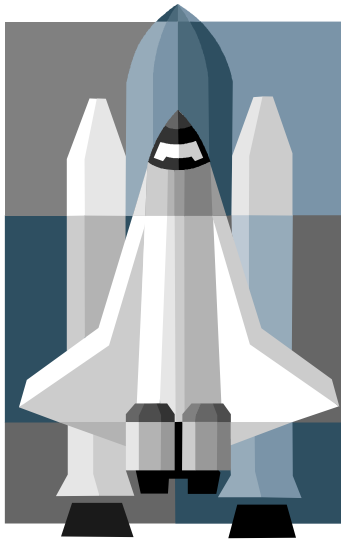




Demo Space Freeze III: Cryogenics

Pre-Visit Activities

Grades 6-12



Developed 12/06

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Standards of Learning

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

- 6.1-** The student will plan and conduct investigations in which:
- observations are made involving fine discrimination between similar objects and organisms
 - hypotheses are stated in ways that identify the independent (manipulated) and dependent (responding) variables
 - a method is devised to test the validity of predictions and inferences
 - one variable is manipulated over time with many repeated trials

PS.2- The student will investigate and understand the basic nature of matter. Key concepts include:

- the particle theory of matter
- elements, compounds, mixtures, acids, bases, salts. Organic, inorganic, solids, liquids, and gases
- characteristics of types of matter based on physical and chemical properties
- physical properties (shape, density, solubility, odor, melting point, boiling point, color)

PS.7- The student will investigate and understand temperature scales, heat, and heat transfer. Key concepts include:

- absolute zero, phase change, freezing point, melting point, boiling point, conduction, convection, radiation, vaporization, and condensation

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: Exploration Research

Prep- This program is set up for such a wide ranged age level that it may require you to do a little research of your own. You can make this activity as in-depth or as brief as you would like. This research activity requires some materials and resources, such as the library and the internet, be available for your students. They will break up into assigned groups and be given a task sheet of questions they will need to research. There are four different groups of subject matter they will be researching that all involve space exploration. Depending on the number of kids you want in each group, you can give the same task sheet to two different groups. One group may find different information than the other, which may prompt an interesting group discussion. There has been a task sheet for each group included in this packet.

Group 1- The Space Suit and its Functions

1. What do a balloon and space suit have in common?
2. What outside elements does a space suit need to protect you from?
3. What functions does a space suit provide that protect you from the above listed elements?

4. What is an EMU space suit used for?
5. How is an astronaut's body temperature controlled while working out in space?

Group 2- Space Tools

1. Can tools used here on earth be used to do work out in space? Why?
2. Can tools used here on earth be easily modified for use in space?
3. What is a trowel and what is it used for in space?
4. While working in space, what are infrared cameras used for?
5. What do astronauts use a MMWS for while working in space?

Group 3- The ISS (International Space Station)

1. How much does the space station weigh?
2. What effects does microgravity have on astronauts living on the ISS?
What part of the body does it affect?
3. What year did the very first piece of the ISS go into orbit?
4. How does the ISS communicate with people here on earth?
5. How many people can live on the ISS at one time?

Group 4- Space Shuttle

1. What is the longest a space shuttle has stayed in orbit for a single mission?
2. How many minutes after launch do the external fuel tanks separate from the space shuttle?
3. What is the maximum weight of cargo a shuttle can take into orbit?
4. What is the wing span of the shuttle in meters and feet?
5. How many people does it take to man the shuttle into space?

Activity 2: Working in Space

This is a fun activity that also gives students a better understanding of how difficult it is for astronauts to work in space.

Prep- Here is a list of materials you will need for this activity:

- Several pairs of thick, oversized, insulated ski gloves or heavy duty work gloves.
- A variety of tools, for example: pliers, socket wrench, screwdrivers, and robotic arm if you have one available.
- Things they can put together and fix, such as a lamp, flashlight, etc. You can also use nuts and bolts, Legos, and K'nex.

Once you have collected all your items, you can set up your class room with activity stations. Have your students work in groups, or you can plan out timed relays where the groups are in a race to get each job completed.

Have your students time how long each task takes with the big thick gloves and without the gloves. Have a class discussion with your students. Ask them "How much longer did each task take with the gloves on?" How much harder was each task with the gloves on? Imagine how difficult it would be with your whole body in a suit. Have students discuss how difficult it would be to do those simple tasks in zero gravity.

Extension: You can make this activity even more tricky by having one student try to do each task blindfolded with the gloves on while his or her other class mates verbally help them through it. This will give your student a better understanding of how much concentration and quick thinking astronauts have to be. What if something happens out in space, say a camera loses visual of a target, and your fellow team mates are stuck completing a job just off a verbal command? Everyone has to work together and work fast.

Activity 3: Experiment procedures and Safety

For this activity you will plan an experiment in your classroom using temperature, while also making sure to take safety procedures into consideration. Pick an experiment that tests how temperature changes can change the properties of a given molecule. Ask your students to label each variable in the experiment. Was the experiment done in a controlled setting? What kind of outside conditions could have altered the findings or outcome of the experiment?

Here is a list of suggested websites. There are several experiments listed here that are perfect for this subject matter:

- <http://www.madsci.org/posts/1175000884.Ph.r.html>
- <http://school.discovery.com/sciencefaircentral/jvc/index.html> This website has a variety of resources and experiment ideas that will be very helpful to you.

- <http://www.spartechsoftware.com/reeko/Experiments/ExpSteelWoolGeneratingHeat.htm> This is a very neat experiment that involves temperature.
- http://www.kids-science-experiments.com/cat_temperature.html
-

Extension: You can break your students up into different group and have each group plan out their own experiment, making sure they keep a log of all their data and findings. Then have each group present their findings to the rest of the class.

Resources

WEBSITES

- http://www.sciencemadesimple.com/lab_safety.html This website has a list of general lab safety procedures.
- <http://teacher.scholastic.com/space/tguide.htm>
- <http://www.astronautix.com>
- <http://depts.washington.edu/rural/RURAL/design/scimethod.html>
- <http://www.isd77.k12.mn.us/resources/cf/SciProjInter.html>

The following are websites and resources you will need for activity one's research project:

- http://www.space.com/business/technology/050713_rtf_sts114_tools.html
- http://www.nasa.gov/mission_pages/station/main/index.html
- <http://quest.nasa.gov/space/teachers/suited/6work.html>
- http://spaceplace.nasa.gov/en/kids/eo1_1.shtml
- http://www.space.com/business/technology/050713_rft_sts114_tools.html
- <http://spaceflight.nasa.gov/shuttle/reference/basics/index.html>
- http://www.pbs.org/spacestation/station/living_spacesuit.htm
- <http://www.factmonster.com/ipka/A0875382.html>

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