LIFE ON MARS?

In "Shooting for the Stars" (p. 14), you read about a teenager who dreams of joining a future mission to Mars. One of the goals of NASA's Mars program is to learn whether living organisms have ever existed on the planet. Read the passage below to learn more about the search for life on the Red Planet. Then answer the questions that follow.

SEARCHING FOR ALIENS

Is Earth the only planet where life exists? No one knows for sure. But some scientists believe living organisms could have once resided on Mars—the planet most similar to Earth in our solar system.
Mars is rocky, relatively close to the sun, and has an atmosphere. Because of these similarities with Earth, scientists have sent many spacecraft to Mars to search for signs of life. One clue they have hunted for is the presence of water. Liquid water is a key ingredient for life on Earth. With an average temperature of -66°F (-51°C), the surface of Mars is too cold for liquid water to exist there today. The average surface temperature on Earth, by comparison, is 61°F (16°C). But images of Mars's surface suggest that water once flowed there.

In 2020, NASA plans to launch a new rover to continue searching for evidence of life. The robotic vehicle will be fitted with equipment that can detect different chemicals, such as carbon (C). This element is the basic building block for all life on Earth.

The rover will also be fitted with a drill that can collect samples of rocks in areas where water may be hiding under the soil. Scientists hope that samples may someday be returned to Earth on later missions. That way, they can analyze the rocks with equipment too large and sophisticated to load onto a rover.

QUESTIONS

1. Which of the following characteristics do Mars and Earth have in common?
   A. Liquid water is known to be present on both planets.
   B. They are located the same distance from the sun.
   C. They are rocky planets.
   D. Their average surface temperatures are below freezing.

2. Which of the following BEST explains why Mars is the focus of the search for alien life in the solar system?
   A. Rovers have detected the basic building block of life on the planet.
   B. Mars is a nearby planet somewhat similar to Earth.
   C. Mars is Earth's nearest neighbor.
   D. Samples can easily be returned to Earth from Mars.

3. What piece of evidence suggests that life does NOT currently exist on Mars?

4. Do you think scientists believe alien life forms on Mars would be similar to or different from life on Earth? Support your answer with evidence from the text.

5. Suppose you were in charge of deciding where a future Mars rover will collect samples to search for evidence of past life. What type of area would you choose? Support your answer with evidence from the passage.

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SIGN OF LIFE?

In "Shooting for the Stars" (p. 14), you read about a young woman who hopes to someday go to Mars. Any future missions to the Red Planet will likely involve searching for signs of living organisms. In the past, scientists have sent rovers—robotic vehicles—to look for clues of past life on Mars. The Curiosity rover once detected a burst of methane (CH₄) gas—a chemical that can be produced by living things. The diagram below shows possible sources of methane on Mars. Use it to answer the questions that follow.

POSSIBLE SOURCES OF METHANE ON MARS

In November 2013, a set of instruments on Curiosity called SAM (Sample Analysis at Mars) detected a burst of methane on the Red Planet. Scientists don't yet know the origin of the methane, but here are three potential sources.

QUESTIONS

1. Does the burst of methane detected on Mars prove that life exists there currently? Support your answer with evidence from the diagram.

2. Does the data collected by the Curiosity rover definitively indicate that life once existed on the planet?

3. What substances are needed for rocks to produce methane? Explain how that process works.

4. Suppose astronauts on Mars were to detect a methane burst. What observations do you think they could make to try to pin down the source of the gas? Explain your answer.
NAME: 

DESIGN A SPACE HABITAT

In “Shooting for the Stars” (p. 14), you learned that NASA hopes to send astronauts to Mars in the 2030s. Scientists and engineers are currently designing technology that could help humans survive for long periods on the Red Planet, where challenging conditions make life difficult. Use the information in the table below, as well as your own research, to complete the rest of the activity.

CONDITIONS ON MARS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atmosphere</td>
<td>The envelope of gases surrounding Mars is made mostly of carbon dioxide, with very little oxygen. The atmosphere contains a relatively high amount of dust. It’s also relatively thin, meaning there is less protection from the sun’s strong rays.</td>
</tr>
<tr>
<td>Weather</td>
<td>Because of its thin atmosphere and greater distance from the sun, Mars’s surface is generally colder than Earth’s. The average surface temperature is −46°C (−51°F). However, temperatures reach as low as −143°C (−225.4°F) at the poles in the winter and as high as 35°C (95°F) at the equator during the summer. Intense dust storms frequently rip around the planet. Every year, telescopes spot Martian dust storms that are as big as a continent and last for weeks.</td>
</tr>
<tr>
<td>Water</td>
<td>No liquid water has been found on the surface of Mars. However, research indicates that large amounts of frozen water lie beneath the surface in some areas of the planet.</td>
</tr>
</tbody>
</table>

DESIGN IT Design a habitat for astronauts on Mars. It should be able to provide the basic needs of life (breathable air, water, and food), as well as a way for astronauts to generate electricity. Be sure to also consider the different kinds of facilities astronauts would need if they were to live on the planet for long periods. Draw a model of your habitat design. Include descriptions of the systems that would help astronauts survive the conditions on Mars.
EXPLORE A STEM CAREER

In “Shooting for the Stars” (p. 14), you read about a teenager who dreams of becoming an astronaut. Exploring space is only one of the many exciting careers within the fields of science, technology, engineering, and mathematics (STEM).

Individuals who specialize in STEM are in high demand. According to one estimate, about 20 percent of all jobs in the U.S.—about 26 million—are in STEM fields. And that number is only expected to grow.

Not only are there a lot of jobs available, but they also cover a huge array of subjects you may be interested in. Use the information below to investigate some types of careers that fall under the STEM umbrella. Then answer the questions that follow to find out what it takes to work in one of these fields.

<table>
<thead>
<tr>
<th>Science</th>
<th>Technology</th>
<th>Engineering</th>
<th>Math</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veterinarian</td>
<td>Computer Programmer</td>
<td>Aerospace Engineer</td>
<td>Accountant</td>
</tr>
<tr>
<td>Biologist</td>
<td>Graphic Designer</td>
<td>Architect</td>
<td>Actuary</td>
</tr>
<tr>
<td>Forensic Scientist</td>
<td>Materials Scientist</td>
<td>Automotive Engineer</td>
<td>Business Manager</td>
</tr>
<tr>
<td>Chemist</td>
<td>IT Manager</td>
<td>Chemical Engineer</td>
<td>Mathematician</td>
</tr>
<tr>
<td>Psychologist</td>
<td>Roboticsist</td>
<td>Environmental Engineer</td>
<td>Physicist</td>
</tr>
<tr>
<td>Medical Doctor</td>
<td>Video Game Designer</td>
<td>Civil Engineer</td>
<td>Statistician</td>
</tr>
<tr>
<td>Food Scientist</td>
<td>Web Developer</td>
<td>Mechanical Engineer</td>
<td>Cryptographer</td>
</tr>
<tr>
<td>Forest Ranger</td>
<td>App Designer</td>
<td>Electrical Engineer</td>
<td>Financial Adviser</td>
</tr>
<tr>
<td>Geologist</td>
<td></td>
<td>Nuclear Engineer</td>
<td>Math Teacher</td>
</tr>
</tbody>
</table>

1. **CHOOSE A FIELD** Pick one of the careers from the chart or another STEM career that interests you.

2. **CAREER QUALIFICATIONS** Research what type of education, training, skills, and background you would need for this career.

3. **JOB DESCRIPTION** Find out what doing this job would entail. Where would you work? What salary would you earn? What does the future for this career look like?

4. **PRESENT YOUR PROFESSION** Create a 5- to 10-minute presentation for your class about your chosen career. If possible, your talk should include visual aid—such as images or videos—or audio components. Explain why you chose your career. Why do you think it is a good fit for you? Be sure to include surprising or interesting facts about the job and explain why you think it is important for society.