

Space Suits – Air that I Breathe

Background Information

In order for astronauts to travel to Mars or other planets, they will need to have specially designed space suits. NASA engineers must consider the type of environment that the astronaut will be in and what type of work the astronaut will be doing when designing the suit. When astronauts are in places where there is little to no oxygen, the suits will have to explode astronauts to breathe.

The atmosphere on Mars is very different from the atmosphere on Earth. Earth's atmosphere is 78 percent nitrogen, 21 percent oxygen, and 1 percent other gases. The atmosphere on Mars is 95 percent carbon dioxide, 3 percent nitrogen, 1.5 percent argon and less than .5 percent other elements. Since there is very little oxygen on Mars, space suits must be designed with oxygen tanks for the astronauts.

In this lesson, students will graphically represent the make-up of the atmosphere using colored hole-punch dots.

Objective

By the end of this activity, students will be able to:

- see the combination of elements which make up the atmospheres of Earth and Mars.
- understand the composition up of different planets.
- appreciate the delicacy of Earth atmosphere.

Instruction Time

45 Minutes

Materials

- Astronomer Journal pages 35-37
- Colored paper—blue, neon green, pink, yellow, red, and orange
- Three-hole punch
- Glue
- Scissors
- NASAexplores Article(s): These Boots Are Made For Walking

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Preparation

1. Using the three-hole punch, make the paper dots according to the percentage of the makeup of the planets' atmospheres.
2. Ensure each student has at least:
 - a. 81 pink dots
 - b. 21 blue dots
 - c. 95 yellow dots
 - d. 1 1/2 neon green dots
 - e. 1/2 orange dot

Procedure

1. Read orally the K-4 NASAexplores article, "These Boots Are Made For Walking."
2. Discuss the needs astronauts will have on the planet Mars. Ask students to discuss what we have on Earth that will not be found on Mars.
3. Explain to the students that the air we breathe is made of invisible gases.
4. Distribute the Student Sheets and materials. Note that the planets are not drawn to scale—Mars is actually about half the size of Earth.
5. Inform students which gas the colors will represent.
6. Have students glue the dots for the Earth gases and Mars gases to the corresponding planet.
7. Allow the students to complete the Student Sheets.
8. Wrap-up: Discuss the fact that the air (atmosphere) on Mars is mostly carbon dioxide, and this is the type of gas that plants need.

Expected Results & Explanations

Upon completion of this activity, students should have a better understanding about the uniqueness of the Earth atmosphere. The fact that Earth is the only location within our Solar System to support life is amazing. This activity displays the percentages of different gases within our atmosphere and how just a little more of one gas, or a little less of another would make Earth's atmosphere more hostile. When students have completed this activity have them write fractions with a denominator of 100 for each gas. For advanced students: After writing the fractions, students can change them into decimal numbers or percentages.

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These Boots Are Made For Walking



How will space suits in the future be different? For one thing, the boots will be made for walking! Astronauts who wear space suits outside of space ships don't walk. They float. When they work in space, they put their feet into holders. This keeps them from floating away.

Astronauts going to Mars will be walking on the ground. They may even be driving a **rover vehicle**. This means that space boots will have to be made in a new way.

Space suits are made for where astronauts are going and what they are doing. They may all look alike. But, they do different things. NASA has been hard at work making new space suits. These are the ones that will go to Mars and even farther.



Space boots used today.

The space suits used now are made for almost zero-gravity. The main part of the suit is made of **fiberglass**. It is very hard. Astronauts wear the suits when they go outside the Space Shuttle and Space Station. But, they can't move much. Astronauts can only bend their knees and turn their waists. On a planet like Mars, astronauts will walk and bend. They will pick up rocks and drive rovers. They will need a suit that will let them move.

Rockets – Space Shuttle – **Spacesuits** – International Space Station

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Space suits are like people-shaped balloons. When you twist a balloon, the air inside gets moved. When you twist inside a space suit, you have to work harder. Ways to help astronauts move will have to be put in the suits.



One idea for a future space suit.

We don't know what astronauts will run into when they get to Mars. This makes it hard to know what kind of suit to make for them.

We do know that the crew will need to move around a lot. We know they will need to be protected from the Sun's rays, too. Mars has a lot of dust in the **atmosphere**. So, the suit will need to have a dust cover, as well.



The only way to know if a space suit will do the job on Mars is to try it out. But, we can't go to Mars just to test it! NASA has to find other ways to test the suits. Scientists can pretend to do some of the things astronauts will do on Mars. But, this does not work very well. That is

because Earth's gravity is different from Mars's. Mars's gravity can be copied by flying in a special plane, but the plane doesn't have rocks and mountains like the desert.

They will have a rover on Mars. Astronauts won't need to carry all of their tools on their bodies. Right now, astronauts have tools connected to their suits. On Mars, that won't be needed. Astronauts can keep their tools on the rover. They might even have a robot helper bring them what they need. That will help them even more.

There are many things we don't know when it comes to Mars. It is hard to plan what kind of clothes astronauts will need. This is just one part of the challenge to get to Mars.