

# Adventures in Science - SHAC Virtual Day Camp 2020

Materials from home: paper & markers, printer (optional), sandwich size plastic zipper baggies, baking soda, vinegar, ½ teaspoon and 1 teaspoon measuring spoons, optional circuit tester: battery, lightbulb from a flashlight or a mini-tree light string, aluminum foil; cup, string, a number of coins or some other small object to fit in the cup to vary its mass

There is an activity written for each of the six requirements. Watch the videos and come here at the stated points, about halfway through and the end of each video.

## Fair Test - Requirement 1

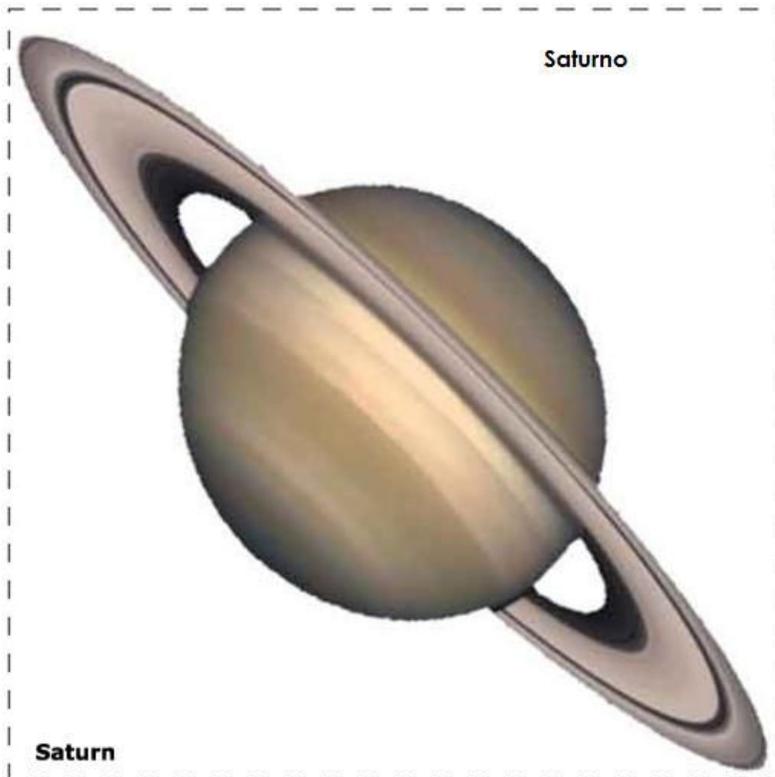
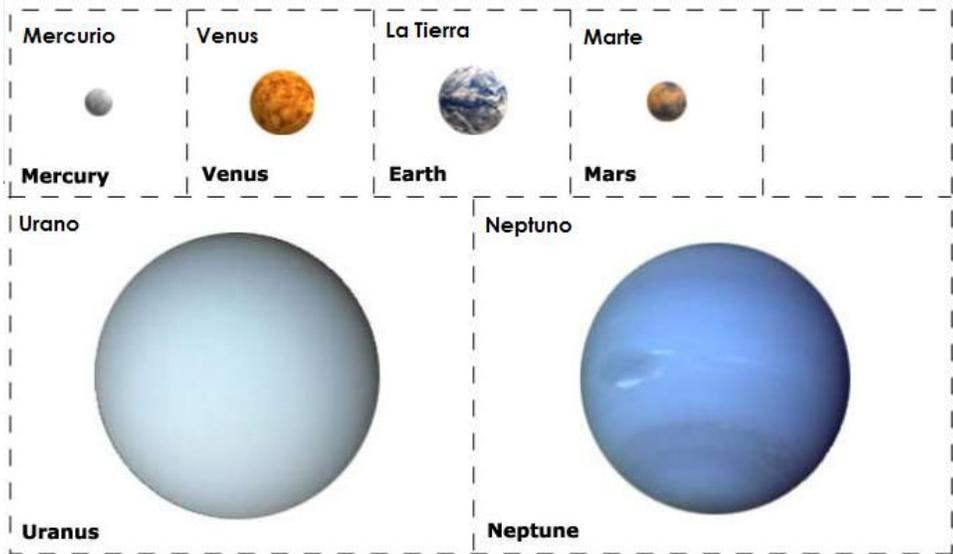
Design an experiment to test the effects of fertilizer on plants. Think of at least three things that you need to keep the same (constants). Draw a picture of how two plants will look after three months - one with fertilizer and one without.

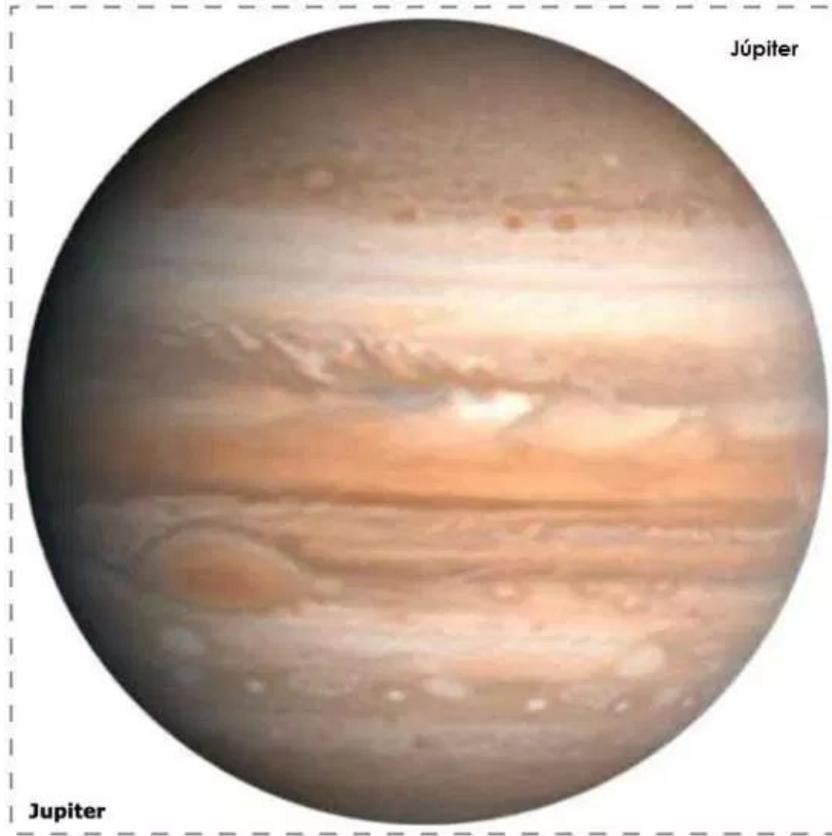
## Smithsonian National Museum of Natural History Virtual Tour - Requirement 2

[https://naturalhistory2.si.edu/vt3/NMNH/z\\_tour-022.html](https://naturalhistory2.si.edu/vt3/NMNH/z_tour-022.html)

## Model the Solar System - Requirement 3C

- 1) Print out the pictures on the next two pages and cut apart the pieces. Compare the planets (notice the names are in both Spanish and English!). The four inner planets are rocky and small, and the four outer planets are gaseous and much bigger. Images from <https://thepracticalperfeccionista.wordpress.com/2011/01/19/planet-printables-to-scale/>
- 2) Our star is huge compared to the planets. To match the pictures, the Sun would be a circle 2.2 meters in diameter.





- 3) We need to use a different scale for the distances. Go outside to a safe place that is about two blocks long. Pick a location on the ground to be the Sun. Then walk the number of steps in the table to model the relative distances.

| Planet  | Actual Distance from Sun | Model Distance from “Sun” |
|---------|--------------------------|---------------------------|
| Mercury | 36 million miles         | 2 steps                   |
| Venus   | 67 million miles         | 3.5 steps                 |
| Earth   | 93 million miles         | 5 steps                   |
| Mars    | 142 million miles        | 7.5 steps                 |
| Jupiter | 484 million miles        | 26 steps                  |
| Saturn  | 887 million miles        | 48 steps                  |
| Uranus  | 1,784 million miles      | 96 steps                  |
| Neptune | 2794 million miles       | 150 steps                 |

- 4) The Houston Museum of Natural Science has the planets the correct relative sizes AND distances outside their main entrance. The Sun is huge and a portion of it is shown right next to the doors. The four inner planets are all on the front steps, and the outer ones are down the sidewalk. Check out the sundial when you can get there!

## Electric Circuits - Requirement 3E

- 1) Brainpop circuits website: <https://www.brainpop.com/games/circuitconstructionkitdc/>
- 2) If you want to build your own circuit tester, you need a battery, lightbulb (from a flashlight or an old string of mini-tree lights), and some aluminum foil. To assemble: [http://www.exo.net/~emuller/activities/chemistry\\_summer\\_2007/Conductivity%20tester.pdf](http://www.exo.net/~emuller/activities/chemistry_summer_2007/Conductivity%20tester.pdf)

## Chemical Reactions - Requirement 3G

- 1) There are many videos on YouTube showing chemical reactions. Watch some with your parents!
- 2) Baking soda & vinegar - put  $\frac{1}{2}$  teaspoon of baking soda in one corner of a plastic baggie, and put  $\frac{1}{2}$  teaspoon of vinegar in the opposite corner. Do your best to seal the bag with as little air as possible and without mixing the reactants.
- 3) Tilt the bag to mix the reactants. You should see bubbles and hear some fixing. The bag should expand a little bit with the carbon dioxide gas that is being released.
- 4) Repeat with a new baggie, but choose one of the ingredients to increase. Do several tests of different combinations to see how you can get the most carbon dioxide gas.

## Motion on a Playground - Requirement 3H

- 1) Build your swing (pendulum) - punch holes near the top of a cup directly across from each other. Tie one end of the string in one hole, then repeat for the other end.
- 2) Use a stopwatch (on a smartphone or computer) to time a complete back-and-forth cycle of the empty pendulum. Repeat for at least three trials. Record your data in a table.
- 3) Add mass to your cup (such as 10 quarters) and swing again, recording your data. Repeat adding mass for several more values.
- 4) Average the time trials for each value of the mass. Make a graph to display your data.
- 5) What is your conclusion: how does changing the mass affect the motion of a swing?