

S . T . E . A . M

To-Go Kit

This kit focuses on science, technology, engineering, arts, and math themed activities.

Activities included:

- Build a volcano
- Craft stick helicopter
 - Glowing circuit
 - Grow a crystal
- Decorate a rocket

Please visit the MoTTU website @
<http://www.depts.ttu.edu/museumttu/>
for instructional videos related to this kit!

Build a Volcano



What is a volcano?

A volcano is a mountain that opens downward to a pool of molten rock below the surface of the earth. When pressure builds up, eruptions occur. Gases and rock shoot up through the opening and spill over or fill the air with lava fragments.

Included Supplies:

- 2 packages of Crayola Model Magic
- 2 film canisters
 - White filled with vinegar
 - Black filled with baking soda
- 1 paper plate
- 1 prefilled paint pot set
- 2 different sized paint brushes

Supplies Needed:

- Paper towels for cleanup

Activity Steps:

1. Place the black film canister --filled with baking soda-- in the center of the paper plate (keep closed).
2. Using the two packages of Model Magic create a volcano/mountain shape around the black film canister. As you build the volcano, leave the lid on the film canister to protect the baking soda.
*MAKE SURE THAT THE MODEL MAGIC DOES NOT COVER THE SIDES OF THE LID!
-This will prevent the lid from being able to open once it dries!
*Let dry overnight.

3. Once volcano is dry, use the paint and paint brushes provided to add color to your volcano.
*Let dry for a few hours.



4. Once paint has dried fully, remove the cap from the black film canister. Then, slowly pour the vinegar from the white film canister into the baking soda that is contained in the black film canister. Watch 'the eruption'.



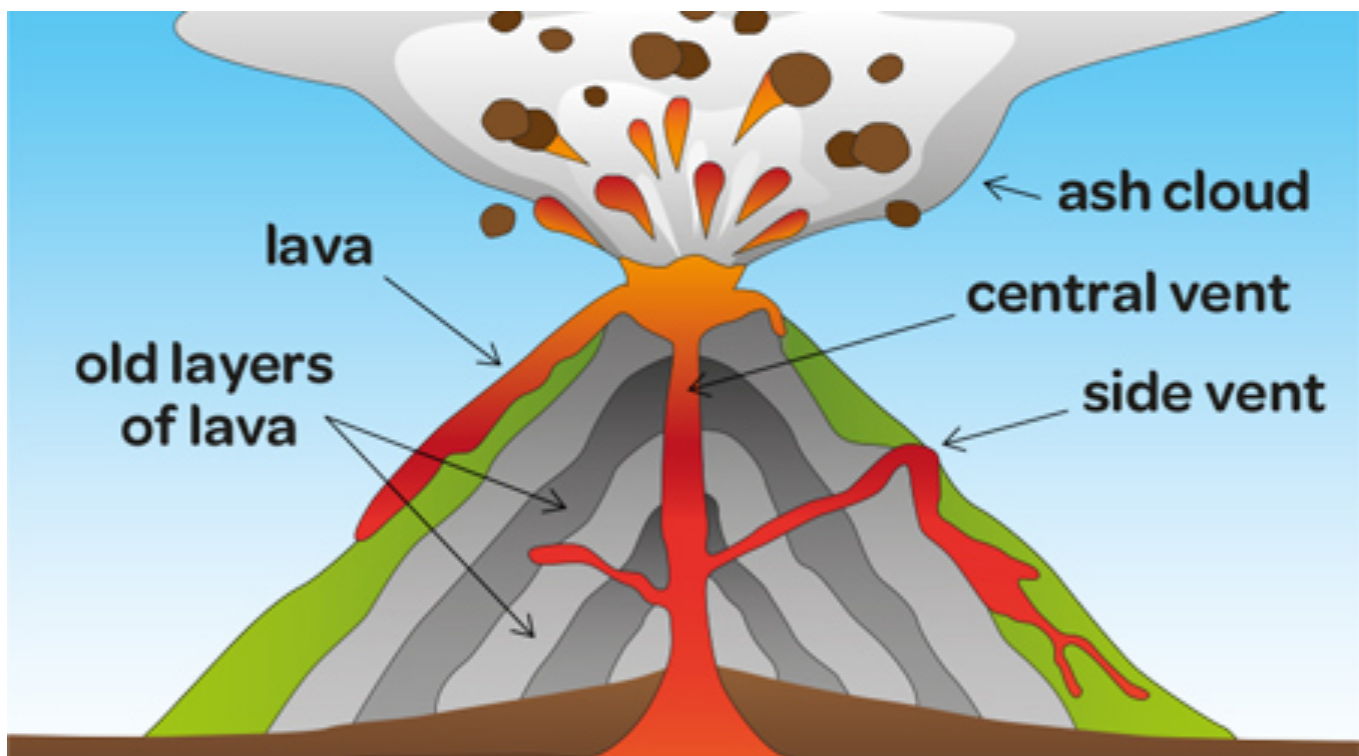
Explanation:

- Explain that is also a chemical reaction! When an acid and a base mix they form a gas called carbon dioxide. Here the vinegar is the acid and the baking soda is the base.
- Explain that this experiment makes an eruption similar to a volcano, however a real volcano does not erupt because it has baking soda and vinegar inside of it.

Why does a volcano erupt?

Volcanoes are giant landforms created by the escape of molten rock called lava from an opening or crater in its surface. When pressure builds up inside the mountain it forces molten rock (lava), ash and gases out through the top. This is called an eruption!

The Earth's crust is made up of huge slabs called plates, which fit together like a jigsaw puzzle. These plates sometimes move. The friction causes earthquakes and volcanic eruptions near the edges of the plates. The theory that explains this process is called plate tectonics.



Rubber Band Helicopter

How does a rubber band helicopter fly?

Energy is stored in the rubber bands by turning the propeller, which generates lift. A twisted rubber band contains a lot of energy. Attached to the propeller in the helicopter in this project, the rubber band, when allowed to untwist will turn the propeller. The untwisting rubber band also spins the main body of the helicopter and the rubber band unwinds from both ends of the rubber band at the same time. Attaching a paper helicopter cut-out creates horizontal (side-to-side) drag which provides more energy to the propeller.

Included Supplies:

- 1 craft stick
- 1 propeller
- 2 rubber bands
- 1 roll of tape
- 1 paperclip
- 1 helicopter cutout

Supplies Needed:

- Scissors

Activity Steps (See photos below):

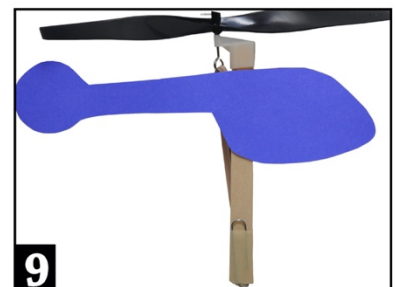
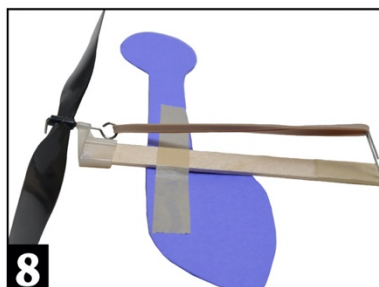
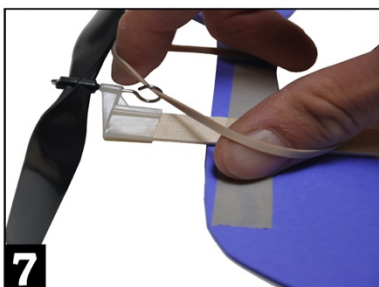
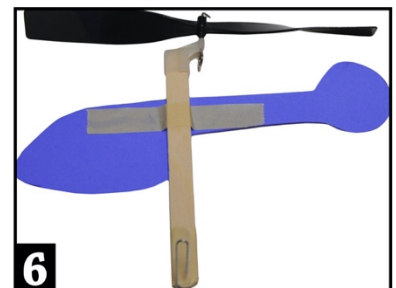
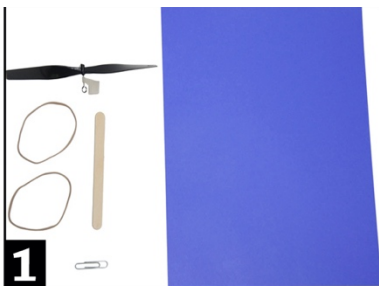
- Add the propeller to the top end of the craft stick.
- Bend the paperclip open halfway and securely tape the larger end to the

bottom of the craft shape (creating a 'L' shape with the bent paper clip).

- Cut out the helicopter shape and tape it horizontally onto the craft stick below the propeller.
- Wrap one end of the rubber band around the open end of the paper clip and attach the other end to the hook attached to the propeller.
- To make the helicopter fly, face the propeller up and away from you and turn it clockwise until the rubber band becomes very difficult to wind (50-80 rotations).
- Hold the propeller with one hand and pinch the bottom of the craft stick and release.

Explanation:

- Explain that the lift occurs when an object pushes against the air (or other gas/fluid), typically causing the object to rise upward or slow its descent.



Glowing Circuit

What is a circuit?

A circuit is a complete path that allows electricity to flow. It must include a source of electricity, such as a battery. Materials that allow electric currents to pass through them easily, called conductors, can be used to link the positive and negative ends of a battery creating a circuit.

Included Supplies:

- 1 piece of 8.5 x 11 inch black card stock
- Copper tape
- 1 coin cell battery
- 1 LED mini bulb
- 1 roll of tape

Supplies Needed:

- Pencil

Activity Steps:

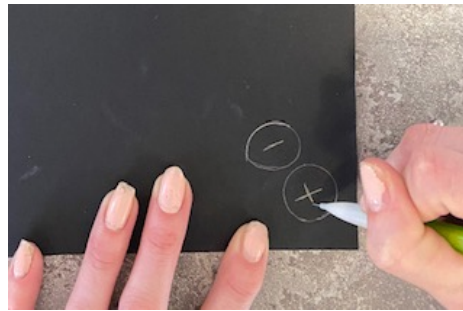
1. Place cardstock in front of you, with the 11-inch sides running North & South, and the 8.5-inch sides running East and West. Fold black card stock in half from 11 inched end to 11 inched end.



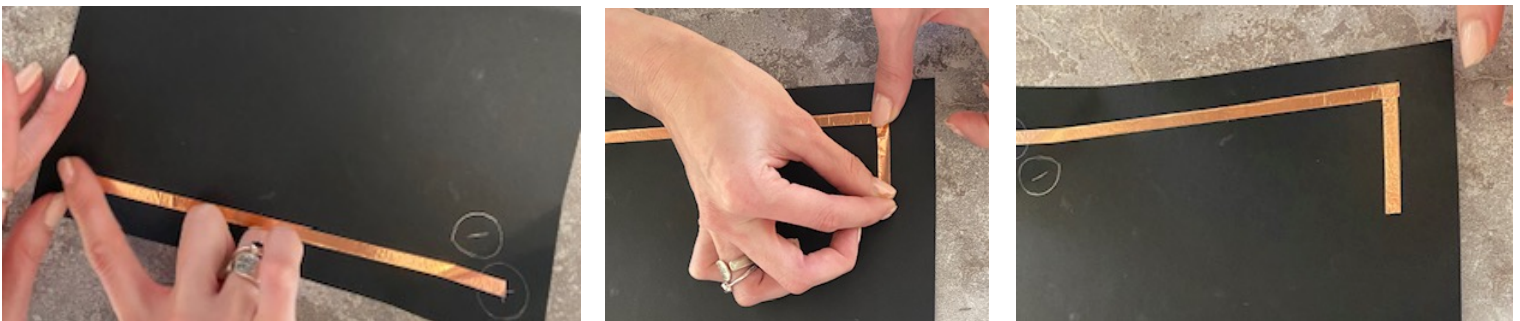
2. Fold over the bottom right back corner of the paper and using a pencil, trace the battery on both sides of the fold.



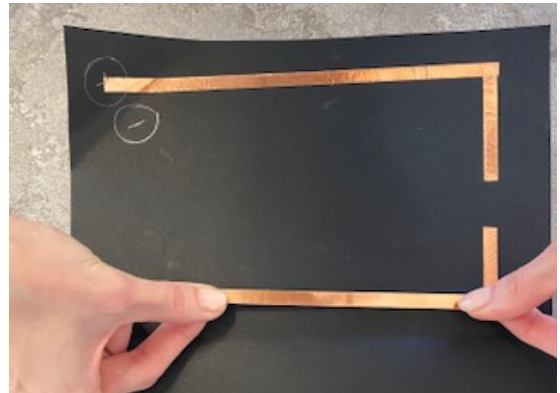
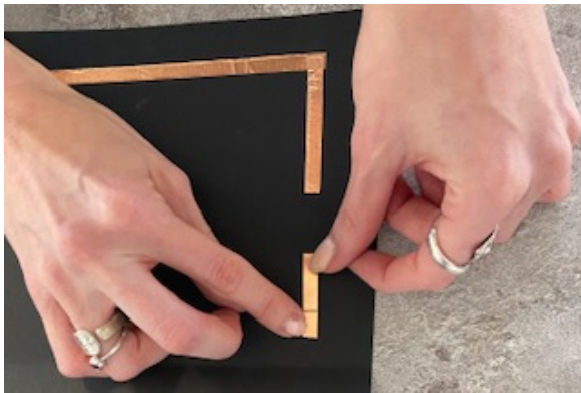
3. Draw a positive (+) sign on the circle on the folder corner, and a negative (-) sign on the other circle.
 - This will allow you to know which side of the battery needs to touch each circle.



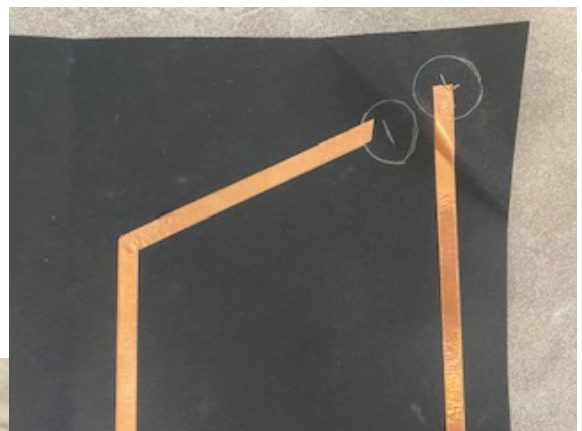
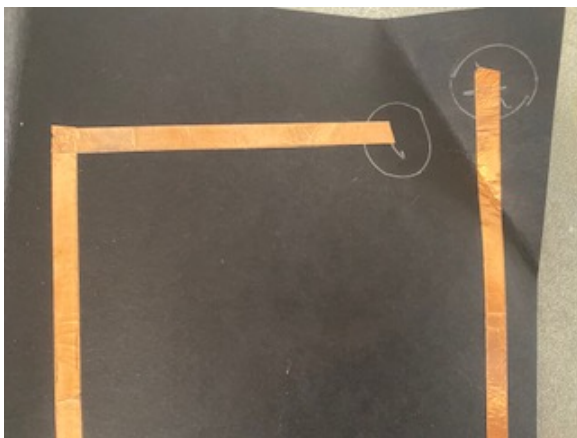
4. Create two lines of copper tape, one starting on the positive (+) circle of the folded corner and adding another small piece at the end of the first piece to create a L shape.
(this is your positive end of your circuit)



5. Leave about a $\frac{1}{2}$ inch gap between the shorter copper line you just laid down and lay another shorter piece parallel towards the fold of the paper. Then lay down a longer piece that touches the end of the short piece.
(creating another L shape)

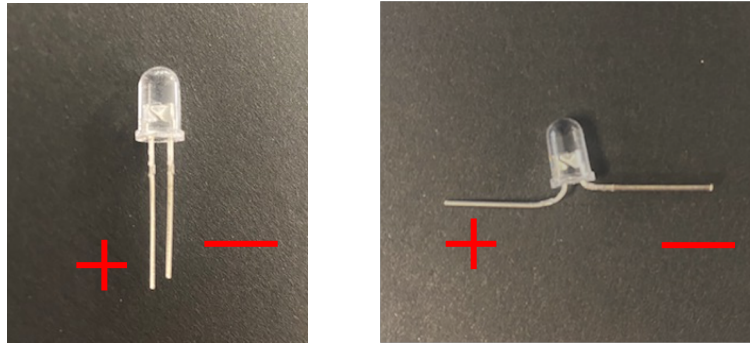


6. Finally, add another strip of the copper tape to the end of the piece that you just laid down and make sure this piece ends in the negative (-) circle.
- Depending on the size of the piece of tape this could be in a L shape or laid in a diagonal line.

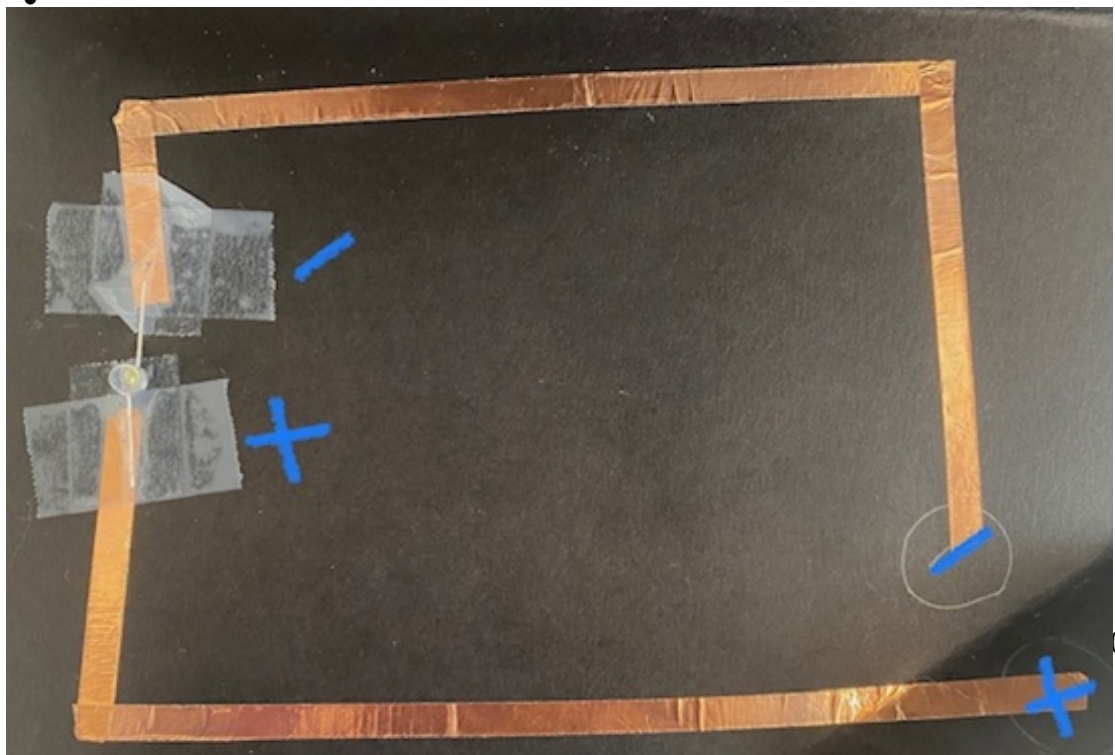


ATTACHING THE LED (light-emitting diode)

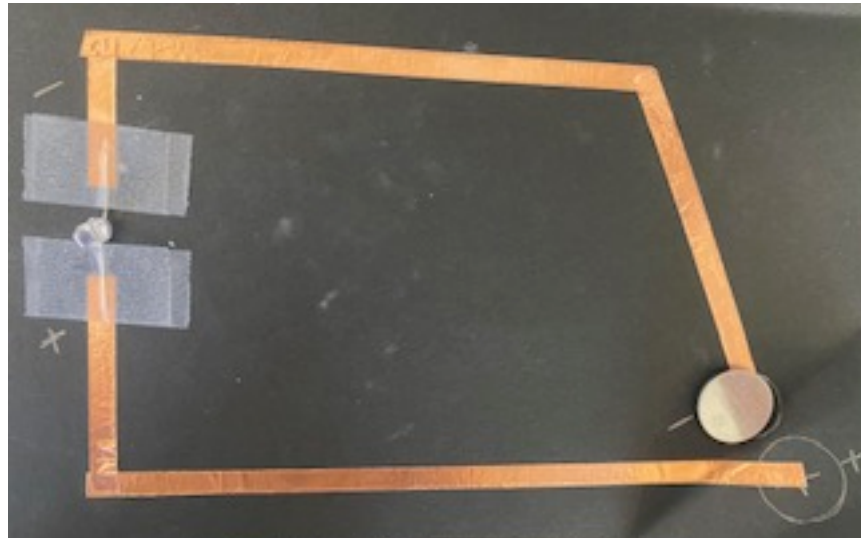
7. Notice the LED has two metal pieces, known as the LED's legs, attached to the end of the light that are not the same length.



- The longer one is the positive (+) side of the LED, and the shorter leg is the negative (-) side.
8. Tape down the LED with the legs touching on the copper.
- Connect the positive (+) side of the battery to the positive (+) leg of the LED, and connect the negative (-) side of the battery to the negative (-) leg of the LED.



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- 9. Place the negative (-) side of the battery (the side without words) on the negative circuit circle.



- 10. Fold the corner to see the LED light up. If it doesn't light up, try flipping the battery to make sure the positive side of the battery connects to the positive leg of the LED.



Grow A Crystal



What is a crystal?

A crystal is a solid that is made up of small, regular 3D shapes. The chemical bonds of a crystal are very ordered and join together at regular angles. Examples of everyday materials you encounter as crystals are table salt, sugar, and snow. Many gemstones are crystals, including quartz and diamond.

****PLEASE READ THE INCLUDED INSTRUCTION GUIDE FOR FULL SAFETY INSTRUCTIONS & FIRST AID INFORMATION****

****FOR USE UNDER ADULT SUPERVISION****

****CONTAINS SOME CHEMICALS WHICH PRESENT A HAZARD TO HEALTH IF NOT HANDLED PROPERLY****

Premade Kit Includes:

- Plastic Container
- Seed Crystal
- Crystal Powder
- Stir Stick

Supplies Needed:

- 230 milliliters of water (needs to be brought to a boil)

Steps:

1. Fill the plastic container with boiling water to reach the marked line of 230 milliliters.
 - Use a sharpie or other dark marker to help identify the line easier if needed.
2. Add the crystal powder and stir well until mixed.
3. Wait for the solution to cool down (about 20-30 minutes) then add the seed crystal to the bottom of the container. Make sure the flat surface of the seed crystal is sitting flat on the bottom of the plastic container
 - *DO NOT PUT THE LID ON THE CONTAINER AS THE CRYSTAL BEGINS TO GROW WITHIN THE FIRST 48 HOURS.
4. Leave crystals uncovered for the first 48 hours and leave undisturbed in a dust-free room temperature environment.
 - The longer you leave the crystal in submerged in the liquid and container the larger the crystals will grow.
5. When the crystals are large enough, pour the liquid out of the container, rinse shortly with water. (If you rinse too long, the crystals will break down again.)
6. Take the crystal out of the plastic container and dry on a suitable surface (for example paper towels) to prevent stains.
 - **WASH HANDS AFTER HANDLING THE CRYSTAL

Explanation:

Explain that when you add the powder to hot water, it breaks up into tiny particles in water which is too small to see. The liquid is called a saturated solution, because if you stir in more powder, no more will dissolve. When the water cools, it can't keep all the particles dissolved and some begin to join together in an organized way. This makes the crystals you see, with straight edges and flat faces.



Decorate a Rocket

Fun Facts about Rockets!

The first rockets were used to launch fireworks in the 1200s. That's about 800 years ago! Before sending humans to space, scientists sent dogs and monkeys (and they even wore spacesuits designed just for them!) In April 1961, the first human used a giant rocket to journey into outer space and circled the Earth for 108 minutes. It takes a rocket only 8 minutes to accelerate to a speed of 15,000 miles per hour. In order to burst through the gravity of Earth, a rocket must travel at speeds of 7 miles per second.

Included Supplies:

- 1 Wooden rocket (2 pieces)
- 3 Space themed suckers
 - Rocketship
 - Astronaut
 - Earth

Supplies Needed:

- Markers, paint, stickers or any decorating material you already have.

Activity Steps:

1. Put your two rocket pieces together, and decorate using any materials you have.



RESOURCES USED FOR THIS ACTIVITY PACK:

- www.oceanexplorer.noaa.gov
- <https://www.exploratorium.edu/tinkering/projects/paper-circuits>
- <https://www.dkfindout.com/us/science/electricity/circuits/>
- <https://www.oddizzi.com/teachers/explore-the-world/physical-features/volcanoes/volcanoes-sneak-a-peek/>
- https://evolution.berkeley.edu/evolibrary/article/fishtree_05
- <https://www.factsjustforkids.com/technology-facts/rocket-facts-for-kids.html>
- Crystal Growing Kit Instructional guide
- STEM Inventions ©