

Check your understanding



1 Where did we get our samples from? Why did we choose that spot?

Answer We took samples in the Yellowknife Bay Formation on Mars. It looks like it used to be a lake. Biological life overwhelmingly needs water to survive. If there was life on Mars at some point in the past, there's a good chance that evidence would be in this type of environment.

2 Why did we need to make sure we had a good plan before starting our experiment?

Answer There are no people on Mars. Scientists need to send very specific instructions to Mars rovers, and it takes a while for the signals to reach the planet. Scientists can't change or stop their experiments in the middle, so they need to be sure of what they are doing before they start. There are also limited resources for the instruments on SAM, so scientists need to have well-thought-out experiments to minimize wasting resources.

3 Where is the carbon in the sample most likely from?

Answer The carbon isotope values matched values for meteorites, carbonate, and rocks that originated on Mars. They also match the values for living things. We don't know how much of our sample came from which sources. It's possible that none of our carbon actually came from living things, but it can't be ruled out.

4 Find a partner and brainstorm. What do organisms need to survive? Do you think that Mars might have had these things in the past?

Answer

- Water – Living organisms need water to survive. Water has been found on Mars and is contained mostly in the Martian ice caps and under the surface.
- Nutrients – Organic carbon and nutrients like phosphorus and nitrogen are important to living things.
- A place to live – One thing to discuss with your students is the fact that Mars lacks a protective atmosphere. As a result, the surface of Mars is exposed to cosmic radiation that's dangerous to biological organisms. If life existed or exists on Mars, it would likely be under the surface where it is protected from this radiation.
- Your students will likely have other answers that are specific to humans. Try to remind them about the diversity of life – including single-celled organisms and plant-like organisms.

5

Why do you think it is difficult to do research on Mars?

Answer

- People can't be there to make sure everything goes well.
- It's really far away, so communication is hard and we can't easily bring samples back to Earth to study.
- Working with a rover is difficult
 - It takes a long time to communicate with the rovers.
 - Programming and problem-solving take time and skill.
 - No human upkeep – when something physically breaks, that capability is completely lost.
 - The limited time span of work with the rover while it has power. The rovers are solar-powered and the time of day, season, and dust accumulation will impact the amount of power available to use scientific equipment.
- Limitations on the scope of research
 - The rovers only have the instrumentation and sampling capabilities that they were created with. There are no options to do anything new unless old instrumentation can be re-programmed.
 - No humans to clean up – researchers have to work within the “mess” previous experiments have left behind.
 - Rovers can't travel very far or very quickly.
 - Competition between scientists about the most important science to do.
- If your students are having trouble, try having them think about doing research in the middle of the desert or in Antarctica. Many of your students also may have played with toys that have remote controls. You can ask them to think about the difficulties they've had in controlling these toys.