

# Lesson 7

## Discovering Environmental Characteristics of Mars

### GRADE LEVEL(S)

4 – 6

### LENGTH

45-90 minutes

### MATERIALS

- Giant Destination Mars Map
- [Discover](#) PowerPoint ([http://mars.nasa.gov/participate/marsforeducators/soi/resources/MarsSOI2012\\_Lesson4\\_pres1.ppt](http://mars.nasa.gov/participate/marsforeducators/soi/resources/MarsSOI2012_Lesson4_pres1.ppt))
- [The Mars Environment: Fun Facts Episode 004](#) YouTube Video (<https://www.youtube.com/watch?v=8JV21hrpaiU>)
- Student handout—notetaking sheet

### VOCABULARY

- Discover
- Atmosphere & Atmospheric Pressure
- Elevation
- Gravity
- Hydrogen
- Magnetic Field
- Radiation

### ESSENTIAL QUESTION(S)

What are the environmental characteristics of Mars and what are the challenges that need to be addressed for humans to visit the planet?

### LESSON OBJECTIVE(S)

Students will:

- Develop an understanding of the primary environmental characteristics of Mars and begin to think about challenges to human travel to the planet
- Learn about the difference in gravity on Earth and Mars

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### ENGAGEMENT

1. Ask students to think about what the surface of Mars looks like on the Giant Mars Map. Ask students to make a list of environmental challenges they might anticipate in human travel to Mars.
2. Show students the YouTube video, *The Mars Environment: Fun Facts Episode 004*.
3. Ask students to share their thoughts on challenges regarding human travel to Mars.
4. Discuss the difference in gravity with students and why there is a difference.

### EXPLORATION

1. Provide student teams with the note-taking sheet. Explain that this will guide their research in class today. Provide them with 30 minutes to research and find data on each of these

points. (A backup to this is to use the provided Power Point presentation if internet access is difficult).

### **EXPLANATION**

1. Create a classroom table on the board. Ask students to share their facts that they found and complete the classroom table.
2. Use data provided in the Power Point to fill in any missing data.

### **EXTENSION**

1. Team challenge: give the teams ten minutes to research and identify where on the Giant Mars Map that the Mars Rover has found signs of potential water.
2. Lead the whole class in a discussion of why finding water on Mars is so significant. Ask students to complete an “exit ticket” on the topic of “Why Finding Water on Mars is a Game Changer for Future Exploration and Habitation”.

### **EVALUATION**

1. During this lesson, the teacher is encouraged to use formative assessment such as questioning and examining student responses/notes throughout the lesson to elicit evidence of learning and deepen student understanding. Teachers may wish to grade student handouts to formally assess student understanding.
2. Teachers are encouraged to create their own grade-level and ability-level assessment so as to best meet the needs of their students.

# DISCOVERING ENVIRONMENTAL CHARACTERISTICS OF MARS STUDENT SHEET

Directions: Paraphrase (write in your own words) information about Mars.

Topic	Notes
Sun	
Temperature	
Seasons	
Radiation	
Atmosphere & Oxygen	
Atmospheric Pressure	

# DISCOVERING ENVIRONMENTAL CHARACTERISTICS OF MARS

## STUDENT SHEET

Topic	Notes
Water	
Soil	
Wind & Dust	
Gravity	
Landforms on Mars	

# DISCOVERING ENVIRONMENTAL CHARACTERISTICS OF MARS

## TEACHER GUIDE

Topic	Notes
Sun	<ul style="list-style-type: none"> <li>• ¼ amount of power from solar energy</li> <li>• Mars is 1½ times farther away from sun than Earth</li> <li>• This makes Mars colder too</li> </ul>
Temperature	<ul style="list-style-type: none"> <li>• Mars is colder than Earth.</li> <li>• -190 to 75 degrees F</li> <li>• Farther from sun</li> <li>• Atmosphere doesn't trap warmth from sun</li> </ul>
Seasons	<ul style="list-style-type: none"> <li>• Martian seasons last 2 times as long as Earth</li> <li>• Martian year = 687 Earth days</li> <li>• Martian year = 669 sols</li> <li>• Sol = Martian day</li> </ul>
Radiation	<ul style="list-style-type: none"> <li>• Mars has thin atmosphere</li> <li>• Mars doesn't have a magnetic field</li> <li>• Radiation levels are twice as high on Mars</li> <li>• Metal conducts radiation</li> <li>• Hydrogen protects from radiation</li> </ul>
Atmosphere & Oxygen	<ul style="list-style-type: none"> <li>• The air of Mars is mainly carbon dioxide (95%). Only 0.1% is oxygen.</li> <li>• No oxygen to breathe</li> <li>• Earth's atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor</li> <li>• The atmosphere changes at different elevations</li> </ul>
Atmospheric Pressure	<ul style="list-style-type: none"> <li>• Atmosphere is thin</li> <li>• Only 1/100 of Earth's surface pressure</li> <li>• 15 lbs of pressure on Earth</li> <li>• 0.15 lbs of pressure on Mars</li> </ul>

# DISCOVERING ENVIRONMENTAL CHARACTERISTICS OF MARS

## TEACHER GUIDE

Topic	Notes
Water	<ul style="list-style-type: none"> <li>• Little, if any, liquid water on surface now</li> <li>• There was probably water long ago</li> <li>• There is water ice below the surface of the planet</li> </ul>
Soil	<ul style="list-style-type: none"> <li>• Toxic</li> <li>• Hard to grow plants in Martian soil</li> </ul>
Wind & Dust	<ul style="list-style-type: none"> <li>• Mars has reddish-brown dust</li> <li>• Winds blow dust around; Wind speed increases to 50-100 meters per second during dust storms</li> <li>• Sometimes almost the whole planet is covered in dust storms</li> </ul>
Gravity	<ul style="list-style-type: none"> <li>• Mars has 1/3 the gravity of Earth</li> <li>• You could jump 3 times as high</li> <li>• Astronauts lose muscle and bone mass at 0 gravity</li> <li>• They exercise 2 hours a day</li> <li>• Gravity is a force that causes two objects to pull toward each other</li> <li>• It keeps planets in orbit around the sun and governs the rest of the motion in the solar system</li> <li>• It holds us to the earth's surface</li> </ul>
Landforms on Mars	<ul style="list-style-type: none"> <li>• Volcanoes</li> <li>• Olympus Mons is 3 X taller than 3 Everest &amp; flat</li> <li>• Plains               <ul style="list-style-type: none"> <li>○ Nothing grows there</li> <li>○ Low and flat</li> <li>○ Opportunity saw its heat shield at Meridiani Planum</li> </ul> </li> <li>• Craters               <ul style="list-style-type: none"> <li>○ Gusev Crater was possibly a water source</li> </ul> </li> <li>• Canyons               <ul style="list-style-type: none"> <li>○ Valles Marineris is bigger than the Grand</li> <li>○ 2,000 miles long</li> </ul> </li> </ul>