breast or thigh. He said when the inside temperature of the chicken was 165°F, it would be done. I figured that if the oven temperature was 325°F, it should not take very long at all for the chicken to reach 165°F. Dad said we should check the temperature of the whole chicken and the extra piece every 15 minutes. Since we have been studying graphing in math class, I decided to make a graph of the temperatures. Here is my graph:



I was very surprised that it took so long for the chicken to get up to 165°F, even though Dad had told me it would.

While the chicken was baking, I mixed up the cornbread batter and put it in the oven as well. Then I chopped the broccoli and put it in a glass casserole dish on a plate in the microwave. When the broccoli was done, I took it out and added butter and salt. I thought about the difference between the microwave oven and the regular oven. The pan I cooked the chicken in was very hot, and I had to use hot pads to touch it. But even though the broccoli was cooked and steaming, the handles of the broccoli dish and the plate under it were not hot at all. Dad told me that microwave ovens and regular ovens use different scientific principles to cook food.

Right before Mr. and Ms. Rice arrived, Dad found a jar of juice in the cupboard, and I poured glasses for everyone and added ice to cool it down. When our company came, everything was ready, which was good, because I was starving! The meal was fabulous, and I was very proud I had provided such significant assistance to Dad.

I can’t wait to cook dinner for you next time you come visit, Grandma. I hope you are doing well.

Much Love,

Rachel

Study the information in the *Cooking Dinner* letter before answering the questions.

1. Which flowchart **best** summarizes heat transfer to the cooking chicken?
   - **A.** Electricity turns to heat → currents of radiation swirl around the chicken → the inside of the chicken warms up → heat spreads throughout the chicken
   - **B.** Electricity turns to heat → air in the oven heats up and the molecules move faster → air molecules bump into the chicken → molecules in the chicken move faster
   - **C.** Electricity turns to heat → heat flows through the metal oven shelf into the chicken pan → heat flows from the pan into the bottom of the chicken → heat flows into the rest of the chicken
   - **D.** Electricity turns to heat → heat causes the air molecules to change shape → the changed air molecules cause the chicken molecules to change shape → the changed chicken molecules release heat

2. The microwave oven heats the broccoli, but not the dish handles or the plate underneath. Which statement **best** explains why this happens?
   - **A.** The microwave oven creates radiation, and the radiation is absorbed by the broccoli but passes through the dish and the plate.
   - **B.** The microwave oven heats using convection currents and the currents collide with the broccoli but slide over the smooth dishes.
   - **C.** The microwave oven heats the air and the hot air heats the broccoli, but the dishes do not conduct heat, so they stay cool.
   - **D.** The microwave oven produces heat, which flows through the floor of the microwave into the dishes, and up out of the dishes into the broccoli.

3. Which conclusion is **best** supported by the data Rachel gathered while baking the chicken?

A. The whole chicken started out colder than the piece of chicken, so it took longer for the whole chicken to increase in temperature in the hot oven.

B. Objects that are made of the same substance, such as chicken, will increase in temperature at the same rate when placed in a hot oven.

C. In a hot oven, the temperature of a metal pan increases faster than the temperature of a baking chicken.

D. In a hot oven, the temperature inside a small piece of chicken rises faster than the temperature inside a large piece of chicken.

4. Rachel wonders how the number of ice cubes added to a glass of juice affects the temperature of the juice. She wants to design an investigation that tests this question and that will produce clear, repeatable results.

Which data table shows the **best** experimental design?

A.

Effect of Ice on the Temperature of Juice

Glass	Amount of Juice (cups)	Beginning Temperature (°F)	Number of Ice Cubes	Temperature after 20 Minutes
Glass 1	0.5	68	2	
Glass 2	1.0	68	2	
Glass 3	1.5	68	2	
Glass 4	2.0	68	2	
Glass 5	2.5	68	2	
Glass 6	3.0	68	2	

B.

Effect of Ice on the Temperature of Juice

Glass	Amount of Juice (cups)	Beginning Temperature (°F)	Number of Ice Cubes	Temperature after 20 Minutes
Glass 1	0.5	38	0	
Glass 2	1.0	38	2	
Glass 3	2.0	38	4	
Glass 4	0.5	68	0	
Glass 5	1.0	68	2	
Glass 6	2.0	68	4	

C.

Effect of Ice on the Temperature of Juice

Glass	Amount of Juice (cups)	Beginning Temperature (°F)	Number of Ice Cubes	Temperature after 20 Minutes
Glass 1	0.5	68	0.5	
Glass 2	1	68	1	
Glass 3	1.5	68	1.5	
Glass 4	2	68	2	
Glass 5	3	68	3	
Glass 6	4	68	4	

D.

Effect of Ice on the Temperature of Juice

Glass	Amount of Juice (cups)	Beginning Temperature (°F)	Number of Ice Cubes	Temperature after 20 Minutes
Glass 1	1.0	68	0	
Glass 2	1.0	68	0	
Glass 3	1.0	68	2	
Glass 4	1.0	68	2	
Glass 5	1.0	68	4	
Glass 6	1.0	68	4	

The following question requires you to write an extended response that combines information from the source with your knowledge of science.

To earn full credit you should:

- Read the question and then study the information in the *Cooking Dinner* letter.
- Answer **all** parts of the question **and** support your ideas with examples, data, facts, or details.
- Write a response that is long enough to fully address the topic. This may require more than one paragraph.

5. Rachel is going to take a chicken sandwich made from leftovers to school for lunch. She wants to keep her sandwich cold on a hot day. She has the two lunch bags shown. Bag 1 is made from padded fabric with a silver fabric lining. Bag 2 is made from brown paper.

bag 1 bag 2

Predict which bag will be more effective, and explain your prediction. Discuss how you could collect data to test your prediction if you had these same two bags. Your response should:

- Predict which bag will be better at keeping cold food cold on a hot day.
- Provide more than one reason for your prediction.
- Describe a simple experiment you could do with these two bags and the kind of data you could collect to prove or disprove your prediction.

Exemplary Response

1. B
2. A
3. D
4. D
5. I predict that bag 1 will keep food cold better than bag 2. Bag 1 is made of padded fabric and has a silver lining. The padded fabric will help prevent the heat from the hot air outside from being conducted through the bag and heating up the air and food inside. The silver lining will help reflect radiation such as infrared and light. If the radiation is reflected by the silver, it will not get inside the bag and warm the food. In contrast, the paper bag is thin. Although paper does not conduct heat as well as metal, it is also not as insulating as thick cloth. You can tell this because you can use thick cloth to take a hot pan out of the oven, but you would not want to do that with a paper bag on your hand. Also, bag 2 does not have the silver lining to reflect radiation. Finally, it is a darker color than bag 1, so it will actually absorb more heat from sunlight. I could test my prediction by putting identical plastic cups of cool water in each bag. I would make sure both cups were the same temperature with a thermometer and then close the bags. Then I would put both bags in a warm, sunny spot. After an hour or two, I would measure the temperature of the water again. If the water in bag 1 stayed cooler than the water in bag 2, I would know my prediction was correct.

Score	Rubric (Question #5)
4	▪ The student's response demonstrates an in-depth understanding of thermal energy flow, principles of insulation, and experimental design. ▪ The student completes all key components of the task accurately and communicates ideas effectively. The response: o Predicts that bag 1 will be more effective at keeping the sandwich cold. o Provides two or more reasons why bag 1 will be more effective than bag 2, which demonstrates an understanding of thermal energy flow and principles of insulation. o Describes a simple experiment and data to be gathered, which would test the prediction and the type of results that would support or disprove the prediction. ▪ The student's response is extensively supported by relevant evidence in the form of details, scientific principles, and/or examples. ▪ Where appropriate, the student uses a higher level of reasoning skills that may include applications, procedures, etc. ▪ The response contains no scientific errors.
3	▪ The student's response demonstrates a good understanding of thermal energy flow, principles of insulation, and experimental design, although less important ideas or details may be overlooked or misunderstood. ▪ The student completes most important aspects of the task accurately and communicates clearly. ▪ The student's response is sufficiently supported by relevant evidence. ▪ The student's logic and reasoning may contain minor flaws. ▪ The response may contain minor scientific errors.
2	▪ The student's response demonstrates a basic understanding of thermal energy flow, principles of insulation, and experimental design, and may show gaps in conceptual understanding. ▪ The student completes some parts of the task successfully. ▪ The student's response is not sufficiently supported by relevant evidence. ▪ The response may contain scientific errors.
1	▪ The student's response demonstrates a limited understanding of thermal energy flow, principles of insulation, and experimental design. ▪ The student completes only a small portion of the task. ▪ The student's response contains little or no support of relevant evidence. ▪ The response may contain major scientific errors.
0	The response attempts to address the prompt, but is mostly or entirely incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Sample Student Responses

Score Point 4

The following authentic student responses show the work of two students who received a score of 4 for their responses. A score of 4 is given when a student completes all key components of the task accurately and effectively. The response should demonstrate an in-depth understanding of the content objectives. The response does not contain errors.

Student 1

I think that bag 1 will be better at keeping food cold on a hot day. I think this for 2 reasons. I think this for the first reason of bag 1 is insulated. It is made of padded fabric with a silver fabric lining. It is very insulated. For the second reason, bag 2 has nothing but paper. It is a plain brown paper bag, so the sun would shine straight through and heat the chicken sandwich instead of keeping it cold. To prove this answer that bag 1 will be better than bag 2, you can do a simple experiment. You could put both bags outside with a thermometer in it for the same amount of time. When you leave them ou there for awhile, take the thermometers out of the bags. Next, you see which thermometer has a lower temperature and which bag it came from. THat is the bag you would use because it blocks out more sun and kepps things cooler than the other bag.

The student correctly predicts Bag 1 to be more effective at keeping food cold. The two reasons given in the response that explains why Bag 1 is more effective demonstrate an understanding of thermal energy flow and insulation. However, the response could be improved by providing more detail using vocabulary such as radiation, convection, conduction, or insulation. The response describes an experiment that could reasonably test the student's prediction and contains a method of collecting data that would support or disprove the prediction.

Student 2

I think bag 1 will keep her chicken sandwich cooler. The other bag is not covered on all sides but bag 1 is. Bag 1 also has a silver material that is most likely an insulator. To test this I could put chicken sandwiches the same size, shape, and temperature in each bag. Then, I would put both outside on the same day, time, and similar spots. Every hour or so I'd check the chicken sandwich's temperature and record it. That is how I could test my hypothesis.

The student's response demonstrates an understanding of thermal energy flow. The response completes all key components of the task. The response correctly predicts which bag should keep the sandwich cool and provides two reasons why that bag will be more effective. The student also describes a simple experiment that could test the prediction. A stronger response would also clarify how the data collected in the experiment could support the hypothesis.

Score Point 3

The following authentic student responses show the work of two students who received a score of 3 for their responses. A score of 3 is given when a student response completes most aspects of the task and demonstrates a good understanding of the content objectives but may contain an error or the student's logic and reasoning may have minor flaws.

Student 1

I think bag 1 will be more effective. Bag 1 has insulation so it will probably keep the cool in rather than letting it escape. And since it has insulation, the food inside of it will stay cooler longer. To test my theory, I would make two sandwiches and put 1 in each bag. Then I would put 1 icepack in each bag making sure the bags were both the same temperature and record the starting temperature. Afterwards, I would let them sit outside in the sun so the heat will be like the hot day Rachel packed her sandwich. I would let the 2 bags sit out for about 1 hour or 2. Then when the hour(s) are up, I would record the temperature of both bags and compare which one stayed closer to the starting temperature

The student's response correctly predicts which bag is more effective at keeping the sandwich cool demonstrating a good understanding of thermal energy flow. The response also provides a simple experimental design that can test the prediction with a good data collecting method incorporated into the design. Not all parts of the task were completed. The response contained only one reason for the prediction and two reasons were required in the task.

Student 2

I think that Bag 1 will be more effective. It would be more effective because the bag is insulated so the cold air is trapped inside of the bag. It also is bigger and more durable than the brown paper bag. The brown paper bag would probably tear under the weight of the chicken. An experiment you could do is put the bag outside at the same time. The bags would each have the same portions and size of the chicken. And they could also have a thermometer in the bag. They could measure the starting temperature for comparison. They could then closely watch the bags for an hour or two. Then record the temperature and put it on a data table. Compare the data and see which one is better.

This student's response earned a score of 3 because not all aspects of the task were completed. The student makes an accurate prediction for Bag 1. The response includes only one valid reason that supports the prediction and demonstrates a good understanding of energy flow and insulation. A simple experiment was described that included a good method to collect data to test the prediction.

Score Point 2

The following authentic student responses show the work of two students who received a score of 2 for their responses. A score of 2 is given when a student response completes some aspects of the task and demonstrates a basic understanding of the content objectives but may show gaps in conceptual understanding. The response may also contain scientific errors.

Student 1

Bag one would be better for keeping food hot or cold. This is because bag one can be sealed, which allows the cold or hot air to remain circulating in the bag. Bag two, however, does not have a sealed top. Bag one is also a better insalator than bag two because of its material. An experiment that can be done is putting the same amount of food in both bags and seeing which one keeps the food hot or cold better. Data that can be collected is information that says which bag kept the food cold or hot the longest.

The student accurately predicts which bag will be more effective at keeping the sandwich cold. And, the reasons given for the prediction demonstrate a limited understanding of thermal energy flow. The experiment described in the response is not adequate to test the prediction. In order for this response to receive a higher score, the experiment would need to include more detail and a method of data collection to support the prediction.

Student 2

Rachel should use bag 1 because it has more material to heat up than bag 2 so it takes longer for heat to reach the center and heat the chicken sandwich.Also bag 2 is made of a darker material, so it absorbs more light than bag 1, which makes it able to heat much faster than bag 1. In conclusion, bag 1 will keep the chicken sandwich colder, longer than bag 2.

The student's prediction is accurate as to which bag will keep the food cold. While the response does include two reasons why Bag 1 is more effective, the descriptions of those reasons could be improved using scientific terminology such as insulation, conduction, and radiation. The response scores a 2 because it does not address all components of the task due to the lack of an experimental design that could prove or disprove the prediction.

Score Point 1

The following authentic student responses show the work of two students who received a score of 1 for their responses. A score of 1 is given when a student response completes only a small portion of the task and demonstrates a limited understanding of the content objectives. The response may also contain major scientific errors.

Student 1
bag 1 because it will keep it cold unlike bag 2.

The response correctly identifies Bag 1 as the more effective bag. However, the response does not include any reasons that would support the prediction and no attempt was made to provide a simple experiment to test the student's prediction.

Student 2
i think bag 1 would be more effective because its more durable than bag 2

This response earns a score of 1 due to correctly predicting Bag 1 as more efficient at keeping food cooler. However, the response does not include any evidence of thermal energy flow that can support the prediction. And, because the response does not contain an experiment to test the prediction, not all parts of the task were completed.

Score Point 0

The following authentic student responses show the work of two students who received a score of 0 for their responses. A score of 0 is given when a student attempts to address the task, but is mostly or entirely incorrect or contains some correct work that is irrelevant to the content objectives.

Student 1
i thing bag 2 will be my answer.bag 1 has to much stuff in it

The response is inaccurate and makes no attempt to address the question. The response also demonstrates no understanding of thermal energy flow, principles of insulation, and experimental design.

Student 2
bag 2 will have a better effective because it is a paper bag

This student's response gives an inaccurate prediction. While the response indicates a reason for the prediction, it is incorrect based on the principles of thermal energy flow. The response does not attempt to propose an experiment that could test the prediction.