New England Common Assessment Program

Released Items
2016

Grade 11
Science

Science

Please use the periodic table on the reference sheet to answer the question.

1 Highly reactive potassium (K) is placed in a container with an unknown element. The container is heated and no reaction is observed.

Which element is **most likely** the unknown element?

A. chlorine (Cl)
B. neon (Ne)
C. nitrogen (N)
D. oxygen (O)

2 The chemical ammonium nitrate (NH_4NO_3) is used in medical cold packs like the one shown below.

When the cold pack is crushed, the ammonium nitrate begins to dissolve in the water inside the cold pack and the water temperature quickly drops.

Which statement correctly describes the reaction between the ammonium nitrate and the water?

A. The reaction is endothermic because energy is absorbed.
B. The reaction is endothermic because energy is released.
C. The reaction is exothermic because energy is absorbed.
D. The reaction is exothermic because energy is released.

Please use the Formulas on the reference sheet to answer the question.

❸ A stone rolls off the top of a cliff and free-falls 50 m to the river below. The stone's velocity at the end of 1 s is approximately 10 m/s.

What is the velocity of the stone 3 s after rolling off the top of the cliff?

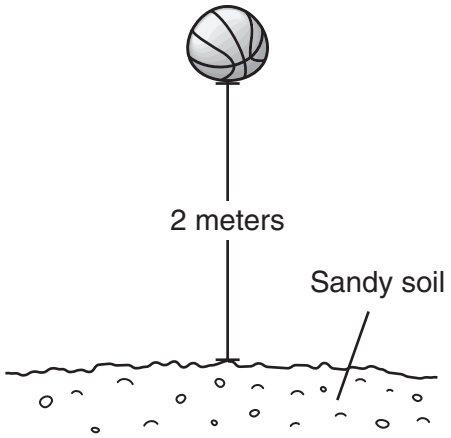
A. 10 m/s

B. 30 m/s

C. 60 m/s

D. 150 m/s

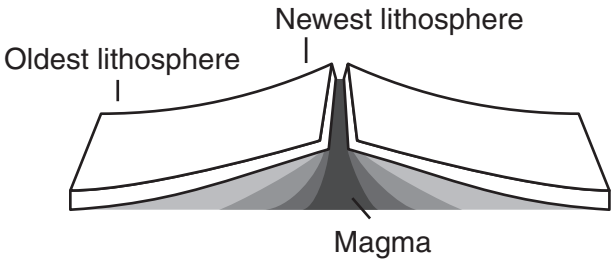
❹ An underinflated ball is dropped from a height of two meters onto sandy soil, as shown below.



a. Predict the height the ball will bounce. Be sure to write your prediction in your Student Answer Booklet. Describe **two** energy transformations that affect the height the ball will bounce.

b. Describe **two** ways to increase the height the ball will bounce. Explain how these two ways will provide more energy for a higher bounce.

5 The Mid-Atlantic Ridge divides the Atlantic Ocean into two nearly equal parts. A deep valley rift runs along the crest of the ridge, as shown in the diagram below.



Scientists drilled into the ocean floor and determined the age of the seafloor on each side of the Mid-Atlantic Ridge.

Which conclusion about the seafloor does the information in the diagram support?

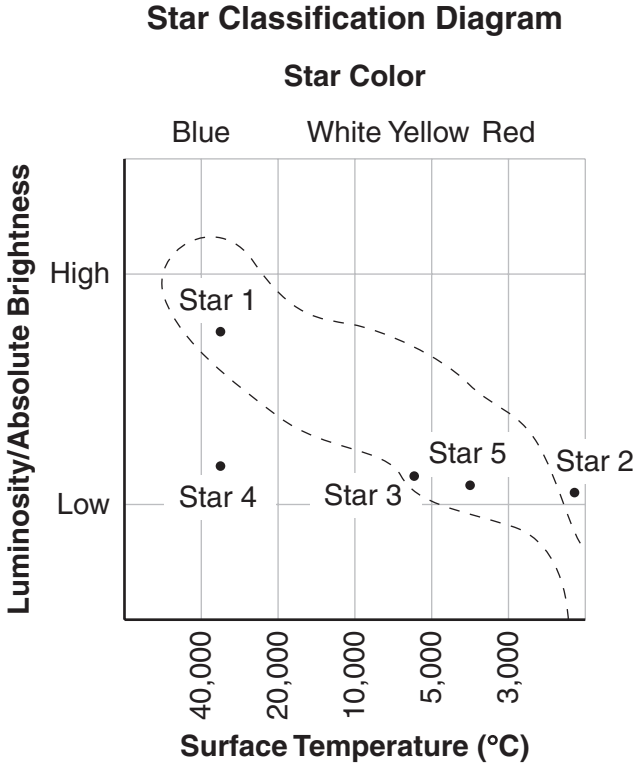
A. The seafloor is youngest where the lithosphere is thickest.
B. The seafloor is youngest where Earth's magnetism has reversed.
C. The seafloor is youngest near the continents.
D. The seafloor is youngest near the ridge.

6 The half-life of potassium-40 is 1.3 billion years. In a rock sample, 75% of the original amount of potassium-40 has decayed.

Which of the following is the **best** estimate of the age of the rock sample?

A. about 2.6 billion years old
B. about 1.3 billion years old
C. about 0.9 billion years old
D. about 0.3 billion years old

7 The diagram below shows information about five stars.



Star 1 and Star 4 have similar surface temperatures. What is the **most likely** reason Star 1 is more luminous than Star 4?

A. Star 1 is larger.
B. Star 1 is older.
C. Star 1 is in a different galaxy.
D. Star 1 is farther from Earth.

Please use the Genetic Code on the reference sheet to answer the question.

8 Examine the normal and the mutated DNA codes shown below.

- Normal DNA sequence:
  ATG GTG GGT GAT GCT ACC
- Mutation of the same section of DNA sequence:
  ATG GTG TCG TAG TGG ACC

What is the immediate result of this mutation?

A. A smaller lipid forms.
B. The same protein is produced.
C. A different protein is produced.
D. Three incomplete carbohydrates form.

9 A news segment presents video clips discussing recent advances in health science.

Which video clip is **most likely** free of bias?

A. A panel of doctors share their personal experiences and advice for helping patients quit smoking.
B. A professional athlete discusses her increased performance that resulted from taking a nutritional supplement.
C. A foreign correspondent interviews elders of a small village to find out about the herb that they have used for centuries to treat cancer.
D. A university student summarizes the results of a controlled investigation comparing the effectiveness of two different types of sunscreen.

10 Which of the following is an example of one way the human nervous system maintains homeostasis?

A. Sensory cells in the nose detect fragrance from a flower, causing the person to breathe in more deeply.
B. Neurons in the skin detect pressure, causing a feeling of pain to be sent to the person's brain.
C. Receptors in the brain detect a decrease in blood pH, causing a signal to be sent to increase the person's breathing rate.
D. Cells in the tongue detect a sweet flavor, causing the person to smile.

Date: _____

Your Name: _____

New England Common Assessment Program

Released Science Inquiry Task

Encounter with an Active Volcano

2016

Grade 11

Science

Directions:

You will be reading a story and analyzing the data provided to answer a set of questions. Read the story and questions thoroughly and explain all of your answers. You may include labeled drawings or diagrams to help you answer the questions.

This Word Bank provides definitions for words used in this task. You may refer back to this page throughout the session.

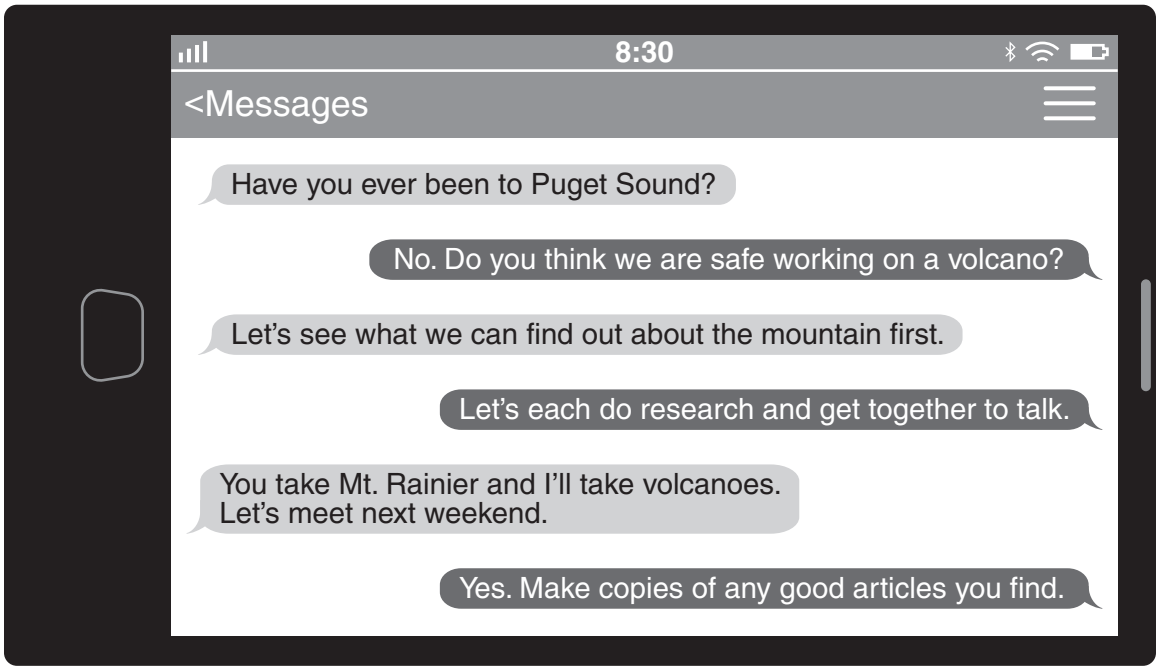
Word Bank

Elevation	the height above sea level
Frequency	the rate at which something occurs or is repeated over a particular period of time
Hazard	a danger or risk
Intern	a student or trainee who works, sometimes without pay, to gain career experience
Nonviolent eruption	nonexplosive volcanic activity
Plume	a rising or expanding body of gas and ash particles
Seismic	relating to earthquakes or other vibrations within Earth's interior
Shallow earthquake	an earthquake originating within 60 kilometers beneath Earth's surface

GO ON

Encounter with an Active Volcano

Patrick and Julia, two high school friends from New England, have been accepted as summer interns to work as tour guides in Mt. Rainier National Park in the state of Washington. They will be leading tours of Mt. Rainier, an active volcano that has not erupted for over 100 years. They will stay in different houses in the town of Puyallup, which is located on Puget Sound, near Seattle, Washington. The two friends made the following texts to each other about their upcoming adventure.



The following weekend, Patrick and Julia met and shared information. They were both amazed that they would be working on an active volcano with a peak that is covered with more than 20 glaciers. The two friends learned that Puyallup was about 40 kilometers northwest and 4000 meters lower in elevation than Mt. Rainier.

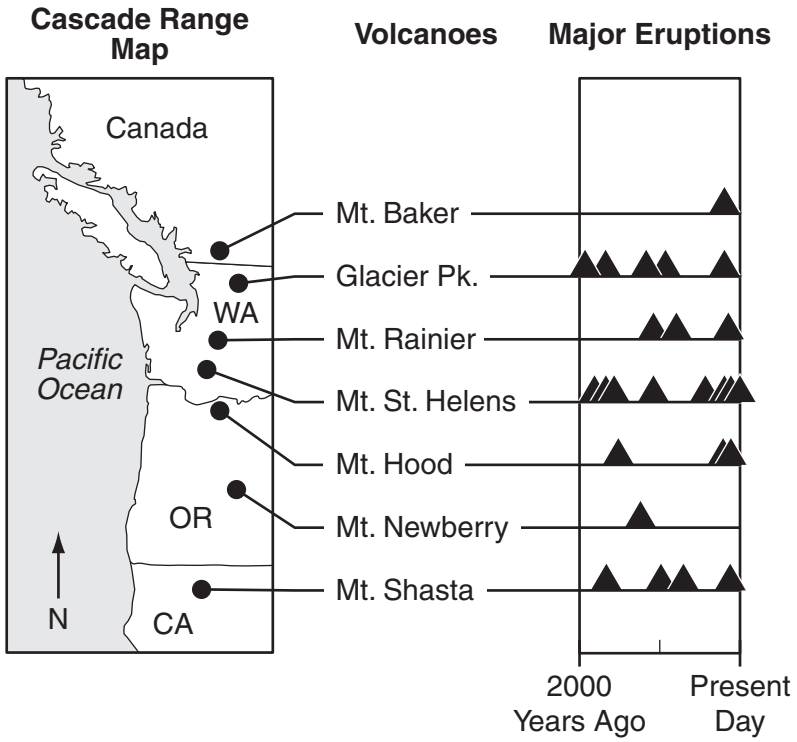
Julia found information that classified Mt. Rainier as a dangerous volcano even though the last recorded eruptions of the mountain were during 1894 and 1895. Those eruptions were small and concentrated at the summit.

Patrick collected information about Mt. St. Helens, a volcano 56 kilometers southwest of Mt. Rainier and where a violent eruption occurred in 1980. Since that time, Mt. St. Helens has had nonviolent eruptions from 2004 to 2008 that added lava to the volcano's crater. More than 100 shallow earthquakes per day signaled underground magma movement in early 2004. However, the 2004–2008 eruptions happened slowly, so they posed no danger to anyone outside the volcano's crater.

GO ON

Some of the articles that Patrick read indicated that many geologists see similarities between the volcanic activities of Mt. St. Helens and Mt. Rainier. The two students learned that both volcanoes are part of a system of volcanoes called the Cascade Mountain Range. Julia found a diagram showing some of the volcanic mountains in the Cascade Range. Diagram 1 shows the information she found.

Diagram 1: Some Cascade Range Eruptions during the Last 2000 Years



The data in the articles and the diagram helped Patrick and Julia develop this question they could investigate to help them determine their safety during their summer in Puyallup, Washington.

Research Question:

How does geological evidence from past volcanic eruptions support predictions about future eruptions?

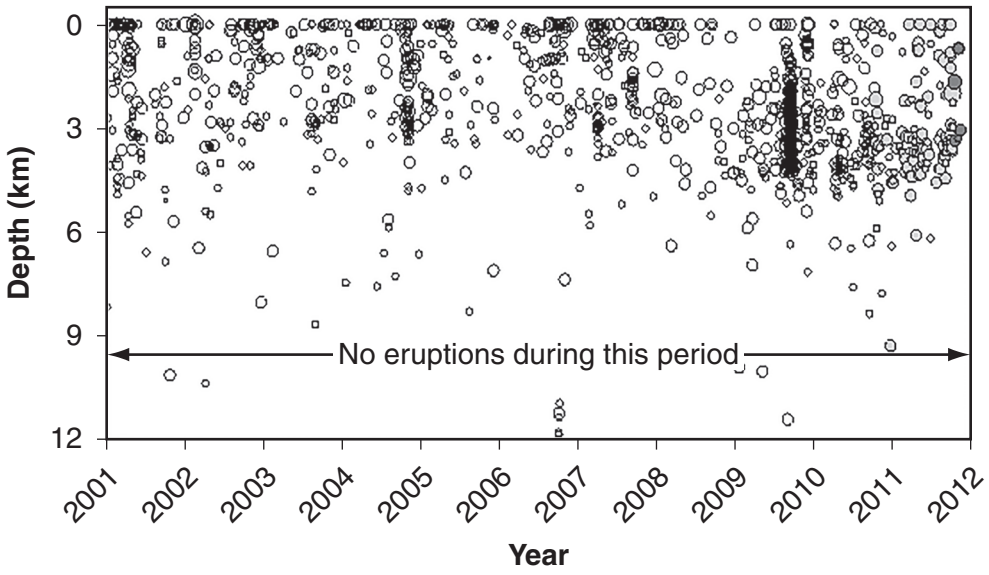
The results of scientists' seismic monitoring of both Mt. St. Helens and Mt. Rainier provided Patrick and Julia with data about the depth and frequency of earthquakes beneath both volcanoes. They decided that they could compare data about Mt. Rainier to data from both the 1980 and 2004–2008 eruptions of Mt. St. Helens to predict the likelihood that Mt. Ranier will have a violent eruption during the summer.

The two students found historical earthquake (seismic) data for both mountains. They learned that most earthquakes that occur directly within a volcano are caused by the movement of magma beneath the volcano. Some continuous earthquake activity is common in a volcanic region. However, the depth and frequency of earthquakes often increase at the time of an eruption.

GO ON

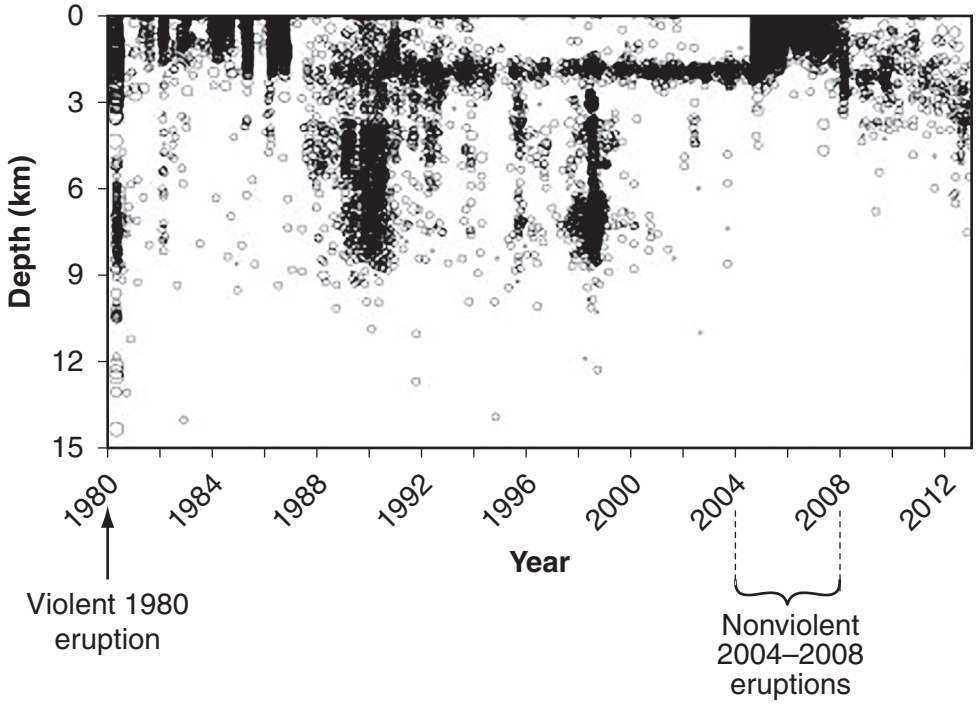
Graphs 1 and 2 show the data about earthquake activity that Patrick and Julia found for both mountains. Each circle represents an earthquake event. Darker areas indicate greater frequency of earthquake activity.

Graph 1: Mt. Rainier Earthquake Activity 2001–2012



Adapted from U.S. Geological Survey.

Graph 2: Mt. St. Helens Earthquake Activity 1980–2012



Adapted from U.S. Geological Survey.

Patrick and Julia compared the data about eruption and earthquake activity in Diagram 1 and Graphs 1 and 2 to predict the likelihood of a violent Mt. Rainier eruption during their stay. Julia predicted that Mt. Rainier was likely to have a violent eruption very soon, maybe before the end of the summer.

GO ON

Patrick wondered if the scales of the data in Graphs 1 and 2 gave Julia enough information to make her prediction.

Answer questions 1 and 2 on page 1 in your Student Answer Booklet.

1 Identify **two** reasons the scales used for the data in Graphs 1 and 2 (depth and years) are or are not appropriate for Julia's prediction. Explain why the scales are or are not appropriate.

Patrick studied all the data and disagreed with Julia's prediction. Patrick claimed that no violent eruption will occur this year on Mt. Rainier.

2 Identify how the evidence from Graphs 1 and 2 supports Patrick's claim that no violent eruption will occur this year on Mt. Rainier. Explain your answer.

"What if Mt. Rainier does erupt? Does that really pose a danger to us?" Julia wondered.

"The earthquake data do not tell us about that," said Patrick. "If Mt. Rainier erupts, what will the impact be on this area?"

"Maybe data from past volcanic eruptions could help answer that question," said Julia.

Julia and Patrick both thought that data about past volcanic eruptions might help them evaluate the impact of a Mt. Rainier eruption. Patrick said he had found plenty of data about the effects of past volcanic eruptions when other Cascade Range volcanoes erupted. The data is described below.

Cascade Range Volcanic Data

- the approximate years of major and minor eruptions,
- the approximate amounts of volcanic material added to and removed from the mountains by the eruptions, and
- the extent of the area covered by materials deposited from the eruptions.

Patrick and Julia thought that this additional Cascade Range volcanic data could help them make a prediction about the possible impact associated with a Mt. Rainier eruption.

GO ON

Answer question 3 on page 2 in your Student Answer Booklet.

3 Identify which of the Cascade Range volcanic data would **best** support a prediction about the possible impact of a violent Mt. Rainier eruption to the area. Explain how the data would help make a prediction.

Patrick and Julia learned that lava flow was not the only destructive effect of an eruption so Julia was curious about what different types of hazards occurred during past violent eruptions of Mt. Rainier. She thought that knowing this information might help them determine the hazards posed by a future violent eruption of Mt. Rainier.

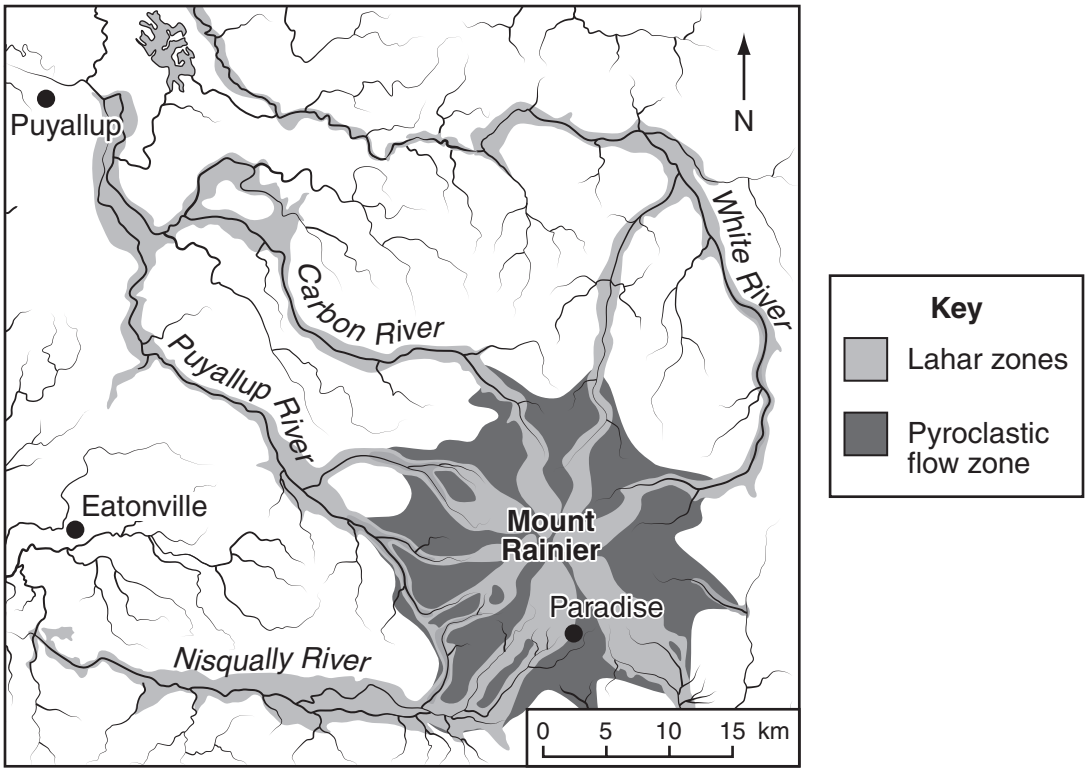
Patrick found two articles that described the hazards violent volcanic eruptions pose. According to the articles, the two risks that seemed the most significant based on past violent eruptions of Cascade Range volcanoes were lahars and pyroclastic flows. The article described these hazards in this way:

- lahars—mixtures of water and rock fragments that flow downstream from the volcano through river valleys
  - move faster than humans can run
  - tens of meters deep
  - hundreds of meters wide
- pyroclastic flows—mixtures of rock fragments and gases
  - high-density and extremely hot
  - move away from the volcano blast area at high speeds

GO ON

Julia found this map that shows the areas affected by lahars and pyroclastic flows based on geologic evidence from past violent Mt. Rainier eruptions.

Map 1: Historical Extent of Mt. Rainier Lahars and Pyroclastic Flows



Adapted from sources shown at
http://www.mmdtkw.org/ALRIVes0917aRainierRiskMap.jpg.

Answer question 4 on page 2 in your Student Answer Booklet.

4 Suppose a violent volcanic eruption happened on Mt. Rainier. Based on the data in Map 1, identify the level of risk (high, moderate, or low) from lahars and pyroclastic flows in **two** of the following towns in Washington:

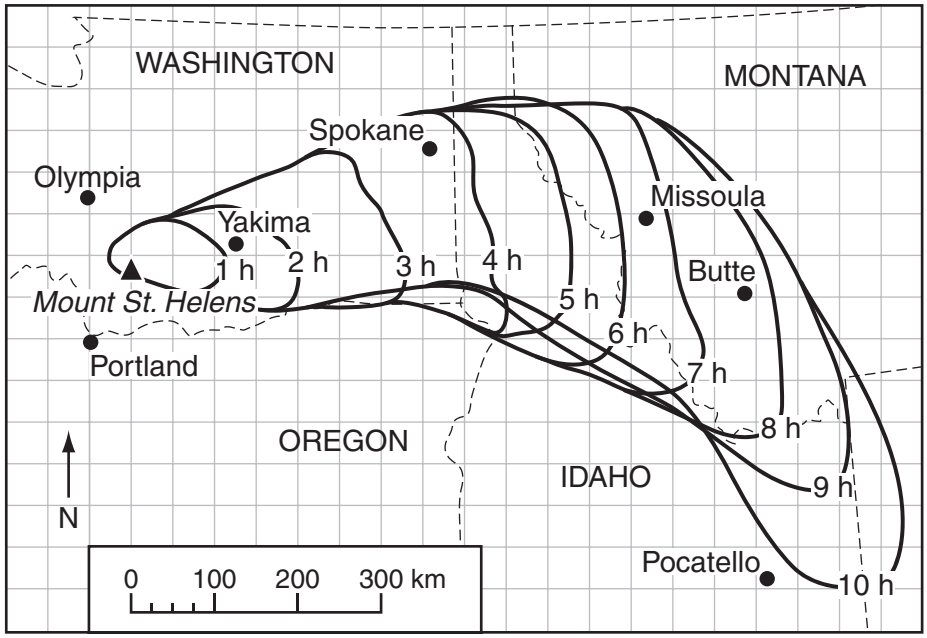
- Eatonville
- Puyallup
- Paradise

For each of the two locations you chose, use the data from Map 1 to justify the levels of risk you identified for **each** hazard.

GO ON

Patrick found information about ash deposited in places far away from Mt. St. Helens after the 1980 eruption. He and Julia wondered if ash from a violent Mt. Rainier eruption might be deposited in Puyallup. Julia found a map that showed the path followed by ash released into the air from the Mt. St. Helens volcano on May 18, 1980, over the first 10 hours. The ash plume traveled quickly over a wide area, as shown in Map 2 below.

Map 2: Mount St. Helens Ash Plume Path over 10 Hours
May 18, 1980



Data adapted from Topinka, USGSICVO, 1999, Modified from: Sama–Wojcicki, et.al., 1981, IN: USGS Professional Paper 1250

Answer question 5 on page 3 in your Student Answer Booklet.

5 Create a line graph of the maximum distance the plume travelled from Mt. St. Helens each hour based on data from Map 2. Be sure to include all the required elements of a graph.

Answer question 6 on page 4 in your Student Answer Booklet.

6 Identify the independent and dependent variables of the investigation that produced the data shown on Map 2 and your graph. Based on the map data, explain the relationship between these two variables.

GO ON

Patrick and Julia studied Map 2. They both wondered how this large area of gas and ash in the air affected people on the ground.

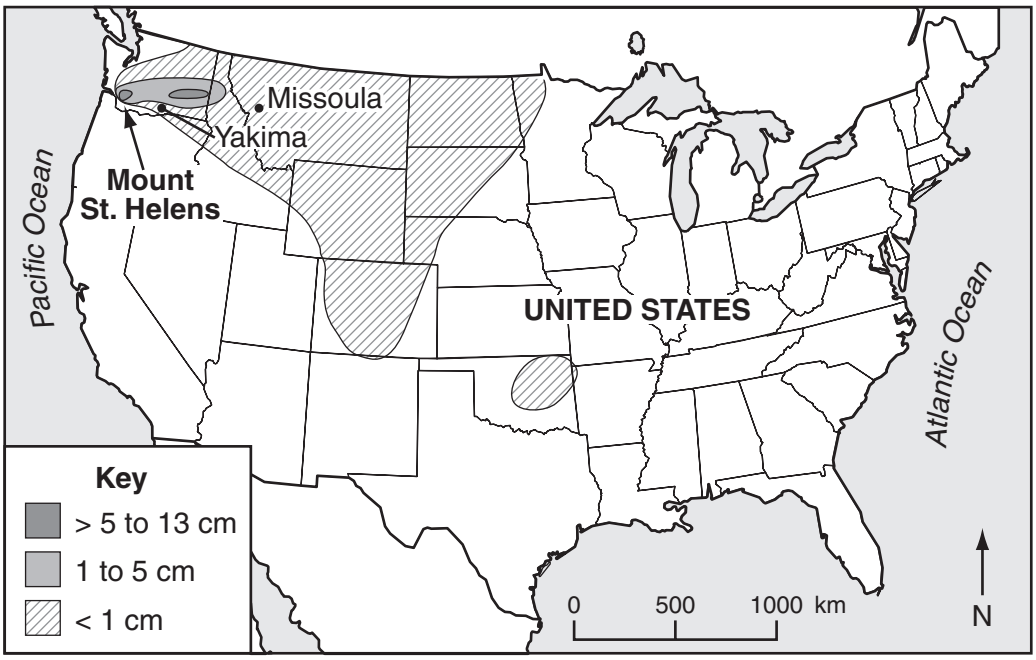
"I wonder how much of the ash fell to the ground," Patrick said.

"Let's see if we can find a map that shows that information," Julia suggested.

By searching on the Internet, Patrick and Julia found a map of ash deposits they could compare to Map 2. Map 3 shows the depth of ash deposits from the 1980 Mt. St. Helens eruption.

GO ON

Map 3: Depth of Ash Deposits from 1980 Mount St. Helens Eruption



Patrick wondered if environmental conditions may have affected the data shown on Maps 2 and 3. Julia looked up the weather archives for May 18, 1980, at Missoula, Montana. She found the weather data shown in Table 1 below.

Table 1: Weather at Missoula, Montana May 18, 1980

Time (P.M.)	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Wind Direction	Wind Speed (kph)
2:00	20	50	102.6	SSE	9.3
3:00	22	34	101.7	NNE	5.6
4:00	22	33	101.2	NNW	5.6
5:00	22	35	101.2	S	7.4

GO ON

Answer question 7 on page 4 in your Student Answer Booklet.

❼ Based on the weather data in Table 1, identify **two** possible environmental variables that may have affected the data shown in Maps 2 and 3. Describe how each variable may have affected the observations shown on Maps 2 and 3.

Julia and Patrick decided that the seismic and volcanic data would help them make a reasonable conclusion about all the risks from a violent volcanic eruption of Mt. Rainier during their stay.

Answer question 8 on page 5 in your Student Answer Booklet.

❽ Based on all the data Julia and Patrick gathered, make a conclusion about the risk to Patrick and Julia in Puyallup if Mt. Rainier erupts. Identify the possible hazards when a violent eruption does happen. Explain how the data support your conclusion.

Date: _____

Your Name: _____

New England Common Assessment Program

Released Science Inquiry Task

Encounter with an Active Volcano

2016

Grade 11

Student Answer Booklet

SCIENCE

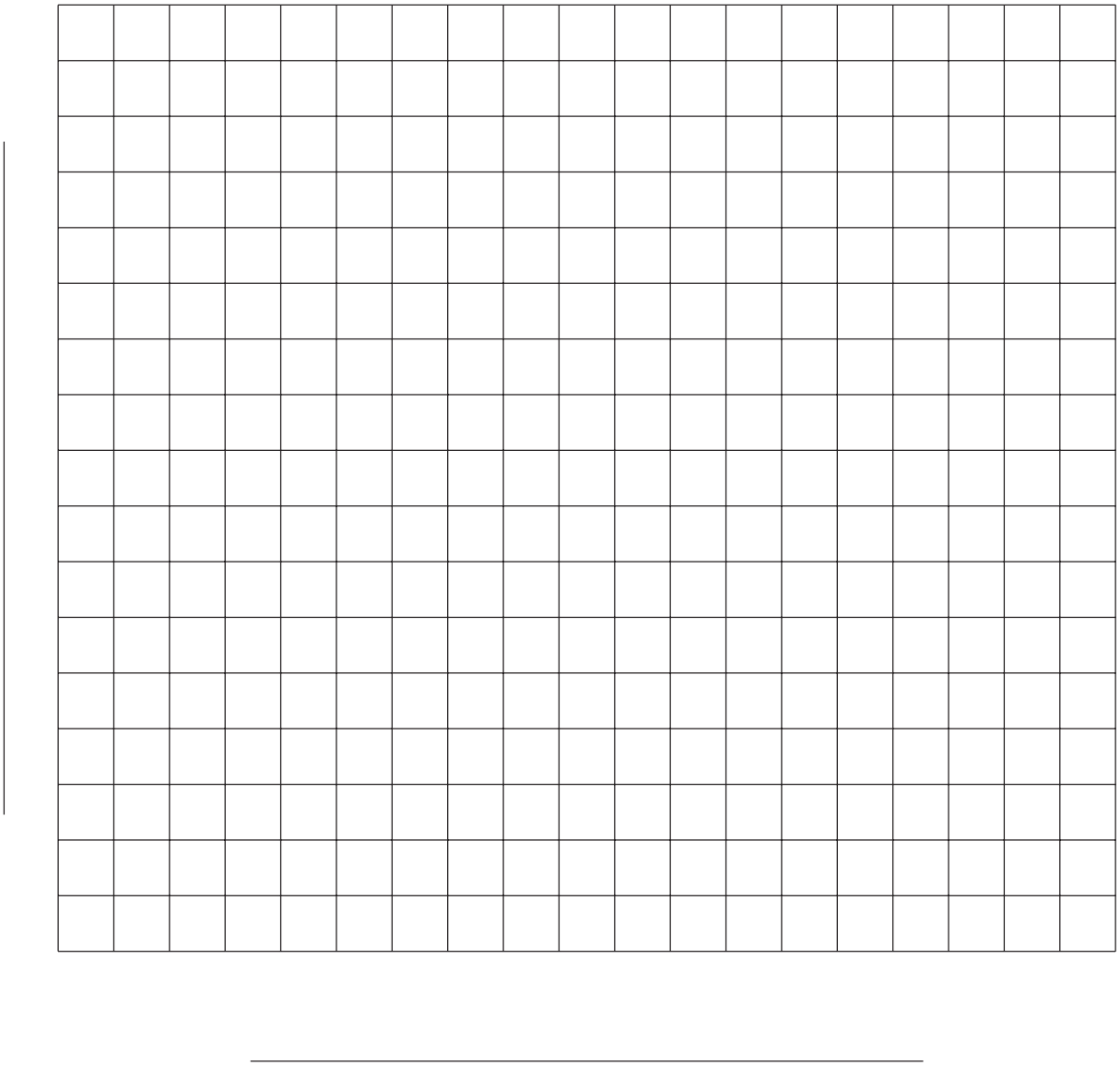
1.

2.

3.

4.

5.



6.

7.

8.

STOP

New England Common Assessment Program

Released Items Support Materials 2016

Grade 11 Science

Grade 11 Science Released Item Information

Item Number	Big Idea[1]	Assessment Target	Depth of Knowledge Code	Item Type [2]	Answer Key	Total Possible Points
1	POC	PS 1-3	2	MC	B	1
2	SAE	PS 2-6	2	MC	A	1
3	POC	PS 3-8	1	MC	B	1
4	SAE	PS 2-5	2	CR4		4
5	POC	ESS 1-3	2	MC	D	1
6	POC	ESS 1-4	2	MC	A	1
7	POC	ESS 3-8	2	MC	A	1
8	POC	LS 1-2	2	MC	C	1
9	NOS	LS 2-5	2	MC	D	1
10	FAF	LS 4-10	2	MC	C	1

Grade 11 Science Released Inquiry Task Information

Item Number	Big Idea[1]	Inquiry Construct	Depth of Knowledge Code	Item Type [2]	Total Possible Points
1	INQ	2-6	2	SA	2
2	INQ	1-2	2	SA	2
3	INQ	4-13	3	SA	2
4	INQ	1-1	3	SA	2
5	INQ	3-8	2	CR3	3
6	INQ	2-5	2	SA	2
7	INQ	4-11	2	SA	2
8	INQ	4-12	3	CR3	3

[1]Big Idea: NOS = Nature of Science, SAE = Systems and Energy, MAS = Models and Scale, POC = Patterns of Change, FAF = Form and Function, INQ = Scientific Inquiry

[2]Item Type: MC = Multiple Choice, CR = Constructed Response, SA = Short Answer

PS1 (9-11) POC-3 Explain how properties of elements and the location of elements on the periodic table are related.

Please use the periodic table on the reference sheet to answer the question.

1. Highly reactive potassium (K) is placed in a container with an unknown element. The container is heated and no reaction is observed.

   Which element is **most likely** the unknown element?

   A. chlorine (Cl)
   B. neon (Ne)
   C. nitrogen (N)
   D. oxygen (O)

PS2 (9-11) SAE-6 Using information provided about chemical changes, draw conclusions about and explain the energy flow in a given chemical reaction (e.g., exothermic reactions, endothermic reactions).

2 The chemical ammonium nitrate (NH_4NO_3) is used in medical cold packs like the one shown below.

When the cold pack is crushed, the ammonium nitrate begins to dissolve in the water inside the cold pack and the water temperature quickly drops.

Which statement correctly describes the reaction between the ammonium nitrate and the water?

A. The reaction is endothermic because energy is absorbed.

B. The reaction is endothermic because energy is released.

C. The reaction is exothermic because energy is absorbed.

D. The reaction is exothermic because energy is released.

PS3 (9-11) POC-8 Given information (e.g., graphs, data diagrams), use the relationships between or among force, mass, velocity, momentum, and acceleration to predict and explain the motion of objects.

Please use the Formulas on the reference sheet to answer the question.

3 A stone rolls off the top of a cliff and free-falls 50 m to the river below. The stone's velocity at the end of 1 s is approximately 10 m/s.

What is the velocity of the stone 3 s after rolling off the top of the cliff?

A. 10 m/s

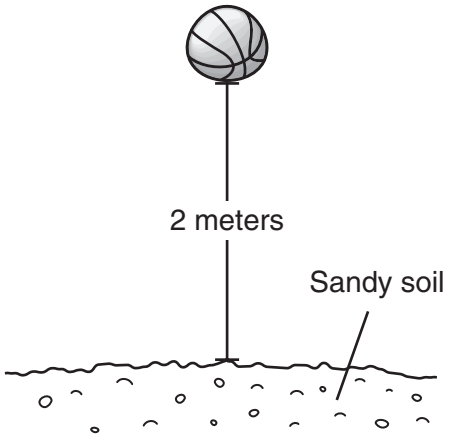
B. 30 m/s

C. 60 m/s

D. 150 m/s

PS-2 (9-11) SAE-5 Demonstrate how transformations of energy produce some energy in the form of heat and therefore the efficiency of the system is reduced (chemical, biological, and physical systems).

4 An underinflated ball is dropped from a height of two meters onto sandy soil, as shown below.



a. Predict the height the ball will bounce. Be sure to write your prediction in your Student Answer Booklet. Describe **two** energy transformations that affect the height the ball will bounce.

b. Describe **two** ways to increase the height the ball will bounce. Explain how these two ways will provide more energy for a higher bounce.

Scoring Guide

Score	Description
4	The response demonstrates a thorough understanding of how transformed energy produces some heat and reduces the efficiency of the system. The response includes a prediction of relative bounce height, descriptions of two energy transformations, two ways to improve bounce height and an explanation why they will improve bounce height.
3	The response demonstrates a general understanding of how transformed energy produces some heat and reduces the efficiency of the system. The overall response is general.
2	The response demonstrates a limited understanding of how transformed energy produces some heat and reduces the efficiency of the system. The overall response is limited.
1	The response demonstrates a minimal understanding of how transformed energy produces some heat and reduces the efficiency of the system. The overall response is minimal.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A thorough understanding is exemplified by the following sample response.

a. Prediction and energy changes

- Prediction possibilities:
    - about 0 cm–20 cm
    - less than 2 m
    - not very much
    - it will not bounce
- Gravitational potential energy is transformed into kinetic energy;
- kinetic energy is transformed to elastic potential energy of the ball;
- the air compressed inside the ball restores the kinetic energy of the ball;
- some energy is transferred as heat and sound to the surroundings;
- some energy is transferred and moves sand particles, and therefore the bounce is low.

b. Ways to cause a higher bounce:

- Drop the ball from a greater height or throw the ball; both will increase the initial energy.
- Inflate the ball, which will allow more energy to be stored elastically (in compression), so less energy is transformed to heat as the ball deforms.
- Bouncing the ball on a hard surface would reduce energy transferred and moves particles of soil (sand).

Score Point 4

4

a. The ball will bounce to height less than 2 meters high, such as 1 meter. One energy transformation that affects the height the ball will bounce is the transfer of kinetic energy to heat energy when the ball collides with the sandy soil. Another transformation that will affect how high the ball will bounce is the transfer of elastic potential energy to kinetic energy when the ball hits the sand and causes the sand to raise.

b. One way to increase the height is rather than dropping the ball and letting it undergo purely freefall motion, a person could throw the ball down to the sand. This will increase the kinetic energy of the ball as an initial velocity will be present. Another way to increase the height is to fully inflate the ball. Therefore, when it hits the sand its elastic potential energy will be greater and thus it will have a greater mechanical energy than before.

The response demonstrates a thorough understanding of how transformed energy produces some heat and reduces the efficiency of the system. In part (a), the response includes a reasonable prediction that the ball will bounce less than 2 meters and describes two accurate energy transformations, from kinetic energy to heat energy when the ball hits the ground and from elastic potential energy to kinetic energy from the ball to the sand. In part (b), the response contains two accurate ways to increase the height of the bounce, by throwing the ball harder or inflating it, and provides explanations for both.

SCORE POINT 3

4

A. The ball would probably not bounce at all. This is because when dropping the ball has a lot of potential energy. When the ball hits the surface of the sandy soil the balls potential energy turns to kinetic energy. But the sand absorbs all that energy making it stationary with no bounce at all.

B. one way to increase the bounce would be to raise the balls dropping point to 100 meters. that way the ball has acquired much more potential energy.

A second way would be to drop the ball on a harder surface, like concrete. the balls energy will still be absorbed, but not as much, allowing the ball to bounce higher.

The response demonstrates a general understanding of how transformed energy produces some heat and reduces the efficiency of the system. In part (a), there is a reasonable estimate with a general explanation of energy transformations, although the transformation should be kinetic while falling and elastic potential when the ball hits the sand. In part (b), there are two reasonable ideas with general explanations for increasing the bounce height.

SCORE POINT 2

4

(a) I belive that the ball will bounce less than 2 meters.

1- The energy of the sandy soil

2- The energy of the under inflated ball

(b)

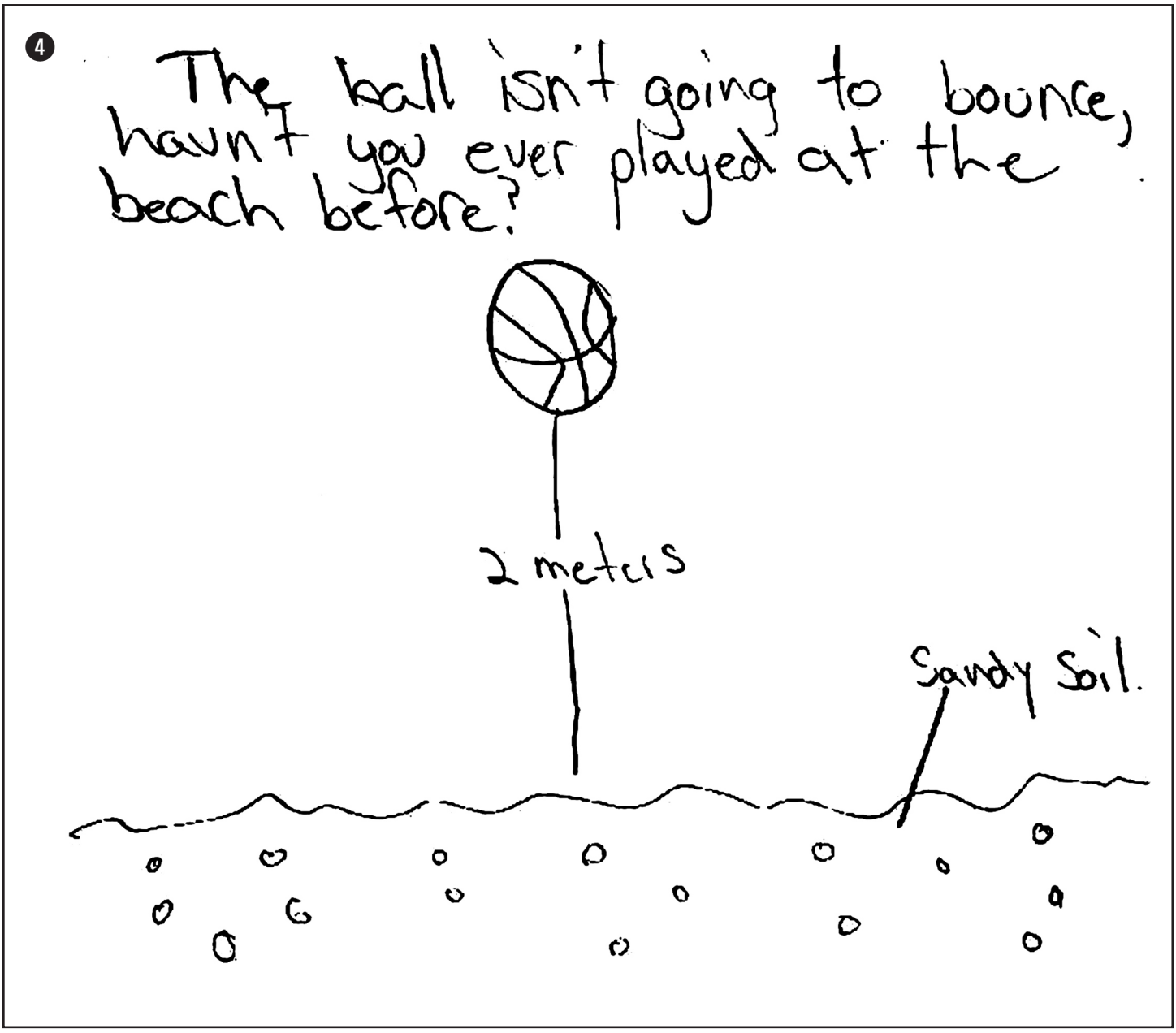
1- One way to increase the hiegnt of the ball would be to bounce the ball on pavement

2- A secand way to increase the hiegnt of the ball would be to inflate the ball.

The response demonstrates a limited understanding of how transformed energy produces some heat and reduces the efficiency of the system. In part (a), there is a reasonable estimate of the bounce height that lacks significant energy discussion. In part (b), there are two reasonable ideas for increasing the bounce height without addressing energy. There are partially correct responses to both parts with limited explanations.

SCORE POINT 1

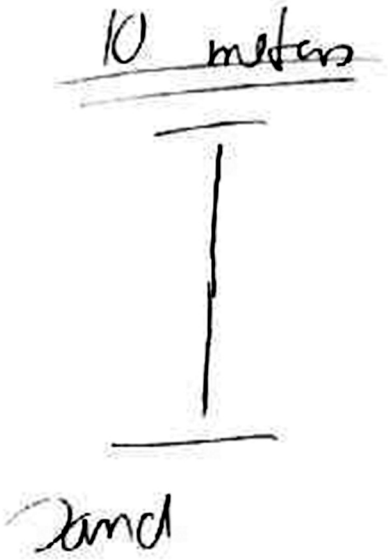
❹



The response demonstrates a minimal understanding of how transformed energy produces some heat and reduces the efficiency of the system by giving a reasonable estimate of the ball not bouncing in response to part (a).

SCORE POINT 0

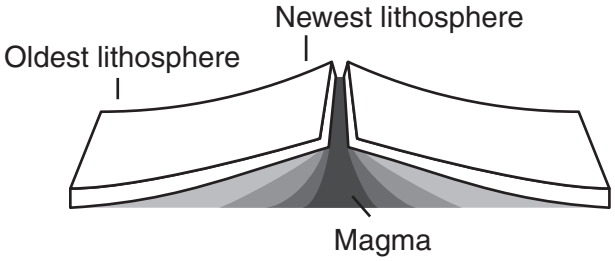
4



The response is incorrect or irrelevant to the skill or concept being measured. The response provides an unreasonable prediction of bounce height and nothing else.

ESS1 (9-11) POC-3 Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle, plate tectonics, sea floor spreading).

5 The Mid-Atlantic Ridge divides the Atlantic Ocean into two nearly equal parts. A deep valley rift runs along the crest of the ridge, as shown in the diagram below.



Scientists drilled into the ocean floor and determined the age of the seafloor on each side of the Mid-Atlantic Ridge.

Which conclusion about the seafloor does the information in the diagram support?

A. The seafloor is youngest where the lithosphere is thickest.

B. The seafloor is youngest where Earth's magnetism has reversed.

C. The seafloor is youngest near the continents.

D. The seafloor is youngest near the ridge.

ESS1 (9-11) POC-4 Relate how geologic time is determined using various dating methods (e.g., radioactive decay, rock sequences, fossil records).

6 The half-life of potassium-40 is 1.3 billion years. In a rock sample, 75% of the original amount of potassium-40 has decayed.

Which of the following is the **best** estimate of the age of the rock sample?

A. about 2.6 billion years old

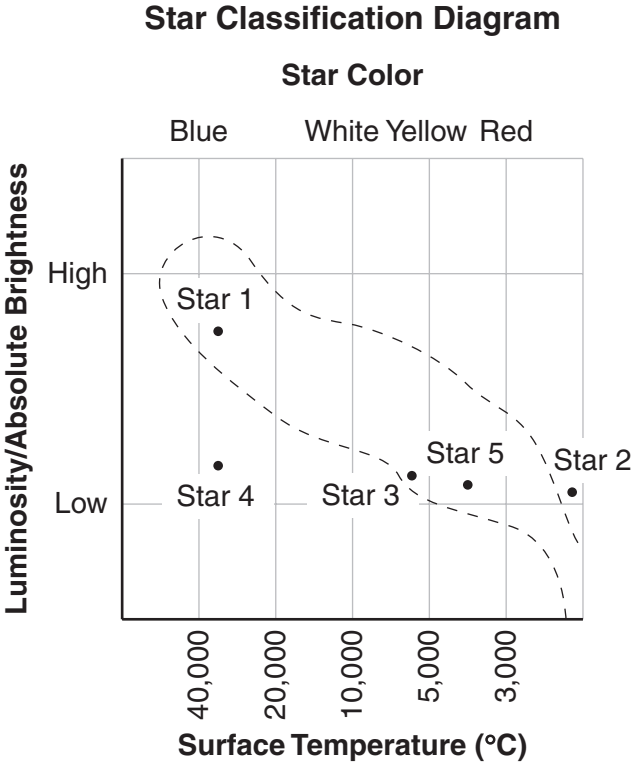
B. about 1.3 billion years old

C. about 0.9 billion years old

D. about 0.3 billion years old

ESS3 (9-11) POC-8 Explain the relationships between or among the energy produced from nuclear reactions, the origin of elements, and the life cycles of stars.

7 The diagram below shows information about five stars.



Star 1 and Star 4 have similar surface temperatures. What is the **most likely** reason Star 1 is more luminous than Star 4?

A. Star 1 is larger.

B. Star 1 is older.

C. Star 1 is in a different galaxy.

D. Star 1 is farther from Earth.

LS1 (9-11) POC-2 Explain or justify with evidence how the alteration of the DNA sequence may produce new gene combinations that make little difference, enhance capabilities, or can be harmful to the organism (e.g., selective breeding, genetic engineering, mutations).

Please use the Genetic Code on the reference sheet to answer the question.

8 Examine the normal and the mutated DNA codes shown below.

- Normal DNA sequence:
  ATG GTG GGT GAT GCT ACC
- Mutation of the same section of DNA sequence:
  ATG GTG TCG TAG TGG ACC

What is the immediate result of this mutation?

A. A smaller lipid forms.
B. The same protein is produced.
C. A different protein is produced.
D. Three incomplete carbohydrates form.

LS2 (9-11) NOS-5 Explain or evaluate potential bias in how evidence is interpreted in reports concerning a particular environmental factor that impacts the biology of humans.

9 A news segment presents video clips discussing recent advances in health science.

Which video clip is **most likely** free of bias?

A. A panel of doctors share their personal experiences and advice for helping patients quit smoking.

B. A professional athlete discusses her increased performance that resulted from taking a nutritional supplement.

C. A foreign correspondent interviews elders of a small village to find out about the herb that they have used for centuries to treat cancer.

D. A university student summarizes the results of a controlled investigation comparing the effectiveness of two different types of sunscreen.

LS4 (9-11) FAF-10 Explain how the immune system, endocrine system, or nervous system works and draw conclusions about how systems interact to maintain homeostasis in the human body.

10 Which of the following is an example of one way the human nervous system maintains homeostasis?

A. Sensory cells in the nose detect fragrance from a flower, causing the person to breathe in more deeply.

B. Neurons in the skin detect pressure, causing a feeling of pain to be sent to the person's brain.

C. Receptors in the brain detect a decrease in blood pH, causing a signal to be sent to increase the person's breathing rate.

D. Cells in the tongue detect a sweet flavor, causing the person to smile.

Broad Area of Inquiry:	**Planning and Critiquing of Investigations**
Inquiry Construct 6:	Provide reasoning for appropriateness of materials, tools, procedures, and scale used in the investigation.

1 Identify **two** reasons the scales used for the data in Graphs 1 and 2 (depth and years) are or are not appropriate for Julia's prediction. Explain why the scales are or are not appropriate.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of how to provide reasoning for the appropriateness of the scale used in the investigation. The response identifies two reasons the scales used for the data in Graphs 1 and 2 (depth and years) are appropriate or not appropriate for Julia's prediction and explains why the scales are or are not appropriate.
1	The response demonstrates a limited understanding of how to provide reasoning for the appropriateness of the scale used in the investigation. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding may be exemplified by one of the following sample responses:

1. A response that identifies the scales as being appropriate, including any two of the following as supportive reasoning:
   - Data for both volcanoes include depth values at times when eruptions occurred on Mt. St. Helens.
   - Both graphs have data for 2001–2012 year spans.
2. A response that identifies the scales as being inappropriate, including any two of the following as supportive reasoning:
   - Data for only Mt. St. Helens include the time from 1980 to 2000, while Mt. Rainier data ranges from 2001–2012.
   - Graph 2 includes a greater depth and includes data for a major eruption.
   - No eruption occurred in the range of years shown in Graph 1.

Scoring note: Other responses supporting or not supporting appropriateness are acceptable if supported by valid reasoning.

Score Point 2

❶ One reason the scales are not appropriate are that Graph 2 spans a much longer period of time, providing a fuller history, than Graph 1. This makes comparing the data sets inaccurate. Another reason the scales are not appropriate is that Graph 2's depth scale ranges from 0-15 km while Graph 1 is only 0-12, so they are not comparable.

The response demonstrates a general understanding of how to provide reasoning for the appropriateness of the scale used in the investigation. The response identifies two reasons the scales used for the data in Graphs 1 and 2 are not appropriate for Julia's prediction and explains that the data would be more comparable if the ranges were the same.

Score Point 1

❶ I do not think they're appropriate because they're 2 different time periods, well not different but longer time spans 2001-2012 vs. 1980-2012. Also, for Mt. Rainer they seem to be pretty scattered out with not eruptions

The response demonstrates a limited understanding of how to provide reasoning for the appropriateness of the scale used in the investigation. The response identifies that the different time periods make the scales inappropriate, but it is unclear why the second reason makes the scales inappropriate.

Score Point 0

❶

Depth doesn't really matter it should be a scale of how intense the earthquake was the numbers are backwards and more than one earthquake could occur in a year.

The response is incorrect or irrelevant to the skill or concept being measured. The response does not address the scales of the graphs.

Broad Area of Inquiry:	**Formulating Questions & Hypothesizing**
Inquiry Construct 2:	Construct coherent argument in support of a question, hypothesis, prediction.

2 Identify how the evidence from Graphs 1 and 2 supports Patrick's claim that no violent eruption will occur this year on Mt. Rainier. Explain your answer.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of how to construct a coherent argument by identifying evidence that either supports or does not support a prediction. The response explains how the claim that no violent eruption will occur this year on Mt. Rainier is supported by the evidence from Graphs 1 and 2.
1	The response demonstrates a limited understanding of how to construct a coherent argument by identifying evidence that either supports or does not support a prediction. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding may be exemplified by the following sample response:

The claim is supported by the seismic data.

Supporting evidence may include

- Seismic data for Mt. Rainier do not indicate a pattern similar to that of the 1980 Mt. St. Helens eruption (when there was a greater number of deeper earthquakes clustered in a very short timeframe).
- Violent eruptions are not necessarily indicated by frequent earthquakes.
- No recent earthquakes under Mt. Rainier occurred at a depth that would indicate an eruption based on the 1980 Mt. St. Helens data.
- Both volcanoes show no eruptions over a great majority of the time observed, suggesting eruptions are rare events and therefore unlikely during any given year.

Score Point 2

❷ I agree with Patrick because there are no eruptions recorded for Mt. Rainier and the only activity that may be concerning was 2007 when the depth was 12km. In the past year the siesmic activity has been less than 9km which compared to Mt. St. Helens 1980 eruption of 15km is not a big threat.

The response demonstrates a general understanding of how to construct a coherent argument by identifying evidence that supports a prediction. The response uses evidence from both graphs to explain why there is not a strong threat of an eruption this year on Mt. Rainier.

Score Point 1

❷ 1) The earthquakes are not very deep in the span from recent years until now so it shows it would be unlikly to be dangerous. graph 1.

The response demonstrates a limited understanding of how to construct a coherent argument by identifying evidence that supports a prediction. The response uses evidence from Graph 1 to explain why there is not a strong threat of an eruption this year on Mt. Rainier but does not connect the evidence with historical data from Mt. St. Helens.

Score Point 0

❷ I think Patrick is right. According to the first graph, the bad eruptions, a 9^{+}, happen every 4½ - 5 yrs. The last eruption that we know of happened in late 2008. As of right know, the graph only goes to 2012, and we don't know what year the went there.

The response is incorrect or irrelevant to the skill or concept being measured. The response misinterprets the graphs, confusing earthquakes with eruptions.

Broad Area of Inquiry:	**Developing and Evaluating Explanations**
Inquiry Construct 13:	Communicate how scientific knowledge applies to explain results, propose further investigations, or construct and analyze alternative explanations.

❸ Identify which of the Cascade Range volcanic data would **best** support a prediction about the possible impact of a violent Mt. Rainier eruption to the area. Explain how the data would help make a prediction.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of communicating how scientific knowledge applies to propose further investigations. The response identifies which Cascade Range volcanic data would best support a prediction about the possible impact of a violent Mt. Rainier eruption to the area and explains how the data would help to make a prediction.
1	The response demonstrates a limited understanding of communicating how scientific knowledge applies to propose further investigations. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding may be exemplified by one of the following sample responses:

- The approximate amounts of volcanic material added to and removed from the mountains by eruptions would provide evidence for how much Mt. Rainier and the surrounding area might change. These amounts would show if being on or near the volcano would present a threat.
- The extent of the area covered by materials deposited from the eruptions would show how distance from the volcano would impact effects from falling ash and debris.

(The times of eruptions do not support a prediction about impacts of an eruption.)

Score Point 2

❸ The data relating to the approximate amounts of volcanic material added to and removed from the mountains would best support a prediction about the impact of a violent eruption because the amount of volcanic material being spread into the environment could be very harming to the area. Also, the volcanoes in the region most likely would have a very similar amount of volcanic material, making the prediction a more accurate one.

The response demonstrates a general understanding of communicating how scientific knowledge applies to propose further investigations. The response identifies the approximate amounts of volcanic material added to and removed from the mountains as the Cascade Range volcanic data that would best support a prediction about the possible impact of a violent Mt. Rainier eruption to the area. The response explains that other volcanoes in the area could be similarly affected by an eruption.

Score Point 1

❸ The extent of the area covered by materials deposited from the eruptions. This would show impact, which is what Patrick and Julia are looking for.

The response demonstrates a limited understanding of communicating how scientific knowledge applies to propose further investigations. The response identifies the approximate amounts of volcanic material added to and removed from the mountains as the Cascade Range volcanic data that would best support a prediction about the possible impact of a violent Mt. Rainier eruption, but the explanation provided is insufficient for full credit.

Score Point 0

❸ The data could predict the time the earthquakes were happening and how much eruption the volcanos did.

The response is insufficient to demonstrate understanding. There is no clear data identified as being the best support for a prediction about the possible impact of a violent eruption.

Broad Area of Inquiry:	**Formulating Questions & Hypothesizing**
Inquiry Construct 1:	Analyze information from observations, research, or experimental data for the purpose of formulating a question, hypothesis, or prediction.

4 Suppose a violent volcanic eruption happened on Mt. Rainier. Based on the data in Map 1, identify the level of risk (high, moderate, or low) from lahars and pyroclastic flows in **two** of the following towns in Washington:

- Eatonville
- Puyallup
- Paradise

For each of the two locations you chose, use the data from Map 1 to justify the levels of risk you identified for **each** hazard.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of how to analyze information from research for the purpose of formulating a prediction. The response identifies the level of risk (high, moderate, or low) from lahars and pyroclastic flows (from an assumed future violent eruption of Mt. Rainier) in two of these towns in Washington: • Eatonville • Puyallup • Paradise For each of the chosen locations, the response uses the map data to justify the levels of risk identified for each hazard.
1	The response demonstrates a limited understanding of how to analyze information from research for the purpose of formulating a prediction. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding may be exemplified by any two towns' information below.

Scoring note: Response need not be presented in a graphic organizer format. Acceptable risk levels are indicated.

Mt. Rainier Eruption Risks for Three Washington Towns

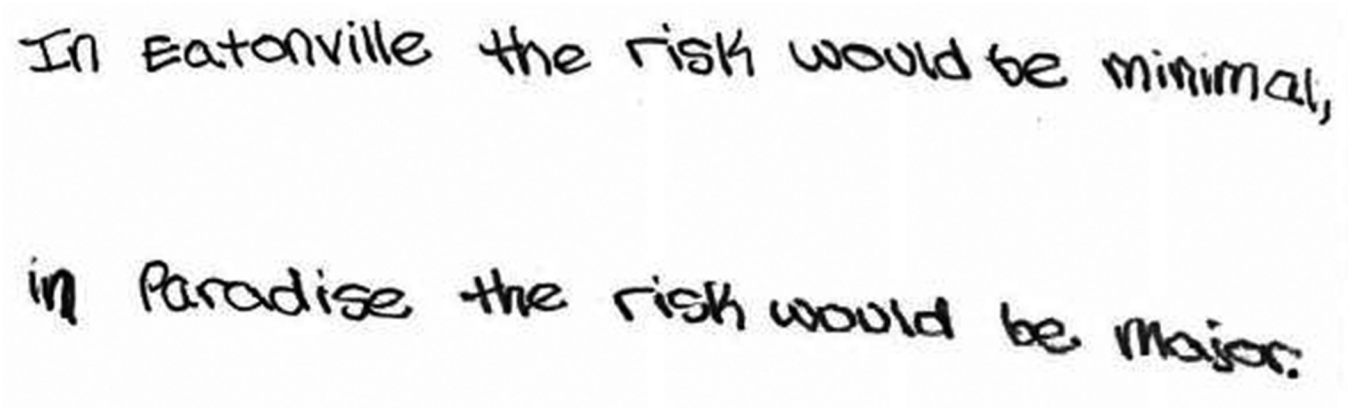
Town	Pyroclastic Flow Risk Level	Data Support	Lahar Risk Level	Data Support
Eatonville	Low	Far from volcano; no history of pyroclastic flows	Low	Not in a drainage downstream of Mt. Rainier; no history of lahars
Puyallup	Low	Far from volcano; no history of pyroclastic flows	Low or moderate	Far downstream from volcano; history of lahars nearby
Paradise	High	Close to volcanic peak; in pyroclastic flow zone	Moderate or high	Near the paths of past lahars

Score Point 2

4 Based on the data in map 2, the level of risk in the town of paradise would be high in the scenario of mt. ~~rain~~ rainier erupting due to it's close proximity to the volcano. The level of risk in Eatonville would be low since the town isn't located in a lahar zone or in a pyroclastic flow zone.

The response demonstrates a general understanding of how to analyze information from research for the purpose of formulating a prediction. The response identifies the town of Paradise as having a high risk of hazards due to its close proximity to the volcano. The response also identifies the town of Eatonville as having a low risk, explaining that it is not located in a lahar or a pyroclastic flow zone.

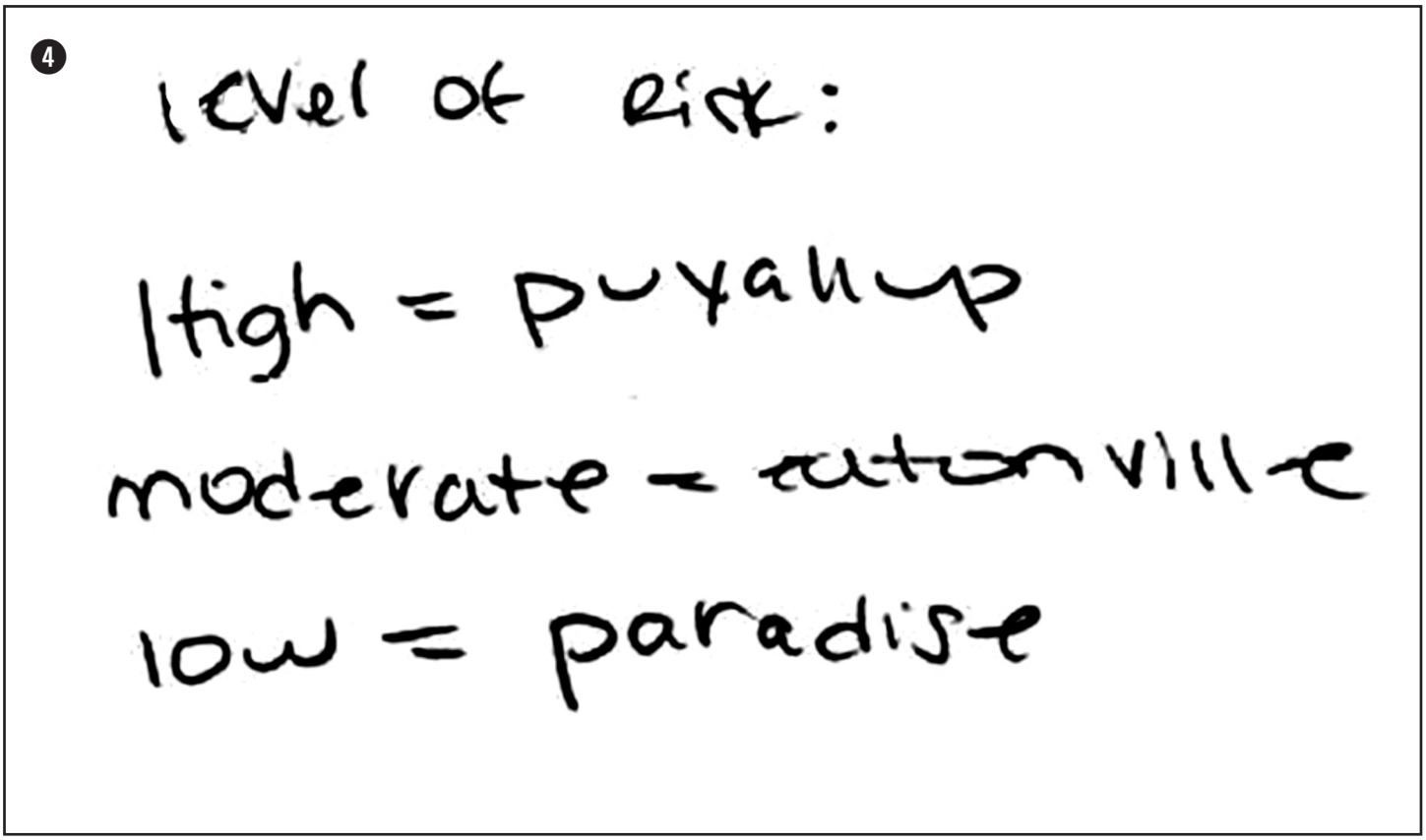
Score Point 1

❹ 

The response demonstrates a limited understanding of how to analyze information from research for the purpose of formulating a prediction. The response accurately identifies the town of Paradise as having a high risk of hazards and Eatonville as having a low risk but does not provide justification for either risk level.

SCORE POINT 0

❹



The response is irrelevant to the skill or concept being measured. The response incorrectly ranks the risk levels for the three cities.

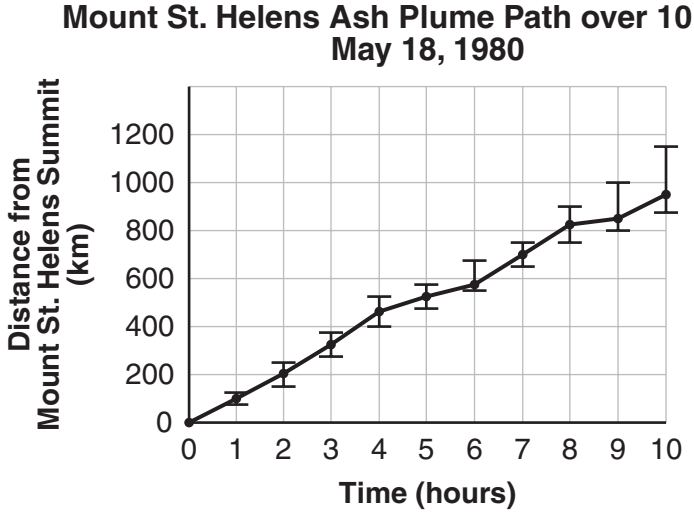
Broad Area of Inquiry:	**Conducting Investigations**
Inquiry Construct 8:	Use accepted methods for organizing, representing, and manipulating data.

5 Create a line graph of the maximum distance the plume travelled from Mt. St. Helens each hour based on data from Map 2. Be sure to include all the required elements of a graph.

Scoring Guide

Score	Description
3	The response demonstrates a thorough understanding of how to use accepted methods for organizing, representing, and manipulating data. The response includes a line graph of the data with an appropriate title, labeled axes, and a consistent scale for the range of data plotted. The overall response is thorough.
2	The response demonstrates a general understanding of how to use accepted methods for organizing, representing, and manipulating data. The overall response is general.
1	The response demonstrates a limited understanding of how to use accepted methods for organizing, representing, and manipulating data. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A thorough understanding may be exemplified by the following sample response:

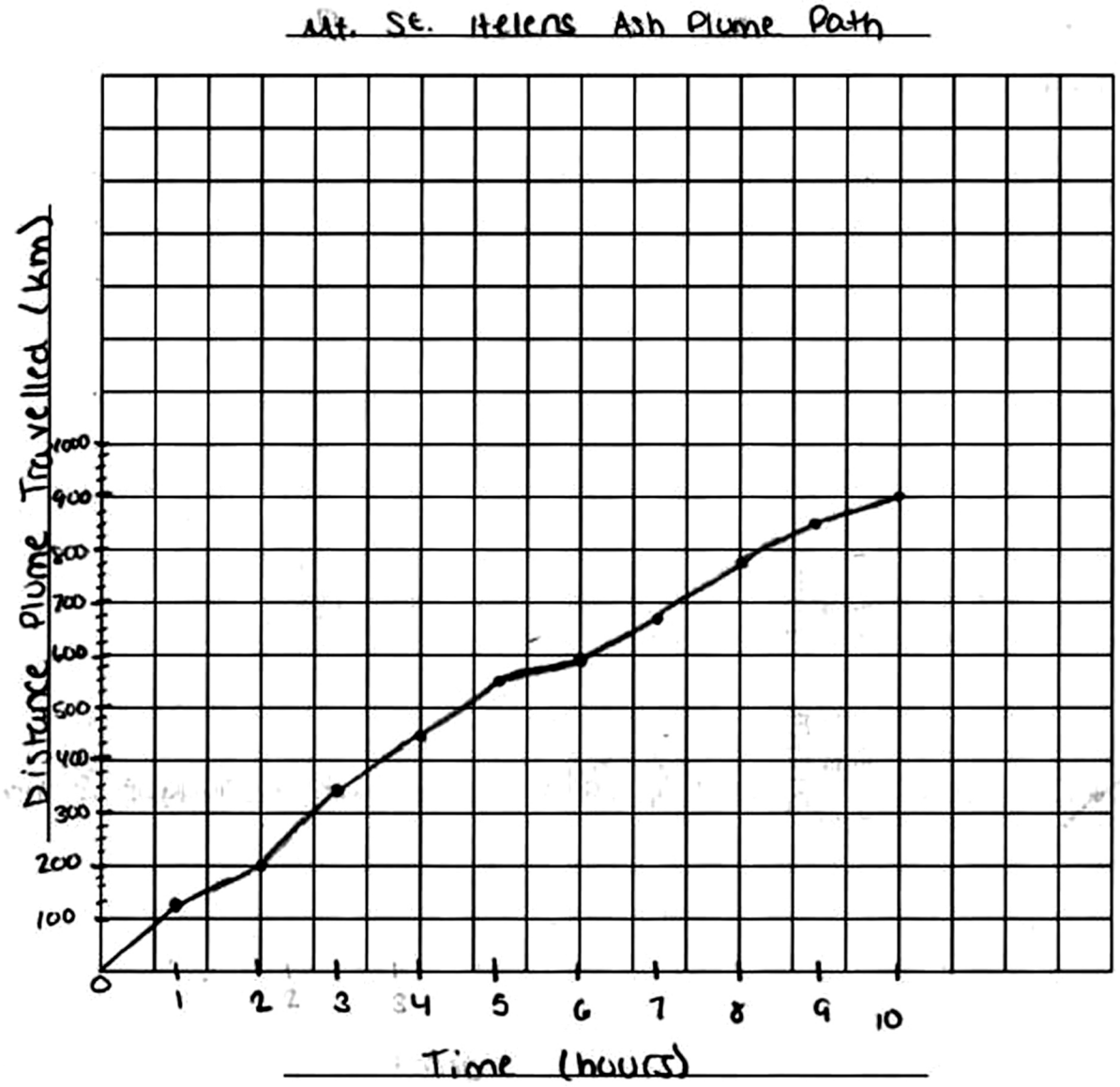


Scoring note: Error tolerance for data points is given in column 3 of the following reference data table. Data points for reference:

Time (hours)	Distance from Summit (km)	Data Point Acceptable Range (km)
1	100	75–125
2	200	150–250
3	325	275–375
4	450 or 475	400–525
5	525	475–575
6	575	550–675
7	700	650–750
8	825	750–900
9	850	800–1000
10	950	875–1150

Score Point 3

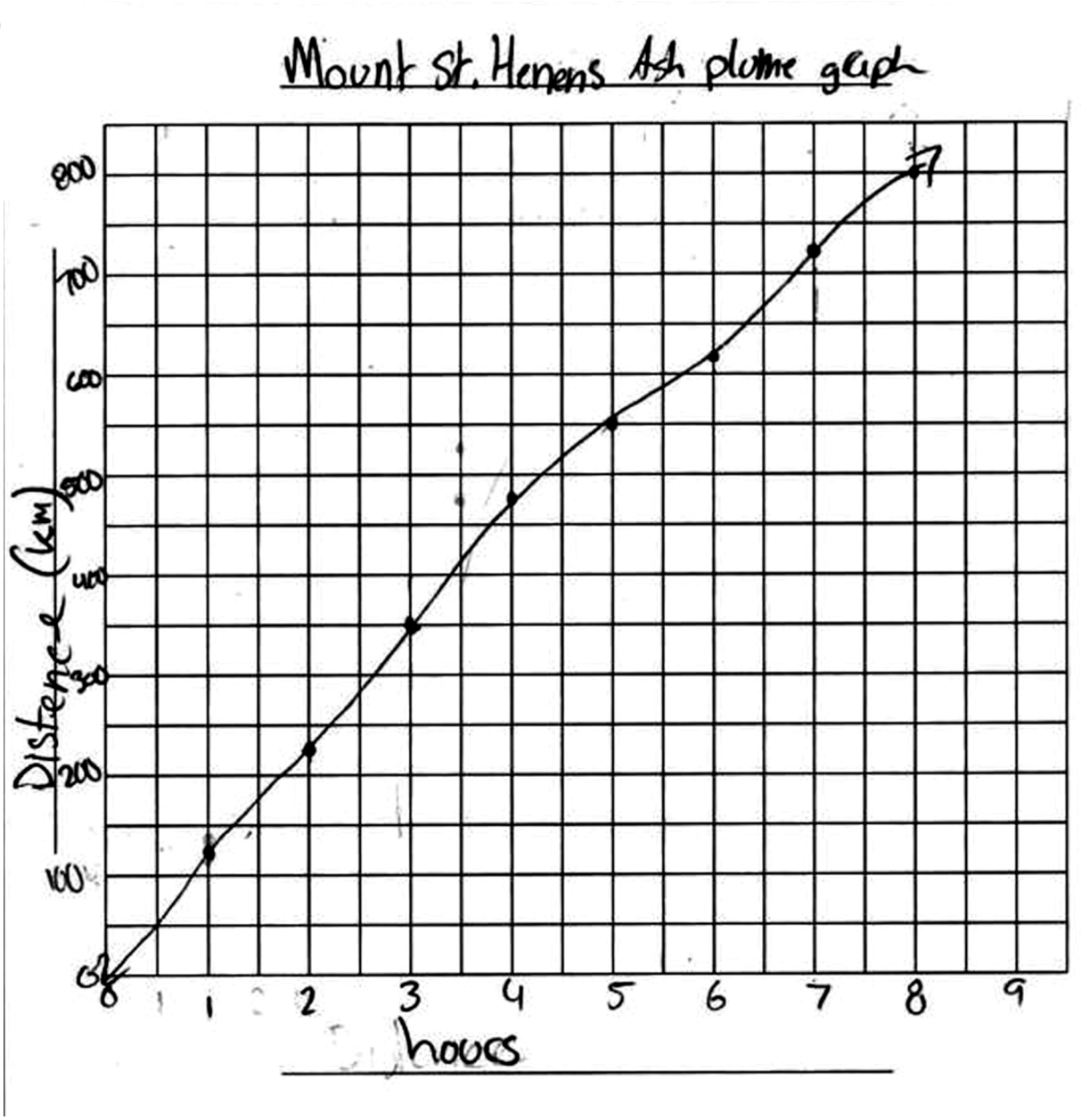
❺



The response demonstrates a thorough understanding of how to use accepted methods for organizing, representing, and manipulating data. The response includes a line graph of the data with an appropriate title, labeled axes with units, correctly plotted data points, and a consistent scale for the range of data plotted. The overall response is thorough.

Score Point 2

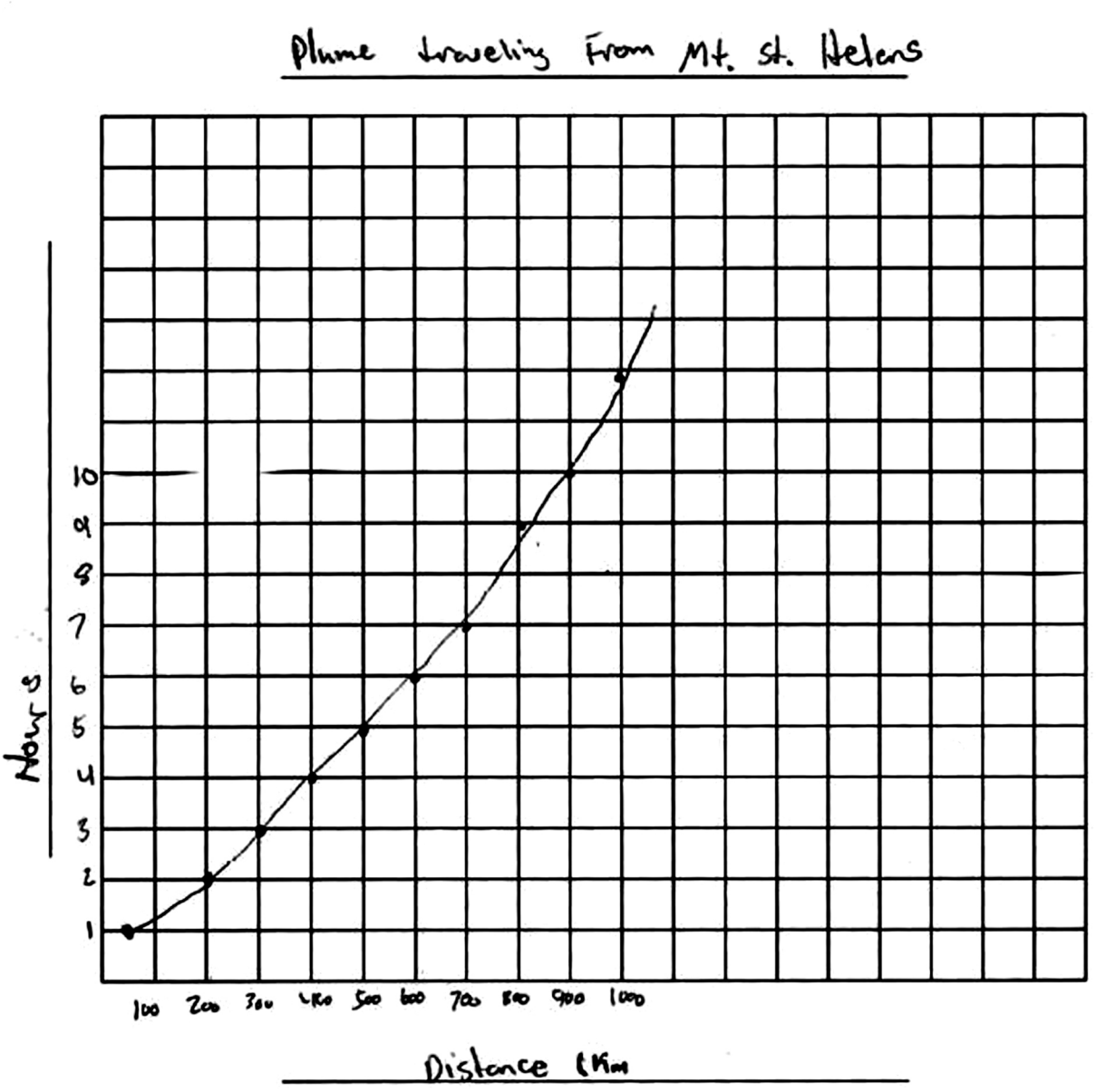
❺



The response demonstrates a general understanding of how to use accepted methods for organizing, representing, and manipulating data. The response includes a line graph of the data with an appropriate title, labeled axes with units, correctly plotted data points, and a consistent scale for the range of data plotted. The scaling is slightly inappropriate, leading to an omission of the hour 10 data point. The *x*-axis label provides only units ("hours") instead of a label ("Time") with "(hours)" as the unit.

Score Point 1

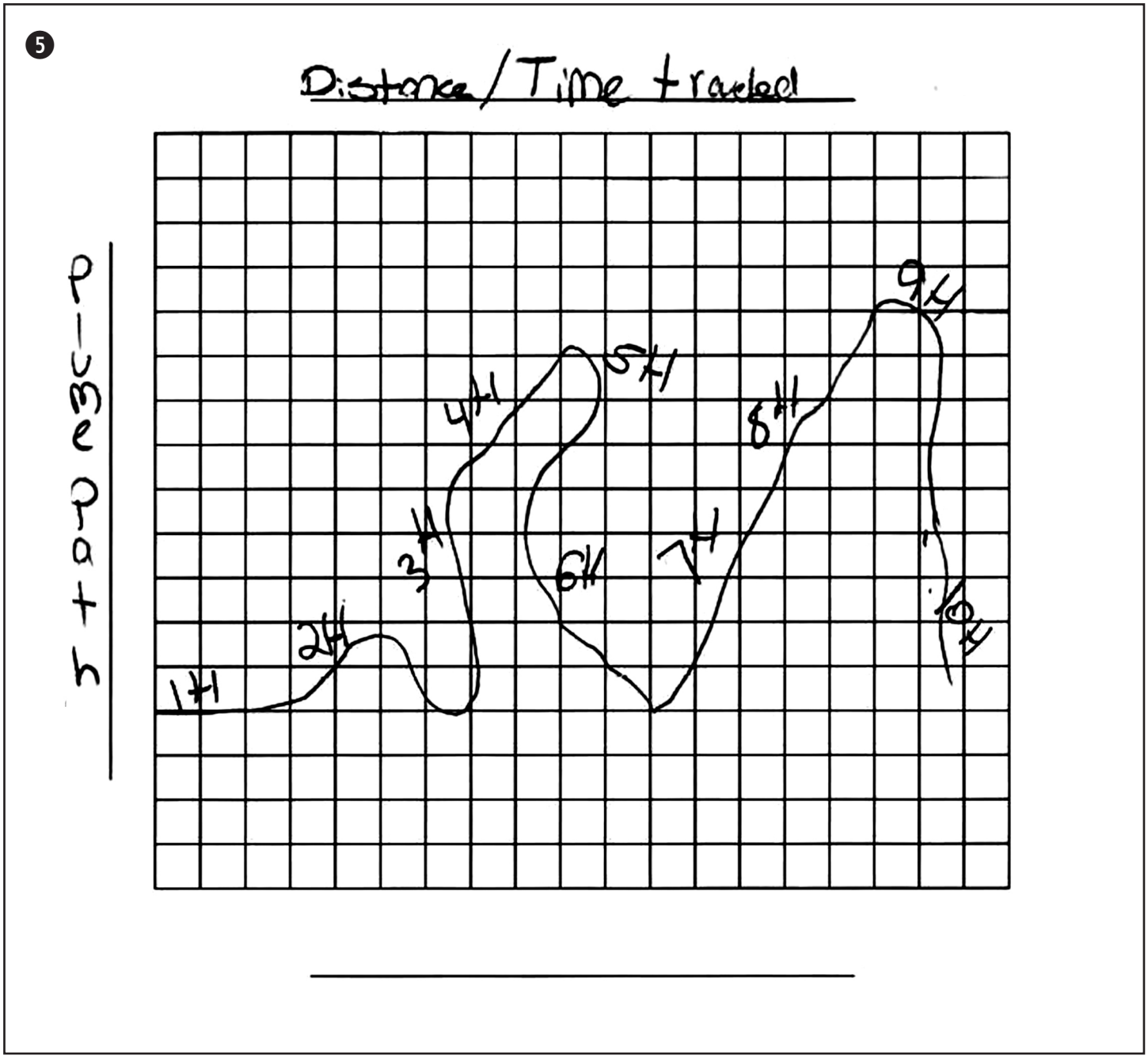
❺



The response demonstrates a limited understanding of how to use accepted methods for organizing, representing, and manipulating data. There is a correct "Distance" label with units, correct units labeled in hours on the other axis, a title, appropriate scaling, and some correctly plotted points. However, the axes are reversed, and there is a missing data point at hour 8, which leads to some incorrect values and an extraneous point graphed at hour 12.

SCORE POINT 0

❺



The response is totally incorrect or irrelevant to the skill or concept being measured. There is no demonstration of understanding of constructing a line graph.

Broad Area of Inquiry:	**Planning and Critiquing of Investigations**
Inquiry Construct 5:	Develop an organized and logical approach to investigating the question, including controlling variables.

6 Identify the independent and dependent variables of the investigation that produced the data shown on Map 2 and your graph. Based on the map data, explain the relationship between these two variables.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of how to develop an organized and logical approach to investigating the question, including controlling variables. The response identifies the independent and dependent variables of the investigation that produced the data and explains the relationship between these two variables based on the map data.
1	The response demonstrates a limited understanding of how to develop an organized and logical approach to investigating the question, including controlling variables. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding may be exemplified by the following sample response:

Independent variable = time in minutes or hours

Dependent variable = distance from volcano/eruption in km

As time increased, the distance of the ash plume from the volcano increased (direct or positively dependent relationship).

Score Point 2

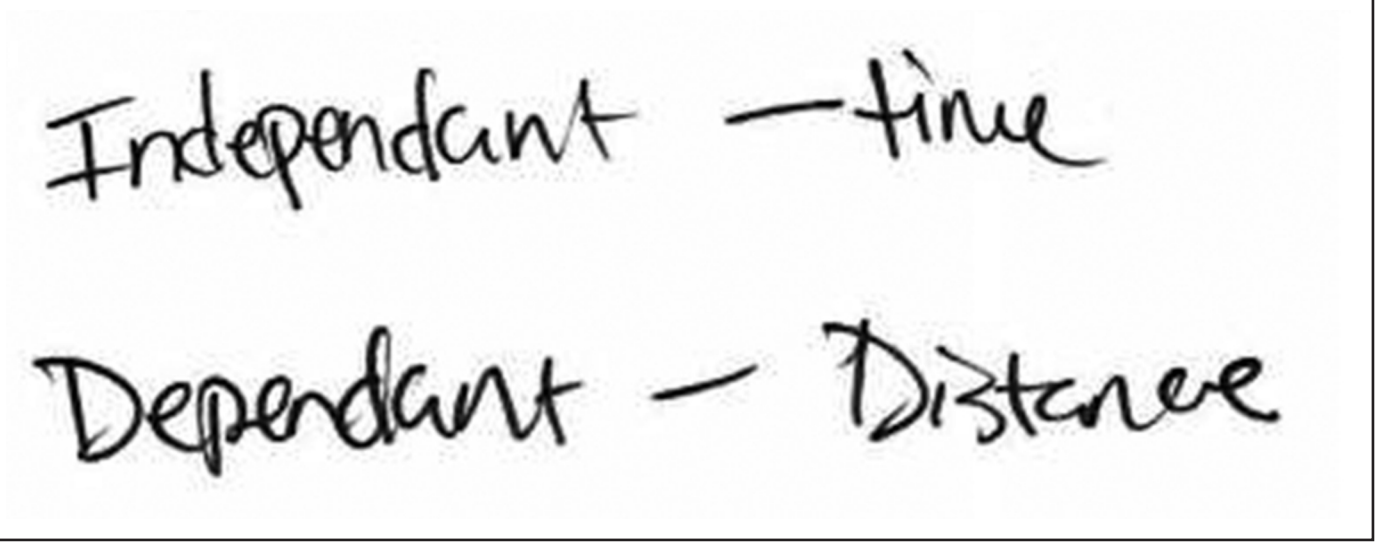
6

Time and distance. Time = independent,
Distance = dependent.
As time passed the plume travelled a longer distance.

The response demonstrates a general understanding of how to develop an organized and logical approach to investigating the question, including controlling variables. The response identifies the independent variable as time and the dependent variable as distance, and correctly explains the relationship between these two variables based on the map data.

Score Point 1

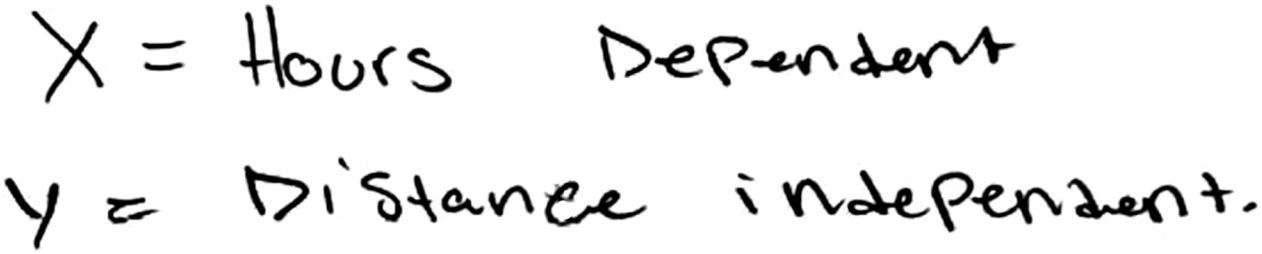
6



The response demonstrates a limited understanding of how to develop an organized and logical approach to investigating the question, including controlling variables. The response identifies the independent variable as time and the dependent variable as distance but does not explain the relationship between these two variables.

Score Point 0

6



The response is incorrect or irrelevant to the skill or concept being measured. The response incorrectly identifies the independent and dependent variables.

Broad Area of Inquiry:	**Developing and Evaluating Explanations**
Inquiry Construct 4:	Analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous.

❼ Based on the weather data in Table 1, identify **two** possible environmental variables that may have affected the data shown in Maps 2 and 3. Describe how each variable may have affected the observations shown on Maps 2 and 3.

Scoring Guide

Score	Description
2	The response demonstrates a general understanding of how to analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous. The response identifies two possible environmental variables that may have affected the data shown in Maps 2 and 3 based on the weather data in Table 1 and describes how each variable may have affected the observations the scientists made.
1	The response demonstrates a limited understanding of how to analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A general understanding may be exemplified by the following sample response:

Two possible environmental variables are wind speed and wind direction.

- Wind speed would affect the rate of travel and total distance traveled by the ash plume.
- Wind direction would affect the plume's travel direction and the area covered by the plume.

Scoring note: Environmental variables not listed in the table may be credited for a limited understanding with reasonable supporting descriptions of their impact upon the data (such as rainfall causing the plume to not travel as far because the rain would carry ash to the ground). Also, descriptions of how wind speed and direction affected the data can be more specific in a general understanding response, as long as a logical explanation of the impact on the data is given.

Score Point 2

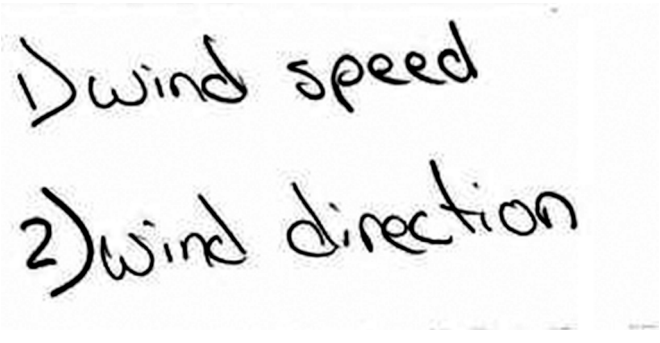
❼

The wind Speed and the wind direction would have helped to spred the ash. The wind speed would push the ash out away from the volcano at a greater Speed, causing it to go further. The wind direction shows where the ash will pass by and effect.

The response demonstrates a general understanding of how to analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous. The response identifies the wind speed and wind direction as two possible environmental variables that may have affected the data shown in Maps 2 and 3, and describes how each variable may have affected the observations the scientists made by spreading the ash at different speeds in different directions.

Score Point 1

❼



The response demonstrates a limited understanding of how to analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous. The response identifies the wind speed and wind direction as two possible environmental variables that may have affected the data shown in Maps 2 and 3 but does not describe how either variable may have affected the observations the scientists made.

Score Point 0

❼ The temperature was rising and the humidity dropped significantly.

The response is incorrect or irrelevant to the skill or concept being measured. The response identifies two factors that are not accepted for credit in the absence of justification.

Broad Area of Inquiry:	**Developing and Evaluating Explanations**
Inquiry Construct 12:	Use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis.

8 Based on all the data Julia and Patrick gathered, make a conclusion about the risk to Patrick and Julia in Puyallup if Mt. Rainier erupts. Identify the possible hazards when a violent eruption does happen. Explain how the data support your conclusion.

Scoring Guide

Score	Description
3	The response demonstrates a thorough understanding of how to use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The response provides a conclusion about the risk to Patrick and Julia in Puyallup if Mt. Rainier erupts, identifies the possible hazards when a violent eruption does happen, and explains how the data support the conclusion. The overall response is thorough.
2	The response demonstrates a general understanding of how to use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The overall response is general.
1	The response demonstrates a limited understanding of how to use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
Blank	No response

A thorough understanding may be exemplified by the following sample response:

Conclusion: The risk to Patrick and Julia in Puyallup is low. When Mt. Rainier does erupt violently, the possible hazards are pyroclastic flows, lahars, and ash deposits.

Support from the data may include any of the following:

- Seismic data for Mt. Rainier/Mt. St. Helens do not support an imminent eruption.
- Historic lahar and pyroclastic flow data for Mt. Rainier support these as hazards of an eruption.
- Ash plume/ash deposit data support a hazard of ash deposits over 13 cm in Puyallup.
- Ash plume/ash deposit/weather data support that the hazard/risk to Puyallup is difficult to determine because weather has a significant influence on the area affected by ash deposits.

Scoring note: A conclusion that all hazards of eruption are low because the risk of eruption is low is acceptable only as a limited understanding response and only with a reasonable description of the data support for the low risk of an eruption.

SCORE POINT 3

8 Based on all the data, Patrick and Julia will be at a low risk in Puyallup if Mt. Rainier erupts. They might experience some ash deposits, but overall they are at a low risk. In Map 1, the lahars and pyrodastic flows come near but don't hit Puyallup. They will be safe from these. In Map 3, a great amount of Washington is covered in ash deposits but the majority are only 1cm to 5cm. Overall Patrick and Julia are safe in Puyallup.

The response demonstrates a thorough understanding of how to use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The response provides a conclusion that the risk is low to Patrick and Julia in Puyallup if Mt. Rainier erupts, and explains that Puyallup is not located in a lahar or pyroclastic flow zone. The response explains that some ash may reach Patrick and Julia, but overall they should be safe.

SCORE POINT 2

8 If It was to europt then puyallup is near a River that could Potentially put then at Risk for LAHAr damage,. still plume could Reach but they should be okay, Puyallup looks safe From Pyroclastic flow.

The response demonstrates a general understanding of how to use evidence to support and justify interpretations and conclusions. The response broadly addresses the three hazards and their contributions to the risk level, but the explanation is not supported with specific data from the investigation. The explanation, while mostly correct, is in general terms.

Score Point 1

❽ If Mt rainer does errupt then Puyallup May be in trouble by Lahar. But this is not likely due to wind speed and direction. However people will have time to leave because of how far if is away.

The response demonstrates a limited understanding of how to use evidence to support and justify interpretations and conclusions. The response identifies lahar as a possible risk factor, but links lahars to wind conditions and does not discuss pyroclastic flows or ash plumes. In addition, no specific risk level is ever identified for Patrick and Julia.

Score Point 0

8 The risk could be pretty big if they've in the wrong area at the wrong time.

The response is insufficient to demonstrate understanding. No specific risk factors are identified or discussed.