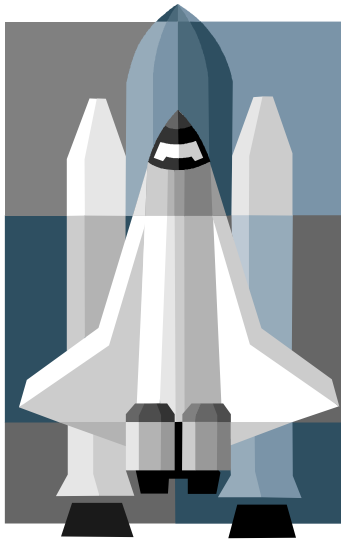




Demo Space Freeze II: Cryogenics

Pre-Visit Activities

Grades 3-5



Developed 11/06

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Standards of Learning

The following Standards of Learning are addressed in the Space Freeze II:
Cryogenics Demonstration:

Standard 3.1- The student will plan and conduct investigations in which:

- predictions and observations are made
- inferences are made and conclusions are drawn

Standard 4.1- The student will plan and conduct investigations in which:

- distinctions are made among observations, conclusions (inferences), and predictions
- hypotheses are formulated based on cause and effect relationships

Standard 5.1- The student will plan and conduct investigations in which:

- predictions made using patterns and simple graphical data are extrapolated

Standard 5.4- The student will investigate and understand that matter is anything that has mass; takes up space; and occurs as a solid, liquid, or gas. Key concepts include:

- atoms, molecules, elements, and compounds
- mixtures and solutions
- effects of temperature on states of matter

Activities

These activities are intended for use before your visit to the Virginia Air and Space Center. It is beneficial for the students to have some prior knowledge about the content area covered in the program. All of the activities can be tailored to your specific classroom needs, and procedures listed are suggestions for teaching.

Activity 1: Headed for Outer Space

Prep- You will need to print out a color copy of an astronaut in a space suit and a picture of a NASA space shuttle. If you don't already have posters or pictures of these items you can find them under Google images. Put the pictures up on the board where all your students can see them.

Ask your students, "If we were all going to take a trip into space, could we go dressed like we are right now?" Most of your students will answer no. Ask them, "Why not?" We would all want to wear a space suit to protect us from space's harsh environmental conditions. Then ask your students to help you list what the conditions in space are like on the board. You can also have your students list these conditions on a piece of paper as well.

This is a list of conditions you may want to cover:

-Lack of oxygen

*Have all of your students take in a deep breath of air. Then ask "Will our space suit need to supply us with oxygen in outer space?" Yes it will.

- Severe cold and hot temperatures

*In outer space the temperatures are very extreme. In the sun's light it is really hot, and in the shade where no sun light hits, it is really cold. Ask your students, "Do we need a space suit that will control our body's temperature in outer space?" Yes we do.

-Lack of air pressure

*Explain that air is pushing in around us at all times, but in outer space there is no air pressure. So if we were to go into outer space without a space suit the lack of air pressure would cause our body serious damage. So that is why we also need a space suit to protect our bodies from the lack of air pressure.

-Lack of gravity

*Explain that gravity is the force that keeps us on the ground. Without gravity we would be flying all over the place. So in outer space when astronauts need to do work outside the space shuttle, their suits have a long secure line that attaches them to the space shuttle for protection.

Your students may come up with other conditions that are controlled by a space suit. Discuss them all. Explain that a space suit has many functions. Then ask, "How did scientists know what kind of materials to use to make the space suit?" "How did they know that these materials could withstand the severe temperatures of space?" They performed many experiments to test all of the materials. "Would you want a space suit made out of the cotton material your t-shirt is made from?" NO you wouldn't because that material would burn up in a second. Scientists tested tons of materials like metals, rubber, glass, etc. to see what things could withstand such harsh conditions. They also did the same with the materials used to engineer a space shuttle. Throughout your discussion with your class, list all the functions of a space suit.

Extension: You can create a lesson that discusses all of the many functions a space suit provides for astronauts. Some of the functions you may want to cover could include the following: the liquid cooling system, drink bag, oxygen supply, microphones, headphones, bladder device for urine collection, etc.

Activity 2: Experiment Safety

The Space Freeze demonstration that your class will be attending at the Virginia Air and Space Center tests different materials for durability to severe cold temperatures using liquid nitrogen. Handling liquid nitrogen can be very dangerous if the proper safety procedures are not followed. This activity is to educate your students on experiment safety before they come to the center.

Explain to your students that scientists and engineers have the important job of determining what materials can be used to build everything around us. When you go to the Virginia Air and Space Center, you will actually get hands on experience testing some materials. Ask your students, "If we are going to be conducting some experiments, what kind of safety gear do you think we will need?" "Can we put materials into a container of severely cold material with our bare hands?" No, we need safety gloves to protect our hands. "What about our eyes?" "What if something were to "pop up" out of the container?" "Would we want it to get into our eyes?" No, we need safety goggles to protect our eyes. "What if we are just sitting in the audience watching and something accidentally jumps out towards us?" "Do we pick it up with our hands?" No we don't want to touch it because it could hurt us. Explain that most experiments are done under a controlled setting. A controlled setting means that all the materials and procedures have been thoroughly planned out so that everything is safe and nothing is interfering with the findings. Explain that safety is always top priority. Always have an adult around when doing experiments.

Extension: You can put together an experiment in your classroom using temperature and measurement. Use the scientific Method. Have your students make observations, questions, hypotheses, experiments, and conclusions.

Resources

WEBSITES

http://www.chem4kids.com/flies/matter_intro.html

http://www.cosmos4kids.com/flies/universe_vacuum.html

http://www.biology4kids.com/flies/studies_scimethod.html

<http://www.pbs.org/teachersource/>

http://www.kidsastronomy.com/explore_index.htm

http://www.kids.gov/k_space.htm

<http://idahoptv.org/dialogue4kids/season7/matter/facts.html>

<http://teacher.scholastic.com/space/tguide.htm>

<http://www.astronautix.com>

BOOKS

Living in Space. Don Berliner. 1993.

The Magic School Bus Lost in the Solar System. Joanna Cole. 1990.

Space Station Science: Life in Free Fall. Marianne Dyson. 1999.

Space Stations. Roy A. Gallant. 2001.

Space Shuttles. Gregory L. Vogt. 1999.

What's the Matter in Mr. Whisker's Room? Michael Ross. 2004.

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