



Demos, Labs, & Science Stations Feature:

- Hands-on Investigations
- STEM Challenge
- Scientific Literacy
- Inquiry Process Skills

EARTH SCIENCE - 5E **NGSS · TEKS**

ASTRONOMY & SPACE

INVESTIGATION STATION

IMAGINATION STATION

Space Suit Challenge

ASTRONOMY & SPACE SCIENCE

who travel to space face many challenging conditions that engineers need to consider when designing space suits. Challenges include extreme conditions such as space being a vacuum, which is a place that has no air. Because most of space is empty, there are no air molecules in space. Without air molecules, an astronaut in space would not be able to breathe. Therefore, if an astronaut is not in direct sunlight, then the temperature of the space suit is very cold. Knowing this, engineers need to design spacesuits that keep the heat in with the astronaut.

Materials:

- ruler
- bubble wrap
- cotton balls
- newspaper
- styrofoam peanuts
- cardboard
- popsicle sticks
- plastic baggies
- tape
- rubber bands
- weights or rocks

Procedure:

1. Prepare the materials you will need to build a thermal space suit for your astronaut (soda can) to represent the astronaut. You will need to have them approved by your teacher.

2. The space suit which meets the following requirements:

- It must be easily inserted to and removed from the space suit.
- It must be able to be tampered with in any way.
- The diameter of the space suit may not exceed a diameter of 20 cm.
- It must be completed within the given time by the teacher.

Assessment:

1. The space suit must be able to hold the soda can until it reaches 2 inches high.

2. The space suit must be able to hold the soda can in the ice water. Put weight on top of the can so that it sits on top of the space suit.

3. The space suit must be able to hold the soda can for 100 seconds.

DEMONS, LABS, & SCIENCE STATIONS

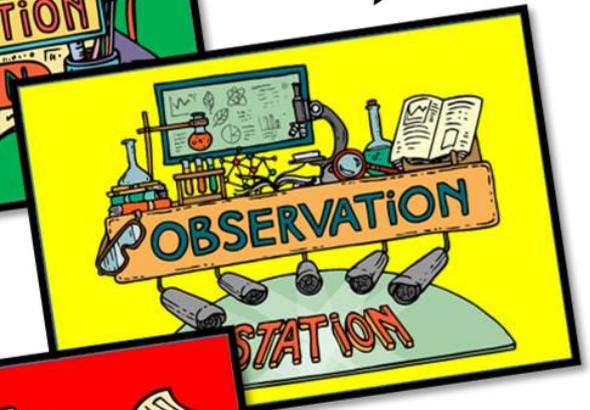
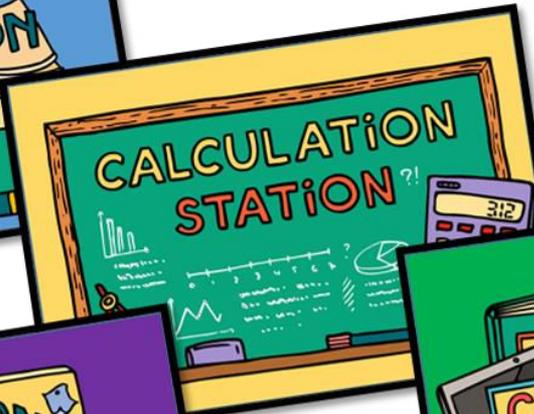
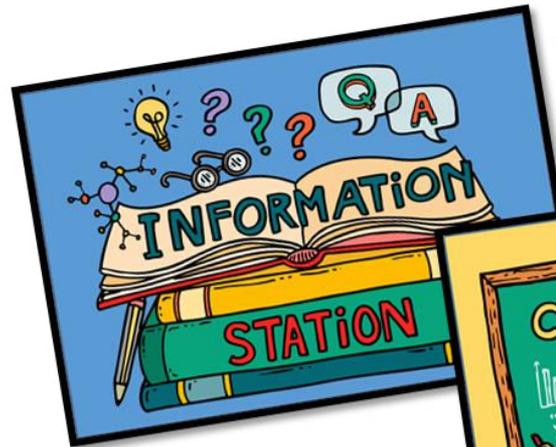
HANDS-ON · STEM · CRITICAL THINKING

**ENGAGING
READING!**

**GRAPHING,
WORD
PROBLEMS &
MEASUREMENT!**

**INQUIRY
SKILLS &
PROCESSES!**

**HANDS-ON
INVESTIGATIONS!**



STEM CHALLENGES!

ALL Station Signage Included!!

Color & Black and White





Teacher guide and answer key offered for every lab!

Easy-to-get materials!



Orbits of Inner Planets

ASTRONOMY & SPACE SCIENCE

Activity: Students will recognize the planets that orbit closer to the Sun have faster revolutions than those farther away.

Materials:

- sidewalk chalk
- outdoor area (basketball court, parking lot)
- meter stick

Procedure:

Before demo:

1. Have students go out and help you measure concentric circles in the parking lot with sidewalk chalk. The circles should be centered on an object (SUN) with a radius of 35 meters, 50 meters, and 75 meters.

During class:

2. Choose four students - one to represent the Sun and the other three to represent the inner planets of Mercury, Venus, and Earth.
3. Have students model the orbits around the Sun by walking around each path at the same speed. Ask the other students to make observations.

What's happening?

The planets orbit around the Sun. Revolution is the movement of one object around another and one complete revolution around the Sun is a year. The planets follow a path, or an orbit, as they revolve around the Sun. The closer they are to the Sun, the faster they revolve around the Sun.

Discussion:

Q: If everyone moved at a constant speed, which planet orbited the Sun the fastest? The slowest?

A: Fastest - Mercury, Slowest - Earth

Q: Do you think all planets orbit the Sun in a perfect circle? Why or why not?

A: Kepler discovered that the orbit of each planet is an ellipse, an oval shape, which may be elongated or nearly circular.

©Henry Denny Science

Space Suit Challenge

ASTRONOMY & SPACE SCIENCE

Astronauts who travel to space face many challenging conditions that engineers must consider when designing spacecraft. Challenges include extreme conditions such as space being a vacuum, a place empty of all matter. Because most of space is empty, there are no air molecules. Without air molecules, there is nothing to hold in the Sun's heat. Therefore, if an astronaut is not in direct sunlight, the temperatures fall to very low levels. Knowing this, engineers need to design spacesuits that keep the heat in with the astronaut for an extended period of time.

Materials:

• 2 aluminum soda cans	• ruler	• popsicle sticks
• 2 line markers	• bubble wrap	• plastic baggies
• aluminum cake pan	• cotton balls	• tape
• stopwatch	• newspaper	• rubber bands
• water	• Styrofoam peanuts	• weights or rocks
• ice	• cardboard	

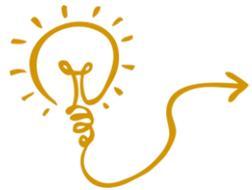
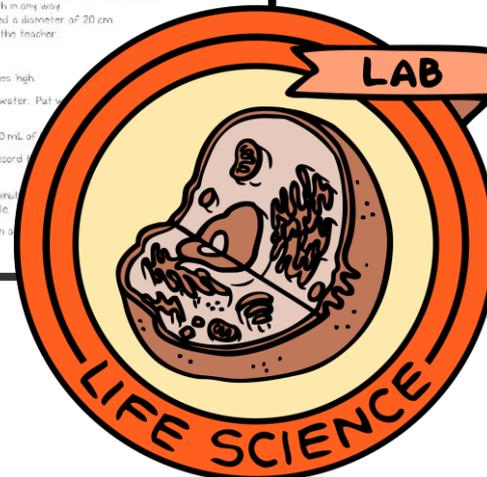
Procedure:

Part A: Design and Build

1. Determine which materials you will need to build a thermal space suit for your astronaut (soda can) to reduce heat loss. If you would like to use additional materials, you will need to have them approved by your teacher.
2. Design and build a space suit that meets the following requirements:
 - Can must be able to be easily inserted into and removed from the space suit
 - The can is not allowed to be tampered with in any way
 - Suit placed around soda can may not exceed a diameter of 20 cm
 - Build time must not exceed given time by the teacher.

Part B: Test the Thermal Space Suits

3. Add ice water to the cake pan until it reaches 2 inches high.
4. Place the insulated and non-insulated can in the ice water. Put it firmly on the bottom of the pan.
5. The teacher will fill each can with approximately 100 mL of water.
6. Immediately put a thermometer in each can and record their numbers in the data table.
7. Allow the cans to sit in the ice water bath for 10 minutes. Record the results in the data table.
8. Calculate the total temperature change for each can.



Discussion questions and teacher set-up included!



Group members will read a passage and then complete a task to help increase science literacy and deepen their understanding of the science concept.



Information Station

Trappist-1 Solar System

For years there has been a fascination with the question, "Is there life on other planets?" Hollywood has produced countless science-fiction movies that keep audiences on the edge of their seats. It's fun to entertain the possibility that aliens are real and imagine what it would be like to live on another planet that hasn't been discovered. Outer space is so vast that other solar systems may exist that could support life. Scientists have discovered such a solar system surrounding a red dwarf star called Trappist-1.

Information Station

A

Where is the Trappist-1 solar system located?

Information Station

B

Compare the age of our solar system to the age of the Trappist-1 solar system.

Information Station

A. _____

B. _____

C. _____

D. _____

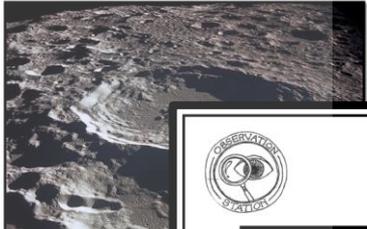
Information Station

D

What record did the Trappist-1 solar system set?

Observation Station

A



Observation Station

B



LUNAR ECLIPSE



SOLAR ECLIPSE

Observation Station

C



1. The image above is a pair of _____ to complete construction on the International Space Station (ISS). What is the record for the longest time spent in space?

2. Would you ever want to go to space? Why or why not?

Name _____ Date _____

A1. _____

A2. _____

B1. _____

B2. _____

C1. _____

C2. _____

Group members will have images, illustrations, or actual samples at this station that show applications or processes of the science topic.



Group members will work with one another to explore the concept through hands-on activities, so they may practice specific inquiry process skills as they learn.



It's a Revolution

Problem How does a planet's distance from the Sun affect its period of revolution?

Materials:

- ball and string model with a handle
- stopwatch
- ruler or meter stick
- safety goggles

Procedure:

1. The ball and string represent the planet and the plastic handle on the model is used to help keep the ball swinging in a circle.
2. Stand on the Floor where the ball is 20 cm away from other students and the Sun.
3. Pull the string, so the ball is 20 cm from the handle above your head, and begin to swing the ball in a circle. Keep it moving.
4. One group member uses the stopwatch to make ten complete revolutions. Record the period of one revolution in the table.
5. Repeat steps 3-4 for two more trials. Calculate the average period of revolution for the three trials.
6. Repeat steps 3-5, pulling the string so the ball is 40 cm from the handle.
7. Answer the questions on your worksheet.

Name _____ Date _____

Distance (cm)	Period of Revolution (s)			
	Trial 1	Trial 2	Trial 3	Average (s)
20				
40				
60				

Analyze and Conclude:

1. Explain what occurred to the period of revolution as you increased the length of the string.

2. In the investigation, what did the string moving the ball around in a circle represent, and what was the force pulling on the string?

3. How did this investigation relate to the planets traveling around the Sun?

© 2015 Getty Images

A

Explain how scientists believe the Sun and planets in our solar system were formed.

B

Name the inner and outer planets and explain why they are classified in this way.

A

A: Created 4.6 billion years ago from a giant nebula cloud of rock, dust and ice which exploded creating a dense area at the center.

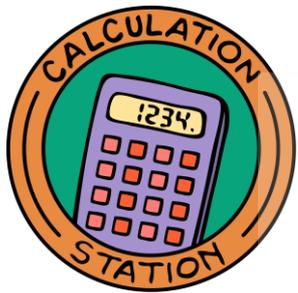
B

A: Inner planets found inside asteroid belt are Mercury, Venus, Earth and Mars, outer planets outside of asteroid belt are Jupiter, Saturn, Uranus and Neptune.

Name _____ Date _____

What occurs when _____

There are three different options for this station: interviews, videos, or group essay. Depending on the option you choose, group members will communicate what they know by answering questions in creative ways.



Group members use their math skills to complete the station challenge. Skills may include graphing, analyzing data, using models, measurement, and calculating formulas or word problems.

Happy Birthday

Every 365.24 days, you celebrate a special day... your birthday! Well, at least on Earth, that is. What if you were born on another planet? How many birthdays would you get to celebrate?

The Earth makes one revolution around the Sun every 365.24 days, which is a year. Therefore, your age is based on the total number of revolutions Earth has made since the day you were born. Since every planet is in a different orbit around the Sun, each planet's revolution takes a different amount of time. The chart below shows the length of time it takes each planet to make one revolution around the Sun!

Planet	Calculation	Age
Mercury		
Venus		
Earth		
Mars		
Jupiter		
Saturn		
Uranus		
Neptune		
Pluto		

Considering your data, would you consider having your birthday party on another planet? Why or why not?

Procedure

- Write down your age.
- Using the table above, calculate how many birthdays you would have on each planet. Use the Formula below to help you.

Current Age: _____

Planet's period of revolution (in days): _____

Calculation: $\text{Age} \div \text{Period of Revolution} = \text{Number of Birthdays}$



The Eggstronaut

Challenge Create a space capsule to help your Eggstronaut return safely to Earth.

A space capsule is an often named spacecraft with a simple shape without wings or other features that could potentially cause lift during atmospheric reentry. Engineers building a space capsule must consider forces such as gravity and drag. In addition, the space capsule must be strong enough to slow down quickly, endure extremely high or low temperatures, and survive the landing.

Materials:

- 1 raw egg
- 1 paper towel
- 30 cm tape
- 3 string
- 4 Styrofoam peanuts

System Requirements:

- Group members must work together to design a capsule that will protect the egg on Earth and can easily allow the egg to be removed.
- Only materials listed above can be used.
- Draw a sketch of the completed capsule with the name of the space capsule.
- Test your space capsule according to the system requirements.
- Answer the questions on your worksheet.

Testing:

At a time and place of your head choice, place your capsule on a flat surface, hold it at a height and keep your fingers close to the capsule. Drop it!

1. Was your space capsule successful at protecting your eggstronaut? Is there anything you would change in your design?

2. How does a typical space capsule return to Earth?

Group members will work together to solve a STEM (Science, Technology, Engineering, Math) challenge by creating models or designs that demonstrate their understanding of the science topic being taught.



This station makes science concepts relevant for students by asking them to imagine scenarios that will bring about discussion and critical thinking.

USER-FRIENDLY PAGES:

Students easily recognize which answer sheet to use at each station by matching station icons located on each page!

Mission: Martian Habitat

Directions: Use your imagination to answer the statement below.

IMAGINE you are the chief engineer of the new mission to colonize Mars and your first task is to design habitats for humans to live.



The grain of the fine sand is formed out of several pebbles.

Describe your design.

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Drip, Drop, Splat!

Problem: How does the density of a liquid and drop height effect the size and shape of liquid splatters?

Materials:

- colored water (graduated cylinder A)
- colored syrup (graduated cylinder B)
- eye dropper
- paper
- metric ruler
- meter stick

Procedure:

- Make a hypothesis of how density of a liquid will effect splatter size on your lab sheet.
- Place the piece of paper down on the lab table in order to catch splatters.
- Measure the heights listed in the data table using a meter stick. Place meter stick with end starting at zero on paper and move up stick when increasing height of drop.
- Use the eye dropper to drop ONE drop of colored water and ONE drop of colored syrup. Make sure to drop on different places on paper.
- Measure the size of the splatter in MILLIMETERS. Record in data table on answer sheet.
- Repeat for each height.
- Use the collected data to graph the splatter size versus drop height for each liquid.

Analyze and Conclude

- Was your hypothesis correct? Explain.
- What were two controls in your experiment that helped you collect the most accurate data possible?

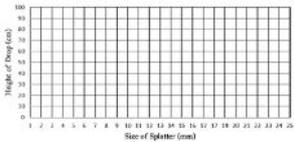
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Date _____

Hypothesis _____

	Drop Height (cm)				
	5	25	50	75	100
Colored Water					
Colored Syrup					

Height of Drop vs. Splatter Size



Legend
 Water
 Syrup

Analyze and Conclude:

- _____
- _____

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TEACHERS SAVE TIME:
Laminate station pages and reuse for each class and for years to follow!

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Demo

Guided Inquiry Lab

Science Stations

Inquiry-Based Science Unit: Astronomy and Space	Classifying	Communicating	Compare & Contrast	Creating Models	Gather/Organize Data	Generalizing	Identifying Variables	Inferring	Interpreting Data and Graphs	Making Decisions	Manipulating Materials	Measuring / Calculating	Observing	Predicting
Orbits of Inner Planets	X	X		X		X				X	X		X	
Gas Giants			X		X					X			X	
Space Suit Challenge		X		X	X		X		X	X	X	X		X
Information Station: Trappist-1 Solar System					X	X		X						
Observation Station: Images & Questions	X		X		X	X		X					X	
Investigation Station: It's a Revolution	X		X		X		X		X		X	X	X	
Calculation Station: Happy Birthday					X		X			X		X		
Communication Station: Questions	X	X				X				X				
Creation Station: The Eggstronaut		X		X	X				X	X	X	X	X	X
Imagination Station: Mission: Martian Habitat		X		X						X				X

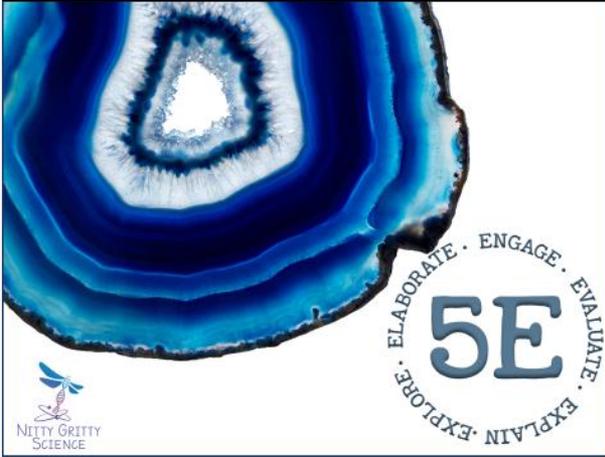
NGS promotes scientific inquiry throughout the curriculum. Students become more confident and effective learners while developing problem-solving and critical thinking skills. Process skills, such as planning, organizing and evaluating, help students to complete projects and assignments. These skills allow students to independently gather information, analyze it, and draw their own conclusions.

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