The Fascination of Scientists with Air in NASA’s Mars Sample Tubes

Description

NASA's Perseverance Rover Collects Martian Air Samples for Scientists

NASA's Perseverance rover is making waves in the scientific community by collecting rock and soil samples on Mars, including atmospheric gases, for future analysis on Earth. These samples are crucial in understanding the evolution of the Martian atmosphere and potentially uncovering evidence of ancient microbial life on the red planet.

With each rock core sealed in titanium sample tubes, atmospheric scientists are eager to explore the mysteries hidden within. The Mars Sample Return campaign, which has already gathered twenty-four samples, holds the promise of unlocking invaluable insights into Mars' atmospheric history.

One unique aspect of the samples being collected is the **"headspace,"** the air surrounding the rocky material within the tubes. By studying this air, scientists hope to learn more about Mars' climate and atmosphere over time, shedding light on its ancient past and potentially revealing the presence of noble gases that have remained unchanged for billions of years.

Furthermore, the analysis of trace gases in Mars' atmosphere could provide clues about the planet's early climate compared to Earth's. By studying the size and toxicity of dust particles in the **headspace**, valuable information can be obtained to aid future manned missions to Mars.

The Perseverance rover's mission is not only groundbreaking in its scientific endeavors but also in its potential to expand our understanding of planetary formation and evolution. With the promise of unlocking the secrets of Mars' past, the collection and analysis of these air samples represent a significant step forward in space exploration and discovery.

Vocabulary List

1. **Headspace** /?h?d?spe?s/ (noun): The air space in a sealed container above the contents, here referring to the air surrounding Martian rock samples.
2. **Atmospheric** /?ætm?s?f??r?k/ (adjective): Relating to the gases that surround a planet.
3. **Trace gases** /tre?s ??æs?z/ (noun): Gases that make up less than 1% of the atmosphere; their presence can reveal much about the planet's history and environment.
4. **Titanium** /ta??te?ni?m/ (noun): A strong, lightweight metal used for sealing sample tubes to preserve Martian rock cores and air samples.
5. **Noble gases** /?no?b?l ??æs?z/ (noun): A group of inert gases that do not undergo chemical reactions under a set of given conditions.

Vocabulary List:

1. **Perseverance** /ˌpɜːrsəˈvɪrəns/ (noun): Steadfastness in doing something despite difficulty or delay in achieving success.
2. **Atmospheric** /ˌætməsˈfɛrɪk/ (adjective): Relating to the gases surrounding a planet.
3. **Noble gases** /ˈnoʊbəl ˈgæsɪz/ (noun): A group of inert gases that have little tendency to engage in chemical reactions.
4. **Trace gases** /treɪs ˈgæsɪz/ (noun): Gases present in very small amounts in the atmosphere that provide crucial information about environmental conditions.
5. **Titanium** /taɪˈteɪniəm/ (noun): A strong lightweight metal used in various applications including aerospace and medical devices.
6. **Groundbreaking** /ˈgraʊndˌbreɪkɪŋ/ (adjective): Innovative; introducing new ideas or methods.

Comprehension Questions

Multiple Choice

1. What is the purpose of NASA's Perseverance rover collecting Martian air samples?

   Option: To study rock and soil composition on Mars
   Option: To analyze atmospheric gases for future research
   Option: To search for signs of ancient microbial life
   Option: All of the above

2. What do atmospheric scientists hope to learn by studying the "headspace" in the sample tubes?

   Option: About Mars' climate and atmosphere over time
   Option: Presence of noble gases on Mars
   Option: Evidence of ancient microbial life
   Option: Size and toxicity of dust particles on Mars

3. What is the main goal of the Mars Sample Return campaign mentioned in the text?

   Option: To collect 100 rock and soil samples from Mars
   Option: To unlock insights into Mars' atmospheric history
   Option: To establish a permanent colony on Mars
   Option: To analyze the geological features of Mars

4. What valuable information can be obtained by analyzing trace gases in Mars' atmosphere?

Option: Mars' early climate compared to Earth's
Option: Presence of ancient microbial life on Mars
Option: Composition of Martian soil samples
Option: Toxicity of the Martian atmosphere

5. What is the significance of studying the size and toxicity of dust particles in the "headspace"?

Option: To develop new spacecraft for Mars missions
Option: To understand the geological formations on Mars
Option: To aid future manned missions to Mars
Option: To determine the presence of liquid water on Mars

6. What role does titanium play in preserving the Martian rock cores and air samples?

Option: It protects against extreme temperatures on Mars
Option: It weighs down the sample tubes for stability
Option: It seals the sample tubes to prevent contamination
Option: It provides energy for sample analysis

Answer

Multiple Choice: 1. All of the above 2. About Mars' climate and atmosphere over time 3. To unlock insights into Mars' atmospheric history 4. Mars' early climate compared to Earth's 5. To aid future manned missions to Mars 6. It seals the sample tubes to prevent contamination

Vocabulary quizzes

Multiple Choice (Select the Correct answer for each question.)

1. Which word refers to having the capacity or capability for development or growth?

Option: Viability
Option: Frail
Option: Embark
Option: Potential

2. Which word describes relating to the identification of long-term goals and the means of achieving them?

Option: Atmospheric
Option: Strategic
Option: Perseverance
Option: Caution

3. Which element is known for its high strength low density and high resistance to corrosion?

Option: Trace gases
Option: Titanium
Option: Noble gases
Option: Groundbreaking

4. Which term refers to the income generated from business activities?

Option: Pricing
Option: Revenue
Option: Division
Option: Debris

5. Which word means to motivate or encourage someone to do something?

Option: Entice
Option: Incentivize
Option: Macroeconomic
Option: Anticipate

6. What is the term for the phase of returning to Earth from space?

Option: Operational
Option: Reentry
Option: Constellation
Option: Prohibitive

7. Which term refers to something able to withstand wear pressure or damage?

Option: Division
Option: Durable
Option: Management
Option: Caution

8. Which word describes accomplishing a desired aim or result?

Option: Initiatives
Option: Successful
Option: Constellation
Option: Entice

9. Which term refers to the ability to work successfully or be effective?

Option: Viability

Option: Division
Option: Groundbreaking
Option: Management

10. Which word means persistence in doing something despite difficulty or delay in achieving success?

Option: Revenue
Option: Perseverance
Option: Division
Option: Debris

Gap-Fill (Fill in the blanks with the correct word from the vocabulary list.)

11. Before starting a new journey it is important to _____ on it with a well-thought-out plan.

12. Effective _____ involves coordinating and overseeing the activities of an organization or team.

13. The store used a creative display to _____ customers and draw them inside.

14. _____ pressure decreases as altitude increases in the Earth's atmosphere.

15. The new invention was considered _____ due to its innovative and revolutionary approach.

16. A good project manager should be able to _____ potential risks and plan accordingly.

17. Determining the right _____ strategy is crucial for the profitability of a business.

18. The company decided to create a new sales _____ to focus specifically on international markets.

19. The high costs of entry serve as a _____ factor for many new entrepreneurs in the industry.

20. Implementing new sustainability _____ can help organizations reduce their

environmental impact.

Matching Sentences (Match each definition to the correct word from the vocabulary list.)

21. Elements like helium and argon belong to this group of unreactive gases that exist in the atmosphere.
22. Carbon dioxide and methane are examples of these gases present in small concentrations in the atmosphere.
23. The space agency confirmed that the satellite was fully functional and ready for use.
24. A group of satellites working together in orbit to provide global communication coverage.
25. The company's total for the fiscal year exceeded expectations leading to significant profits.
26. Before investing in a new project the team evaluates its to ensure it is worth pursuing.
27. The product launch was highly anticipated and turned out to be a venture for the company.
28. The team decided to the initial proposal after receiving feedback from stakeholders.
29. The creation of a new department focused on research and development led to increased innovation within the organization.
30. After the spacecraft reentry the remaining space was carefully monitored for safety reasons.

Answer

Multiple Choice: 1. Potential 2. Strategic 3. Titanium 4. Revenue 5. Incentivize 6. Reentry 7. Durable 8. Successful 9. Viability 10. Perseverance
Gap-Fill: 11. Embark 12. Management 13. Entice 14. Atmospheric 15. Groundbreaking 16. Anticipate 17. Pricing 18. Division 19. Prohibitive 20. Initiatives
Matching sentence: 1. Noble gases 2. Trace gases 3. Operational 4. Constellation 5. Revenue 6. Viability 7. Successful 8. Revisiting 9. Division 10. Debris

CATEGORY

1. Sci/Tech - LEVEL6

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