

Sample Test Items by Strand- Grade 6 Science

Science as Inquiry - The Abilities Necessary to Do Scientific Inquiry

GLE 1—*Generate testable questions about objects, organisms, and events that can be answered through scientific investigation*

Julie has the following objects:

- two ice cubes
- an empty glass
- a glass of water at room temperature

Which question could Julie answer **most easily** by conducting a scientific investigation?

- A. What is the temperature of the water?
- B. Does ice melt faster in air or in water?
- C. How long does it take for water to freeze?
- D. Does the mass of an ice cube change when it melts?

Correct response: B

Science as Inquiry - The Abilities Necessary to Do Scientific Inquiry

GLE 3—*Use a variety of sources to answer questions*

In which activity would using the Internet be **most** helpful?

- A. analyzing the results of an experiment
- B. predicting the outcome of an experiment
- C. measuring the variables used in an experiment
- D. performing research before conducting an experiment

Correct response: D

Science as Inquiry - The Abilities Necessary to Do Scientific Inquiry

GLE 10—*Identify the difference between description and explanation*

Which statement is an explanation rather than a description?

- A. The elephant weighs over 5 tons.
- B. The rock has many crystals in it.
- C. The bird flaps its wings while it is flying.
- D. The pond became smaller from evaporation.

Correct response: D

Science as Inquiry - The Abilities Necessary to Do Scientific Inquiry

GLE 16—*Use evidence to make inferences and predict trends*

Use this data table to answer the question.

Insect Species on Different Trees

Tree	Number of Insects: Species A	Number of Insects: Species B
A	542	3
B	7	1098
C	0	763
D	876	5

A scientist examined the numbers of two different species of insects on four different kinds of trees in the same forest. The results of her examination are shown on the data table. What inference can the scientist make about the insects?

- A. Species B insects are the main food source for species A insects.
- B. Species A and species B insects are very closely related.
- C. There are more of species B insects than species A insects in the entire forest.
- D. Species A insects prefer different kinds of trees from species B insects.

Correct response: D

Science as Inquiry - The Abilities Necessary to Do Scientific Inquiry

GLE 17—Recognize that there may be more than one way to interpret a given set of data, which can result in alternative scientific explanations and predictions (

Use this data table to answer the question.

Temperature and Rainfall

Town	Average Temperature (degrees Celsius)	Average Annual Rainfall (centimeters)
Farmon	18	33
Davis	25	72

Jenny compared the average temperature and annual rainfall for two towns in the same state. The results are shown in the data table. From these results, Jenny concluded that hotter weather causes more rain to fall. What is another reasonable interpretation of this data?

- A.** Farmon is a very cold place to live.
- B.** Colder weather causes more rain to fall.
- C.** Rain causes the temperature to increase.
- D.** Davis is the rainiest town in the entire state.

Correct response: C

Science as Inquiry - The Abilities Necessary to Do Scientific Inquiry

GLE 23—*Use relevant safety procedures and equipment to conduct scientific investigations*

While working on a class chemistry experiment, Victor dropped a glass test tube filled with an unknown liquid. What should Victor do **first**?

- A. put on gloves
- B. inform the teacher
- C. sweep up the broken glass
- D. clean up the spilled chemical

Correct response: B

Science as Inquiry - Understanding Scientific Inquiry
GLE 25—Compare and critique scientific investigations

Use this data table to answer the question.

Experimental Design for Studying Effects of Pollutant

Plant	Water (ml/day)	Sunlight (hours/day)	Pollutant (grams)	Initial Height of Plant (meters)
1	100	12	0	0.45
2	200	12	1	0.47
3	300	12	10	0.50
4	400	12	100	0.44

Chris wanted to determine the effects of a soil pollutant on the growth of a sunflower plant. He designed an experiment and recorded his results in the data table. Where does Chris make a **mistake** in the design of his experiment?

- A. The experiment doesn't have a control.
- B. The experiment should use more types of plants.
- C. The amount of water should be the same for each plant.
- D. The amount of pollutant should be the same for each plant.

Correct response: C

Science as Inquiry - Understanding Scientific Inquiry

GLE 26—Use and describe alternate methods for investigating different types of testable questions

Lamont has two blocks of metal. The blocks are both the same size, as shown below.



Block 1



Block 2

Lamont wants to show that the blocks are made from **different** metals. One way to do this is to show that Block 2 has a different melting temperature than Block 1. However, this would require a very powerful heat source.

Which of these is another way Lamont could show that the blocks are made from **different** metals?

- A.** Show that both blocks conduct electricity.
- B.** Show that the blocks weigh different amounts.
- C.** Show that both blocks can be picked up by a magnet.
- D.** Show that the blocks come from two different regions on Earth.

Correct response: B

Science as Inquiry - Understanding Scientific Inquiry

GLE 31—Recognize that there is an acceptable range of variation in collected data)

Use this data table to answer the question.

Height of Plant

Measurement	Height of Plant
1	21.2 cm
2	21.5 cm
3	21.4 cm

Damon measured the height of a plant three times with a metric ruler. He recorded the measurements in the data table above. Which statement **most likely** explains the variation in Damon's data?

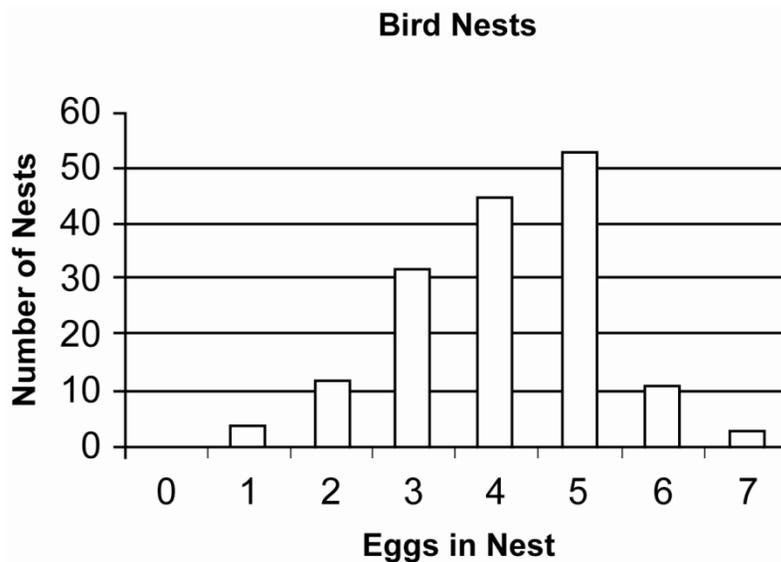
- A. The plant was growing while Damon measured it.
- B. Damon used different rulers for each measurement.
- C. Damon made small errors while measuring the plant.
- D. The plant expanded and shrank because of temperature changes.

Correct response: C

Science as Inquiry - Understanding Scientific Inquiry

GLE 32—Explain the use of statistical methods to confirm the significance of data (e.g., mean, median, mode, range)

Use this graph to answer the question.



A scientist studied 160 bird nests and counted the number of eggs in each nest. Her results are shown in the bar graph above. Which statement **best** describes the scientist's results?

- A. The mode is 5, but the median is less than 5.
- B. The mode is 5, but the median is greater than 5.
- C. The median is 5, but the mode is less than 5.
- D. The median is 5, but the mode is greater than 5.

Correct response: A

Science as Inquiry - Understanding Scientific Inquiry

GLE 34—*Recognize the importance of communication among scientists about investigations in progress and the work of others*

A scientist makes an important discovery while conducting an experiment. What should the scientist do next?

- A. Tell other scientists about the experiment and the discovery.
- B. Tell other scientists about the discovery but not about the experiment.
- C. Tell other scientists about the experiment but not about the discovery.
- D. Write about the discovery in his or her notebook but not tell any other scientists about it.

Correct response: A

Science as Inquiry - Understanding Scientific Inquiry

GLE 36—*Explain why an experiment must be verified through multiple investigations and yield consistent results before the findings are accepted*

A scientist performed an experiment that had an unexpected result. Before telling anyone about the result, the scientist performed the experiment again. What is the **most likely** reason the scientist performed the experiment more than once?

- A. The scientist wanted to make sure no one else could do the experiment.
- B. The scientist had extra chemicals and wanted to use them all.
- C. The scientist wanted to be sure the results were accurate.
- D. The scientist wanted to get different results.

Correct response: C

Physical Science - Properties and Changes of Properties in Matter

GLE 4—*Differentiate between the physical and chemical properties of selected substances*

Jeanette is studying a substance. Which property of the substance is chemical?

- A. its density
- B. its temperature
- C. its melting point
- D. its flammability

Correct response: D

Physical Science - Properties and Changes of Properties in Matter

GLE 10—*Identify the average atomic masses of given elements using the periodic table*

Use this element from the periodic table to answer the question.

14
Si
Silicon
28.1

What is the atomic mass for silicon?

- A. 14.0
- B. 14.1
- C. 28.1
- D. 42.1

Correct response: C

Physical Science - Properties and Changes of Properties in Matter

GLE 12—*Determine the effect of particle size of the same reactants on the rate of chemical reactions during a lab activity (e.g., powdered vs. solid forms)*

A scientist has two samples of the same chemical: one sample is a solid block, and the other sample is a powder. The scientist puts the solid block in a beaker of water and observes a reaction.

What would **most likely** happen if the scientist placed the powdered sample into a different beaker of water?

- A. No reaction would occur.
- B. A completely different reaction would occur.
- C. The same reaction would occur but at a faster rate.
- D. The same reaction would occur but at a slower rate.

Correct response: C

Physical Science - Motions and Forces

GLE 15—*Explain why velocity is expressed in both speed and direction*

A scientist is trying to track the movement of a rocket. What information does the scientist need to determine the velocity of the rocket?

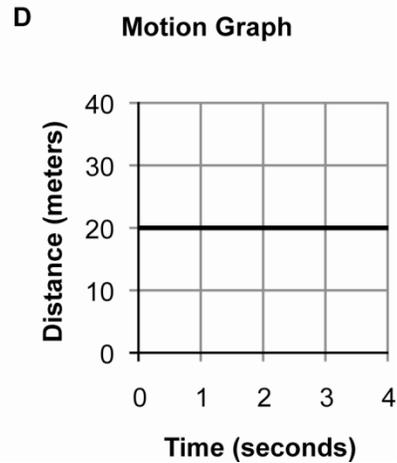
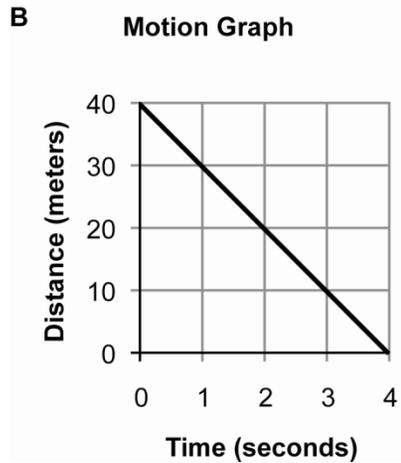
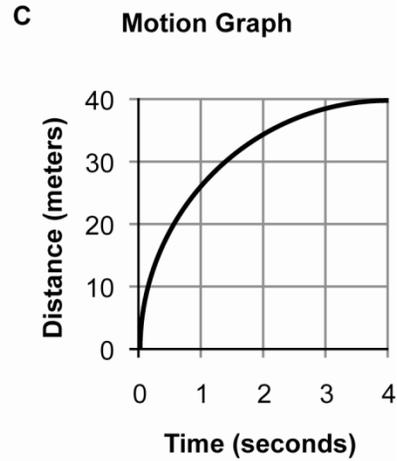
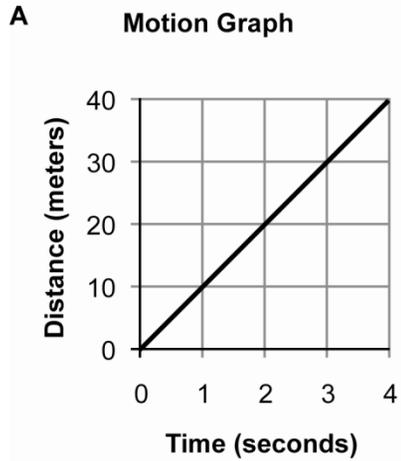
- A. the mass and speed of the rocket
- B. the speed of the rocket and the direction the rocket is moving
- C. the time the rocket has been traveling and the mass of the rocket
- D. the time the rocket has been traveling and the direction the rocket is moving

Correct response: B

Physical Science - Motions and Forces

GLE 16—Compare line graphs of acceleration, constant speed, and deceleration

Mrs. Wilson’s science class is graphing the movement of vehicles passing their school. Which line graph shows a vehicle slowing down?

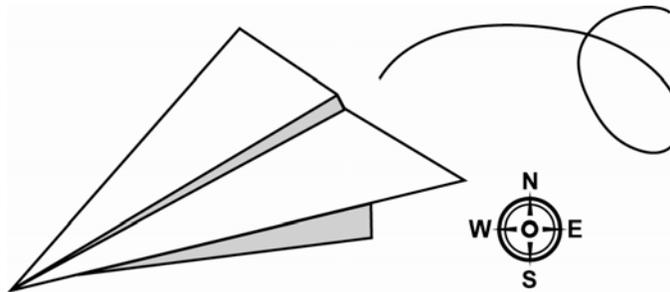


Correct response: C

Physical Science - Motions and Forces

GLE 23—Predict the direction of a force applied to an object and how it will change the speed and direction of the object

Jenny threw a paper airplane toward the west. The wind, however, caused the airplane to move in a southwestern direction.



Which statement **best** describes the direction of the wind?

- A. The wind is blowing from the north.
- B. The wind is blowing from the south.
- C. The wind is blowing from the west.
- D. The wind is blowing from the east.

Correct response: A

Physical Science - Transformations of Energy

GLE 24—Describe and give examples of how all forms of energy may be classified as potential or kinetic energy

Noah carried a skateboard up a hill and then rode the skateboard down the hill. When Noah reached the bottom of the hill, he rolled to a stop. When did Noah have the most **potential energy**?

- A. while carrying the skateboard up the hill
- B. while standing on the skateboard at the top of the hill
- C. while riding the skateboard down the hill
- D. while standing on the skateboard at the bottom of the hill

Correct response: B

Physical Science - Transformations of Energy

GLE 26—Describe and summarize observations of the transmission, reflection, and absorption of sound, light, and heat energy

What happens to green light and red light when they shine on a green leaf?

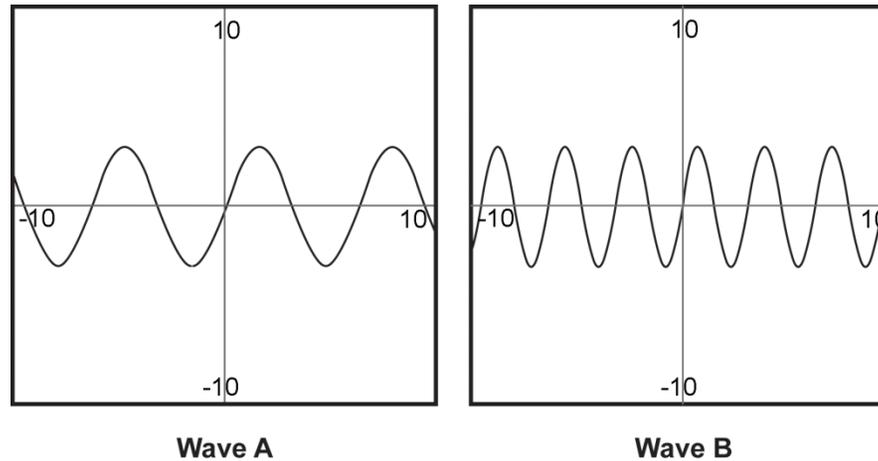
- A. Both are absorbed.
- B. Both are reflected.
- C. Green light is absorbed, and red light is reflected.
- D. Green light is reflected, and red light is absorbed.

Correct response: D

Physical Science - Transformations of Energy

GLE 32—Identify and illustrate key characteristics of waves (e.g., wavelength, frequency, amplitude)

Use these graphs to answer the question.



The two waves above are traveling at the same speed. Which statement **best** describes the difference between the waves?

- A. Wave A has a higher frequency than wave B.
- B. Wave A has a lower frequency than wave B.
- C. Wave A has a higher amplitude than wave B.
- D. Wave A has a lower amplitude than wave B.

Correct response: B

Physical Science - Transformations of Energy

GLE 34—Apply the law of reflection and law of refraction to demonstrate everyday phenomena (e.g., how light is reflected from tinted windows, how light is refracted by cameras, telescopes, eyeglasses)

What would be the best use for a material that reflects almost all light?

- A. as a mirror
- B. as a window
- C. as a light bulb
- D. as a sheet of paper

Correct response: A

Physical Science - Transformations of Energy

GLE 36—Explain the relationship between an object's color and the wavelength of light reflected or transmitted to the viewer's eyes

Laura sees a red flower. Which statement **best** describes why the flower is red?

- A. The light that strikes the flower is mostly red.
- B. The light that is absorbed by the flower is mostly red.
- C. The light that is reflected from the flower is mostly red.
- D. The light that passes through the flower is mostly red.

Correct response: C

Physical Science - Transformations of Energy

GLE 40—*Identify heat energy gains and losses during exothermic and endothermic chemical reactions*

Dee adds five grams of a chemical to one liter of liquid and observes a reaction. If the reaction is **endothermic**, what will happen?

- A. The volume of the liquid will increase.
- B. The volume of the liquid will decrease.
- C. The temperature of the liquid will increase.
- D. The temperature of the liquid will decrease.

Correct response: D

Science and the Environment

GLE 42—*Identify energy types from their source to their use and determine if the energy types are renewable, nonrenewable, or inexhaustible*

Which nonrenewable energy source comes from the remains of dead organisms?

- A. gasoline
- B. solar power
- C. geothermal heat
- D. hydroelectricity

Correct response: A

Science and the Environment

GLE 43—*Explain how the use of different energy resources affects the environment and the economy*

Some electricity is made by damming rivers and using the water to push a turbine. What is a potential negative effect of this form of energy?

- A. It can cause the river to be heavily polluted.
- B. It can destroy the habitat of wildlife that live in the river.
- C. It can produce toxic waste that must be disposed of.
- D. It can consume too much water.

Correct response: B

Science and the Environment

GLE 44—*Explain how an inexhaustible resource can be harnessed for energy production*

Stanley helped his mother install a solar generator on the roof of their home. Which statement **best** explains the advantage of using a solar generator?

- A. Solar power is easy to store.
- B. Solar power is readily available.
- C. Solar generators can produce energy at all times.
- D. Solar generators can produce very large amounts of energy.

Correct response: B

Science and the Environment

GLE 45—*Describe methods for sustaining renewable resources*

After harvesting, a farmer plowed the remaining vegetation into the soil. What is the **most likely** reason the farmer did this?

- A. to prevent fires
- B. to prevent erosion
- C. to save time and energy
- D. to add nutrients to the soil

Correct response: D

Science and the Environment

GLE 46—*Identify ways people can reuse, recycle, and reduce the use of resources to improve and protect the quality of life*

What is the **best** ecological reason for using recycled paper?

- A. Recycled paper lasts longer.
- B. Recycled paper is safer to use.
- C. Recycled paper is much cheaper to buy.
- D. Recycled paper conserves resources.

Correct response: D

Task

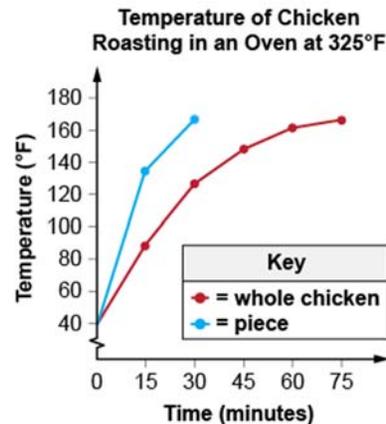
You are asked to read a letter about cooking dinner. Then you will answer five questions. The first four questions are multiple choice. The last question requires you to write an extended response.

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. Responses with fewer than 25 words will not be scored.

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.

Rubric

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	<ul style="list-style-type: none"> ▪ 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: <ul style="list-style-type: none"> ○ Predicts that bag 1 will be more effective at keeping the sandwich cold. ○ 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. ○ 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	<ul style="list-style-type: none"> ▪ 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 contains minor scientific errors.
2	<ul style="list-style-type: none"> ▪ The student’s response demonstrates a limited 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 contains scientific errors.
1	<ul style="list-style-type: none"> ▪ The student’s response demonstrates a basic 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.

	<ul style="list-style-type: none">▪ The response contains 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.