

Exotrex2 Lesson **Answer Key 2.2b: Venus Mission**

Name: _____ Date: _____

Mission Notes: Record your notes on this handout as you complete the Venus Mission. Use this as a reference for your end-of-mission report to Dr. Burke.

Task #1 – Atmospheric Probe: Fly your probe through Venus' atmosphere in order to study its composition.



1) As you play Atmospheric Probe, what causes the most damage to your probe? The clouds cause significant damage but so does

flying too high in the atmosphere. Help students see that there is a damage state by flying high.

2) Why do you think that causes so much damage? Students may state that they see lightning which can cause damage. Clouds are also made of caustic sulfuric acid and high altitude winds of up to 220 miles per hour can cause significant damage.

Atmospheric Probe Observations: Complete the following observations for your records. If you missed them, you can access them through the dashboard [] and then click on observations.



Your probe returned with _____ acid --damaged shields from droplets of _____ sulfuric _____ acid inside the _____ clouds which also causes a _____ yellow color.



Your probe experienced Venus' strong _____ greenhouse ---gas effect, which is why Venus is so hot.
deathly _____ and _____ are extremely _____.



Your probe calculated Venus' surface temperature around _____ 880F which is hot enough to _____ melt _____ lead.

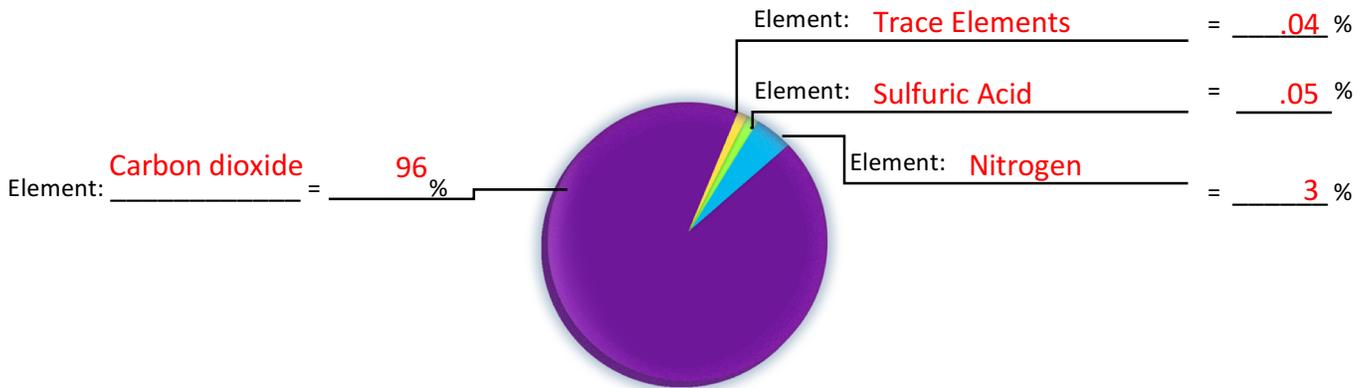


You fought against high powered _____ winds in Venus' upper _____ atmosphere some reaching _____ 220 miles per hour.



Through the _____ lightning -lit sky, your probe caught glimpses of several _____ volcanoes on Venus' surface.

Task #3 - Particle Analysis: Determine what you collected in Venus' atmosphere.



3) How does the atmospheric composition affect living conditions on Venus? _____

Carbon dioxide creates a greenhouse effect that makes Venus the hottest planet in the solar system.

4) Explain how you would use at least one of the elements on Venus if you decided to settle there:

Trace element of water can be used for humans, carbon dioxide and nitrogen can be made into ingredients for fertilizer but must react with hydrogen which may be hard to find.



Task #4 - Conclusions: You will need to share with Dr. Burke what you have learned but be prepared to answer this very important question:

5) Would you recommend Venus for the future home of humanity? Explain your answer

Not a good alternative for humanity because:

-Surface temperatures are too hot due to greenhouse effect

- Clouds made of sulfuric acid create a hostile environment

- Winds of up to 220 miles an hour in the upper atmosphere will make it hard to land

Exotrex2 Lesson 2.2b: Venus Mission Discussion Prompts

Debrief Game Play –

It is important that students see the cohesiveness of the Venus Mission as a series of two mini-games plus a reporting conversation with Dr. Burke. Ask students to explain what they had to do in order to fully explore Venus. Students should be able to sequence the following events:

- Pilot probe successfully above Venus to collect atmospheric samples
- Analyze the elemental composition of collected samples to discover available resources
- Report findings to Dr. Burke and make a recommendation on inhabitability of Mercury for humanity

Atmospheric Probe Game-

Debrief the Atmospheric Probe Game to emphasize that an atmosphere is very important for sustaining life on a planet. Unfortunately, Venus has an atmosphere that traps heat so efficiently that it is the hottest planet in the solar system due to an intense greenhouse gas caused by carbon dioxide. Use the following questions to highlight the effects of an intense greenhouse effect as well as additional atmospheric conditions of Venus.

Why is Venus so hot?

- Prompt students to use facts from their notes in which they state that the surface temperature of Venus can reach 880F as evidence. Draw their attention to the findings in the Particle Analysis game in which 96% of the atmosphere is made of carbon dioxide and prompt them to explain how that can affect a planet. Remind students that Venus is not the closest planet to the sun and ask how it can be hotter than Mercury. (This line of questioning will be best if students have gone through the Mercury Mission first).

What are the clouds like above Venus?

- Prompt students to share about what they saw as they played the Atmospheric Probe game. Students can share that there were a lot of clouds, especially in the background, and that it was difficult to see any of Venus' surface. The clouds are yellowish and students should be able to explain that is due to droplets of sulfuric acid present in the clouds. There are lightning storms as well. Prompt students to also think about how this thick cloud cover also can contribute to an intense greenhouse effect. See <https://www.universetoday.com/36816/winds-on-venus/> as reference for this discussion.

Particle Analysis Game –

Discussion should be built off of the answers that students found for the percentages of elements as well as to how students would use them. Ask students how the thick cloud cover and intense heat would impact them personally if they decided to colonize Venus. Encourage students to do research on the chemical composition of Earth' atmosphere as a reference point. Since Venus' atmosphere is predominately composed of carbon dioxide, delve deep into the greenhouse effect and the impacts of a runaway greenhouse effect here on Earth.

Exotrex2 Lesson 2.2b: Venus Mission Discussion Prompts (continued)**Conclusions and Reporting to Dr. Estella Burke –**

Students will have different experiences reporting to Dr. Burke so be sure to debrief their experiences and see if there were different outcomes for students. Here are the following questions that will be asked:

- How did the atmosphere of Venus look to you while you were flying your probe?
- What makes the clouds appear to be yellowish in color?
- Do you think Venus should be considered for humanity's next home?
- What are the reasons why Venus would not make a good home for humans?