AmplifyScience



Geology on Mars

Investigation Notebook



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Safety Guidelines for Science Investigations

- 1. **Follow instructions.** Listen carefully to your teacher's instructions. Ask questions if you don't know what to do.
- 2. **Don't taste things.** No tasting anything or putting it near your mouth unless your teacher says it is safe to do so.
- 3. **Smell substances like a chemist.** When you smell a substance, don't put your nose near it. Instead, gently move the air from above the substance to your nose. This is how chemists smell substances.
- 4. **Protect your eyes.** Wear safety goggles if something wet could splash into your eyes, if powder or dust might get in your eyes, or if something sharp could fly into your eyes.
- 5. **Protect your hands.** Wear gloves if you are working with materials or chemicals that could irritate your skin.
- 6. **Keep your hands away from your face.** Do not touch your face, mouth, ears, eyes, or nose while working with chemicals, plants, or animals.
- 7. **Tell your teacher if you have allergies.** This will keep you safe and comfortable during science class.
- 8. **Be calm and careful.** Move carefully and slowly around the classroom. Save your outdoor behavior for recess.
- 9. **Report all spills, accidents, and injuries to your teacher.** Tell your teacher if something spills, if there is an accident, or if someone gets injured.
- 10. Avoid anything that could cause a burn. Allow your teacher to work with hot water or hot equipment.
- 11. Wash your hands after class. Make sure to wash your hands thoroughly with soap and water after handling plants, animals, or science materials.

Date: ____

Geology on Mars Unit Overview

How can we search for evidence that other planets were once habitable? This is the question that you and your classmates will take on in your role as student planetary geologists. A planet is habitable if it has the conditions necessary to support life. Liquid water is one of those conditions; it is essential for life to exist. In your search, you will focus on our neighboring planet, Mars. You will examine a particular landform on the surface of Mars to investigate whether it was formed by flowing water or flowing lava. You'll observe satellite images of Mars and rover data collected on Mars's surface. You will also get evidence from models and compare Mars images to images of landforms formed by flowing water and flowing lava on Earth's surface.

Chapter 1: Comparing Earth and Rocky Planets Chapter Overview

Could life exist on Mars? One essential requirement for life is water. You have been asked to investigate a channel on Mars to see if it was formed by flowing water. You will begin by comparing landforms on Mars with landforms on Earth.



Lesson 1.1: Comparing Rocky Planets

Today you will take on the role of a student planetary geologist working for the Universal Space Agency. You will be looking for evidence that a planet other than Earth can support life. You will use the same data and practices that planetary geologists use to explore Earth, Mercury, Venus, and Mars, and you'll get to study each of these planets in detail. This will help you form your own ideas about where in our solar system future space missions might find evidence of life. Welcome to outer space!

Unit Question

• How can we search for evidence that other planets were once habitable?

Vocabulary

- habitable
- rocky planet
- system

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Comparing Rocky Planets

Working with a partner, use the Comparing Rocky Planets Cards to gather evidence about which planet is most similar to Earth.				
 Which sphere are you and your partner studying? (check one) atmosphere biosphere geosphere hydrosphere 				
2. Record your notes about your sphere for each planet.				
Mercury:				
Venus:				
Earth:				
Mars:				

Comparing Rocky Planets (continued)

3. Answer the following questions for your sphere, using evidence from the Comparing Rocky Planets Cards.

For the sphere you studied, which rocky planet is most similar to Earth?

Why?

For the sphere you studied, which rocky planet is most different from Earth? _____

Why?

Homework: Signs of Habitability on Mars

1. This unit focuses on Mars. List one or two ideas or questions you have about Mars.

2. Scientists are looking for signs that Mars could have been habitable in the past. Think of the things that a planet needs to be habitable. With these things in mind, what signs of habitability would you look for on Mars?

3. Why would you look for the signs of habitability that you listed above?

Homework: Reading "Scale in the Solar System"

Read and annotate the "Scale in the Solar System" article. Then, answer the questions below.

1. What is the biggest object in our solar system, and how many Earths could fit inside it?

2. Humans have been on the Moon, so why haven't humans visited any other planets in the solar system?

Active Reading Guidelines

- 1. Think carefully about what you read. Pay attention to your own understanding.
- 2. As you read, annotate the text to make a record of your thinking. Highlight challenging words and add notes to record questions and make connections to your own experience.
- 3. Examine all visual representations carefully. Consider how they go together with the text.
- 4. After you read, discuss what you have read with others to help you better understand the text.

Lesson 1.2: Observing the Surfaces of Mars and Earth

You have been asked to help search for evidence that Mars might have been habitable in the past. You'll begin by exploring an interactive map of Mars's surface that is based on 50 years of data from satellites, rovers, and landers. You will also study aerial images that show landforms formed by flowing water and flowing lava on Earth to help identify whether landforms on Mars might have been formed by the liquid water that is necessary for a place to be habitable.

Unit Question

• How can we search for evidence that other planets were once habitable?

Chapter 1 Question

• What geologic process could have formed the channel on Mars?

Key Concepts

• Earth, Mars, and other rocky planets can be thought of as systems. These systems are made up of interacting spheres that can include the geosphere, atmosphere, hydrosphere, and biosphere.

Vocabulary

- channel
- geologic process
- landform

Digital Tools

• Google Mars™

Warm-Up

In a moment, you will watch a video made by other students about the Earth system. A system is a set of interacting parts forming a complex whole.

What systems can you think of? List one or two examples of things that you think might be systems.

Observing the Surface of Earth

- 1. With your partner, closely examine each of the landforms on the Geologic Processes Cards.
- 2. In the middle column of the table below, describe the shape of the landforms formed by each geologic process.
- 3. In the last column, record any other interesting observations or questions you have about the landforms.

Word Bank

straight	wide	branching	triangular
curved	narrow	merging	square
gnarled	spread out	Іоору	circular

Geologic process	Describe the shape of the landforms formed by this geologic process.	Record other observations or questions about the landforms formed by this geologic process.
Flowing water		
Flowing lava		

Lesson 1.3: Investigating a Mystery Object on Mars

What is the mysterious object found on Mars? That is the question scientists tried to answer after an image from a rover on Mars showed a mysterious object that looked like a jelly donut. Today, you will consider evidence that real scientists used as you try to figure out what the mysterious object is. To help you with this, you will also learn about how scientists engage in argumentation to find convincing answers to science questions.

Unit Question

• How can we search for evidence that other planets were once habitable?

Chapter 1 Question

• What geologic process could have formed the channel on Mars?

Key Concepts

- Earth, Mars, and other rocky planets can be thought of as systems. These systems are made up of interacting spheres that can include the geosphere, atmosphere, hydrosphere, and biosphere.
- When landforms on different rocky planets look similar, it is evidence that they may have been formed by the same geologic process.

Vocabulary

• claim

landform

• system

- evidence
 reasoning
- geologic process
 rocky planet

Warm-Up

Read the story about Claire and the puddle, and then answer the questions that follow.

Claire is a middle school student. On her way to school one day, she saw a puddle in the road. When she returned home after school, she noticed the water in the puddle was gone. What happened to the water in the puddle?

1. What ideas do you have about what happened to the puddle?

2. What information would you need to collect in order to be more confident about what happened to the puddle?

Jelly Donut Evidence Card Sort

- 1. Sit next to your partner. Place the question and two claims at the top of the desk between you, as shown below.
- 2. Read the information on each evidence card.
- 3. Discuss each piece of evidence with your partner.
- 4. Place the evidence under the claim you think it supports.

Question

What is this object that the *Opportunity* rover photographed on the surface of Mars?

Claim 2

Claim 1

The object is a rock that was moved to that spot.

The object is fungus that grew in that spot.

Evidence

Evidence

Evidence

Evidence

Evidence	



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Homework: Reflecting on How Planetary Geologists Get Evidence

In your role as a student planetary geologist, you have been helping the Universal Space Agency figure out what geologic process formed the channel on Mars. Answer the questions below and refer to the image of the channel on Mars on page 17.



1. Above are two images of landforms on Earth. Select one of the images above that you think is evidence that can support an answer to the question *What geologic process could have formed the channel on Mars?* What do you think the answer to this question is, and how does the image you selected support that answer to this question?

2. Based on what you know now, do you think the channel on Mars was formed by flowing water or flowing lava? (check one)

flowing water

] flowing lava



Homework: Reflecting on How Planetary Geologists Get Evidence (continued)

Channel on Mars



Chapter 2: Using Models as Evidence Chapter Overview

How can you study a planet that is too far away for you to directly observe? In this chapter, you will learn about models and how scientists use them to gather evidence about things that are otherwise difficult to study.



Lesson 2.1: "Investigating Landforms on Venus"

How do scientists gather evidence about things they cannot directly observe, such as planets that are far away? Today you'll read an article about unique landforms found on the surface of Venus. You'll find out how scientist Taras Gerya used a computer model to figure out what geologic process on Venus formed those landforms. You will practice reading like a scientist: carefully and actively, making sure that you understand the text and images. You will record your questions and ideas as you read, and you'll have a chance to discuss your thoughts about the article with others.

Unit Question

• How can we search for evidence that other planets were once habitable?

Chapter 2 Question

• How can we gather more evidence about whether lava or water formed the channel on Mars?

Vocabulary

- geologic process
- landform
- model

Warm-Up



Claire made the diagram above to show how the puddle she saw on the way to school disappeared by the end of the day. She wanted to show her idea that heat from the sun caused the water to evaporate into the air. However, Claire's diagram is incomplete.

Think about what's missing. What would you add to the diagram to better show Claire's idea?

Introducing Active Reading



Discussion Questions

- What do you notice about this student's annotations?
- How do you know that she was thinking carefully while reading and trying to understand the article?

Reading "Investigating Landforms on Venus"

- 1. Read and annotate the article "Investigating Landforms on Venus."
- 2. Choose and mark annotations to discuss with your partner. Once you have discussed these annotations, mark them as discussed.
- 3. Now, choose and mark a question or connection, either one you already discussed or a different one you still want to discuss with the class.
- 4. Answer the reflection question below.

Rate how successful you were at using Active Reading skills by responding to the following statement:

As I read, I paid attention to my own understanding and recorded my thoughts and questions.

Never		

Almost never

□ Sometimes

Frequently/often

All the time

Active Reading Guidelines

- 1. Think carefully about what you read. Pay attention to your own understanding.
- 2. As you read, annotate the text to make a record of your thinking. Highlight challenging words and add notes to record questions and make connections to your own experience.
- 3. Examine all visual representations carefully. Consider how they go together with the text.
- 4. After you read, discuss what you have read with others to help you better understand the text.

Homework: Recording Initial Ideas About the Chapter 2 Question

Chapter 2 Question: How can we gather more evidence about whether lava or water formed the channel on Mars?

One challenge in studying the channel on Mars is that Mars is too far away for scientists to directly observe what happens there.

Based on what you learned about Gerya in the article you read today, how can scientists study Mars if they can't directly observe what is happening there?

Lesson 2.2: Modeling a Geologic Process

In the previous lesson, you read about a computer model of Venus. Today, you will return to the "Investigating Landforms on Venus" article to deepen your understanding of how Taras Gerya's model helped explain a geologic process that happened on Venus. You will then use a physical model to gather evidence about what formed the channel on Mars.

Unit Question

• How can we search for evidence that other planets were once habitable?

Chapter 2 Question

• How can we gather more evidence about whether lava or water formed the channel on Mars?

Vocabulary

- evidence
- geologic process
- landform
- model

Warm-Up



- 1. Which question would a scientist be most likely to use a model to answer? (check one)
 - How was this lake formed?
 - ☐ What is the temperature of this lake?
 - What is a rock at the bottom of this lake made of?
- 2. Why might a scientist use a model to answer the question you selected?

Second Read of "Investigating Landforms on Venus"

Gerya and his team wanted to answer the question *What formed the novae on Venus*? Their idea was that the higher surface temperature and thinner crust of Venus caused the novae to form.

- Reread the final three paragraphs of the "Investigating Landforms on Venus" article.
- Then, highlight or add annotations to parts of the text that relate to the questions next to the article.
- Using your annotations, answer the questions below.

How were the novae on Venus similar to the landforms in Gerya's computer model?

How did the results of Gerya's model provide evidence for what formed the novae on Venus?

Stream Table Observations: Do Landforms Remain?

Stream Table Observations

1. During the Flowing Water Model demonstration, observe the stream table while water is flowing through it. What do you notice? Record your observations on the lines below. You can use the Word Bank to help you describe what you see.

Word Bank

straight	wide	branching	triangular
curved	narrow	merging	square
gnarled	spread out	Іоору	circular

Stream Table Observations: Do Landforms Remain? (continued)

Landform Observations

2. In the stream table diagram below, draw what you see in the stream table once the water has stopped flowing through it. Make sure to draw any landforms that the flowing water formed. Remember, you are looking at the stream table from above (bird's-eye view).



Stream Table After Water Has Stopped Flowing

3. Record your observations about the landform(s) that the flowing water formed.

Name: ___

Homework: Reflecting on the Flowing Water Model

In this lesson, you used a scientific model to learn more about the geologic process of flowing water.

1. How was the Flowing Water Model similar to flowing water on Earth?

2. How was the Flowing Water Model different than flowing water on Earth?

3. How would you change the Flowing Water Model to make it more like the actual geologic process on Earth?

Lesson 2.3: Gathering Additional Evidence from Models

Today you will get to test some of your ideas about how flowing water forms a channel by setting up the Flowing Water Model to specifically test an idea your class comes up with! You'll then watch a video of a Flowing Lava Model. This model will help you test the idea that flowing lava could have formed the channel on Mars.

Unit Question

• How can we search for evidence that other planets were once habitable?

Chapter 2 Question

• How can we gather more evidence about whether lava or water formed the channel on Mars?

Key Concepts

- Scientists can use models to test their ideas and get evidence about processes in the natural world that are difficult to observe.
- Landforms can provide evidence about the past because they remain after the geologic processes that formed them stop happening.
- Models represent the natural processes being investigated in important ways, but they are not exactly the same.

Vocabulary

- claim
 landform
- evidence
 model
- geologic process
 system

Warm-Up

Marta observed a flowing stream in a sandy area. She developed a claim that water flowing over sand will create a curved and winding channel.

1. How can she test this idea in the Flowing Water Model?

2. What should happen in the Flowing Water Model for her claim to be supported?

Stream Table Observations: Testing an Idea

1. The scientific idea we are testing is _____

2. Describe how the two stream tables are set up in order to test this idea.

3. During the Flowing Water Model demonstration, observe *one* stream table while water is flowing through it. What do you notice? Record your observations on the lines below. You can use the Word Bank to help you describe what you see.

Word Bank

straight	wide	branching	triangular
curved	narrow	merging	square
gnarled	spread out	Іоору	circular

Stream Table Observations: Testing an Idea (continued)

Landform Observations

4. In the stream table diagram below, draw what you see in *the same* stream table you observed once the water has stopped flowing through it. Make sure to draw any landforms that the flowing water formed. Remember, you are looking at the stream table from above (bird's-eye view).



Stream Table After Water Has Stopped Flowing

5. Record your observations about the landform(s) that the flowing water formed.

6. Did the Flowing Water Model support the idea we tested?

The scientific idea we tested is (**supported** / **not supported**) based on the Flowing Water Model. I think this because . . .

Observing a Flowing Lava Model

1. Record your observations about the landforms that remain after the wax has stopped flowing.

2. Based on your observations, do you think lava could have formed the channel on Mars? Why or why not?

Homework: Thinking About Modeling Flowing Lava

In this lesson, you observed a scientific model to learn more about the geologic process of flowing lava. Think about how the Flowing Lava Model was similar to and different than real flowing lava and the landforms it forms on Earth.

1. How was the Flowing Lava Model similar to flowing lava on Earth?

2. How was the Flowing Lava Model different than flowing lava on Earth?

3. How would you change the Flowing Lava Model to make it more like the actual geologic process on Earth?

Chapter 3: Analyzing New Evidence Chapter Overview

You have received new evidence from NASA about the channel on Mars. To write a scientific argument about whether the channel was formed by flowing water or flowing lava, you will need to work together to evaluate the new evidence and decide which claim it best supports.



Lesson 3.1: Evaluating New Information from Mars

In this lesson, you'll continue your search for evidence that will help you decide what geologic process formed the channel on Mars and whether the channel is evidence that Mars once had the liquid water necessary for life. After you consider how convincing the evidence you have so far is, you will examine new evidence collected by NASA spacecraft orbiting Mars. How can the new evidence help you think about whether flowing lava or flowing water formed the channel on Mars?

Unit Question

• How can we search for evidence that other planets were once habitable?

Chapter 3 Question

• How can we decide which geologic process formed the channel on Mars?

Key Concepts

- When landforms on different rocky planets look similar, it is evidence that they may have been formed by the same geologic process.
- Scientists can use models to test their ideas and get evidence about processes in the natural world that are difficult to observe.
- Landforms can provide evidence about the past because they remain after the geologic processes that formed them stop happening.

Vocabulary

- claim landform
- evidence
 model
- geologic process
 reasoning

Warm-Up

Our Scientific Question

What geologic process could have formed the channel on Mars?

We have been thinking about two claims that are possible explanations for how the channel on Mars was formed. We have considered evidence from images, as well as from the Flowing Water Model and the Flowing Lava Model. As you answer the questions below, refer to the image of the channel on Mars on page 17.

1. Select the claim you think is best supported by the evidence you have seen so far. (check one)

Claim 1: Flowing water formed the channel on Mars.

- Claim 2: Flowing lava formed the channel on Mars.
- 2. Why do you think the claim you selected is best supported by the evidence?

New Information About the Channel on Mars

Comparing Triangle-Shaped Landforms on Mars and Earth

Channel on Mars

1. What did you learn about the channel on Mars from the new NASA data? After you look at the new evidence card about Mars, describe the new information you learned.

Channel on Earth Formed by Flowing Water

2. What did you learn from the background information about this type of channel? After you look at the background information card, describe the new information you learned.

Channel on Earth Formed by Flowing Lava

3. What did you learn from the background information about this type of channel? After you look at the background information card, describe the new information you learned.

New Information About the Channel on Mars (continued)

- 4. Which claim does the evidence about the triangle-shaped landform near the channel on Mars best support? (check one)
 - **Claim 1:** Flowing water formed the channel on Mars.
 - Claim 2: Flowing lava formed the channel on Mars.
 - both claims
- 5. Explain how the evidence supports the claim you selected.

Lesson 3.2: Evaluating Claims About the Channel on Mars

You have looked at evidence that was collected by satellites orbiting Mars, as well as evidence from scientific models and from images of Earth. Today, you'll get to look at evidence that the *Curiosity* rover collected on the surface of Mars! You will also investigate rock samples from Earth that may help you understand more about the channel on Mars.

Unit Question

• How can we search for evidence that other planets were once habitable?

Chapter 3 Question

• How can we decide which geologic process formed the channel on Mars?

Key Concepts

- When landforms on different rocky planets look similar, it is evidence that they may have been formed by the same geologic process.
- Scientists can use models to test their ideas and get evidence about processes in the natural world that are difficult to observe.
- Landforms can provide evidence about the past because they remain after the geologic processes that formed them stop happening.

Vocabulary

• claim

• habitable

reasoning

• evidence

landform

model

geologic process

Warm-Up

The information we have about the channel on Mars has mostly come from satellite images and scientific models. However, rovers and landers developed by NASA have made it possible to collect information directly from the surface of Mars.

Think about the channel on Mars. (You can refer to the image of the channel on page 17.) What information would you want to collect from the surface of Mars to help you determine whether the channel was formed by flowing lava or flowing water?

Evaluating New Rock Information

- 1. Read and analyze Background Information: Rock Types Card.
- 2. Observe the basalt and conglomerate rock samples with your hand lens.
- 3. Read and analyze Channel on Mars Evidence Card F.
- 4. Discuss and answer the questions below.

Channel on Mars

1. What did you learn about the channel on Mars from the new NASA data about the rock *Curiosity* found?

Channel on Earth Formed by Flowing Water

2. What did you learn from the background information about rock types?

Channel on Earth Formed by Flowing Lava

3. What did you learn from the background information about rock types?

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1.1	ann	<u> </u>

Evaluating New Rock Information (continued)

4. Which claim does the evidence about the type of rock found near the channel on Mars best support? (check one)



Flowing water formed the channel on Mars.

Flowing lava formed the channel on Mars.

Both claims.

5. Explain how the evidence supports the claim you selected.

Recording Your Completed Evidence Gradient

- 1. On the Channel on Mars Evidence Gradient below, write "Card A" in the same location you placed that card on your student sheet.
- 2. Repeat this process for Cards B–F.

Channel on Mars Evidence Gradient

Claim 1

Claim 2

Flowing water formed the channel on Mars.

Flowing lava formed the channel on Mars.

Geology on Mars-Lesson 3.2-Activity 3



Homework: Could Mars Have Been Habitable?

We learned about two of the characteristics that make Earth habitable:

- liquid water
- an energy source (such as the sun)

In this lesson, you considered all the evidence about the channel on Mars.

Based on what you've learned about this channel, do you think space agencies should continue to explore Mars for evidence of past habitability? Why or why not? Explain your thinking.

You can use this page to record notes or create drawings.

Lesson 3.3: Reasoning About Evidence from Mars

Today you will use a tool called the Reasoning Tool to help you develop a convincing argument about what formed the channel on Mars. This work will prepare you to write a scientific argument for the Universal Space Agency. Your argument will help the Agency decide whether the channel provides evidence that there was once liquid water in this location on Mars. Liquid water is one of the conditions necessary for habitability.

Unit Question

• How can we search for evidence that other planets were once habitable?

Chapter 3 Question

• How can we decide which geologic process formed the channel on Mars?

Key Concepts

- When landforms on different rocky planets look similar, it is evidence that they may have been formed by the same geologic process.
- Scientists can use models to test their ideas and get evidence about processes in the natural world that are difficult to observe.
- Landforms can provide evidence about the past because they remain after the geologic processes that formed them stop happening.

Vocabulary

channel

habitable

• claim

landform

reasoning

- rocky planet
- system

- evidence
- model
- geologic process

Warm-Up

Curiosity's image of rock near the base of the channel on Mars was an exciting discovery for NASA. It changed many scientists' thinking about the possibility of water on Mars and of its habitability.

How did this piece of evidence change your thinking about the channel on Mars? Explain your ideas below.



Reasoning About Evidence from Mars

- 1. Review the left column, which contains evidence that was gathered in previous lessons.
- 2. Work with a partner to complete the middle column of the Reasoning Tool by recording your reasoning about how the evidence connects to or supports the claim listed in the right column.
- 3. In the last row at the bottom of the Reasoning Tool, include one more piece of evidence.
- 4. When your teacher instructs you to do so, find a new partner and explain at least one piece of evidence and the reasoning about that evidence to your new partner.

Question: What geologic process could have formed the channel on Mars?

Claim: Flowing water formed the channel on Mars.

Evidence	This matters because (How does this evidence support the claim?)	Therefore, (claim)
Evidence Card A: Geologic Process: Flowing Water In satellite and aerial images, channels formed by water on Earth have a curved, branching shape similar to the shape of the channel on Mars.		Flowing water formed the channel on Mars.
Evidence Card C: Flowing Water Model In the Flowing Water Model, a channel remained in the sand after the water stopped flowing.		Flowing water formed the channel on Mars.

Reasoning About Evidence from Mars (continued)

Evidence	This matters because (How does this evidence support the claim?)	Therefore, (claim)
Evidence Card F: Image of Rock Near the Triangle-Shaped Landform The same type of rock (made of pebbles and other cemented sediment) is found near the base of the channel on Mars and near channels on Earth that are formed by flowing water.		Flowing water formed the channel on Mars.

Lesson 3.4: Writing an Argument About the Channel on Mars

Today you will write a scientific argument to support your claim about which geologic process formed the channel on Mars, just like scientists do at the end of their investigations. After you write your argument, you will hear from planetary geologist Dr. Lauren Edgar again. She will share some of the exciting evidence that the rover *Curiosity* has gathered on Mars.

Unit Question

• How can we search for evidence that other planets were once habitable?

Chapter 3 Question

• How can we decide which geologic process formed the channel on Mars?

Key Concepts

- When landforms on different rocky planets look similar, it is evidence that they may have been formed by the same geologic process.
- Scientists can use models to test their ideas and get evidence about processes in the natural world that are difficult to observe.
- Landforms can provide evidence about the past because they remain after the geologic processes that formed them stop happening.
- Evidence can support or go against a claim.
- A convincing argument is supported by evidence and the process of reasoning.

Vocabulary

• claim

habitable

reasoning

• evidence

- landform
- geologic process
 model

Warm-Up

Read both arguments about the puddle. Pay attention to what makes one argument more convincing than the other. Then, answer the questions below the two arguments.

Argument 1	Argument 2
The water in the puddle that Claire observed evaporated. The highest temperature was 32°C (90°F). Since the puddle was there in the morning and gone later that day, it must have evaporated.	The water in the puddle that Claire observed evaporated. Since the highest temperature was 32°C (90°F), we know that it was a warm day. When water gets hot, it can change from liquid to gas. This is called evaporation. I think the water became so warm that it became water vapor (gas), and that is why the puddle was gone by the afternoon.

1. Which argument is more convincing? (check one)

Argument 1

Argument 2

2. Why is the argument you selected more convincing?

Writing a Scientific Argument About the Channel on Mars

What geologic process could have formed the channel on Mars?

- Use your Reasoning Tool from Lesson 3.3 (pages 50–51) to help you write an argument to answer this question.
- Refer to Components of a Written Scientific Argument and the Word Bank below, as needed.
- Be convincing; show the audience how your claim is clearly supported by the evidence.

Word Bank

landform	model	rocky planet	reasoning
geologic process	conglomerate rock	claim	evidence

Homework: Reading "The Future of Mars Exploration"

Find out what the next steps are in the search for evidence of habitability on Mars! Read and annotate the "The Future of Mars Exploration" article and then answer the question below.

Would you be interested in being one of the first humans to explore Mars? Why or why not?

Active Reading Guidelines

- 1. Think carefully about what you read. Pay attention to your own understanding.
- 2. As you read, annotate the text to make a record of your thinking. Highlight challenging words and add notes to record questions and make connections to your own experience.
- 3. Examine all visual representations carefully. Consider how they go together with the text.
- 4. After you read, discuss what you have read with others to help you better understand the text.

Homework: Reading "Canals on Mars?"

Scientists have been studying Mars for hundreds of years! To learn more about the ideas that scientists used to have about Mars, read and annotate the "Canals on Mars?" article and then answer the questions below.

Why did some people think that there was evidence of intelligent life on Mars?

How was this idea refuted?

Active Reading Guidelines

- 1. Think carefully about what you read. Pay attention to your own understanding.
- 2. As you read, annotate the text to make a record of your thinking. Highlight challenging words and add notes to record questions and make connections to your own experience.
- 3. Examine all visual representations carefully. Consider how they go together with the text.
- 4. After you read, discuss what you have read with others to help you better understand the text.

Geology on Mars Glossary

atmosphere: the mixture of gases surrounding a planet *atmósfera: la mezcla de gases que rodea a un planeta*

biosphere: all the living things on a planet biosfera: todos los seres vivientes en un planeta

channel: a long, narrow groove that forms where water, lava, or other liquid flows canal: una ranura larga y estrecha que se forma donde el agua, la lava u otro líquido fluye

claim: a proposed answer to a question about the natural world *afirmación: una respuesta propuesta a una pregunta sobre el mundo natural*

compare: to notice how two or more things are alike or different comparar: notar en qué son iguales o diferentes dos o más cosas

evidence: information about the natural world that is used to support or go against (refute) a claim evidencia: información sobre el mundo natural que se utiliza para respaldar o rechazar (refutar) una afirmación

geologic process: an event or series of events that causes changes in the geosphere, such as flowing water or flowing lava

proceso geológico: un evento o serie de eventos que causa cambios en la geosfera, como agua o lava que fluye

geosphere: the solid part of a rocky planet geosfera: la parte sólida de un planeta rocoso

habitable: having the conditions necessary to support life habitable: que tiene las condiciones necesarias para sostener la vida

hydrosphere: all the liquid water and solid water (ice) on a planet hidrosfera: toda el agua líquida y el agua sólida (hielo) en un planeta

landform: a feature that forms on the surface of a planet, such as a mountain, channel, or sand dune accidente geográfico: un rasgo que se forma sobre la superficie de un planeta, como una montaña, un canal o una duna de arena

Geology on Mars Glossary (continued)

model: an object, diagram, or computer program that helps us understand something by making it simpler or easier to see

modelo: un objeto, diagrama o programa de computadora que nos ayuda a entender algo haciéndolo más simple o fácil de ver

planetary geologist: a scientist who studies the geospheres of planets in our solar system geólogo/a de planetas: un/a científico/a que estudia las geosferas de los planetas en nuestro sistema solar

reasoning: the process of making clear how your evidence supports your claim *razonamiento: el proceso de aclarar cómo tu evidencia respalda tu afirmación*

rocky planet: any planet with a solid surface, such as Earth or Mars planeta rocoso: cualquier planeta con una superficie sólida, como la Tierra o Marte

scientific argument: a claim supported by evidence argumento científico: una afirmación respaldada por evidencia

system: a set of interacting parts forming a complex whole sistema: un conjunto de partes que interactúan formando un todo complejo

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Geology on Mars





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