

KIDS DAY 2021

*Inspiring the next
generation of
scientists and
engineers*

Solids Liquids and Gases Lesson Sheet

Our Roots Video/Robotic Hand Video/Solar Tower Video

-Play "Our Roots" (<https://www.youtube.com/watch?v=-9GYcThATBg>)

- Sandia National Laboratories was founded in 1945, over 75 years ago!
- What types of experiments did we see in those videos?
 - o Did you see the rocket launches?
 - o Did you see the train crash test?
 - o Did you see some computer simulations?
- These experiments are important for us to conduct so we can understand what is physically happening.
- Our scientists can simulate experiments (virtually conduct an experiment) with computers so we can compare our hypothesis (our best guess based our knowledge of science and math) to reality.
- Sandia also researches the weather, climate patterns, nuclear power, and many other exciting experiments.

- Play "Solar Tower Video": <https://www.youtube.com/watch?v=P4So-SwuqA0>

- How are the materials catching fire?
- What is happening when the mirrors reflect the sun?
- Have you ever taken a mirror or a shiny surface and reflected the light somewhere?
- If we use a lot of curved mirrors, we can reflect the sun enough to heat an object up!
- This research is important to test materials that need to survive high heats!
 - o For example, when a spacecraft is reentering Earth's atmosphere, the friction caused by the air heats up the surface of the ship a lot. Just like when you run your hands together and feel heat, the air is rubbing the outside skin of the ship and causing it to heat up. We need to be able to test the materials on the outside of the ship to make sure astronauts can stay safe when returning to Earth, and the Solar Tower is a great place to heat things up!

To work at Sandia and work on exciting experiments, you need a good understanding of science and how the world works around us.

To do that, let's learn about the states of matter!

Solids, Liquids, and Gases Lesson

What are solids, liquids, and gases?

Matter is all around us! Take a minute and see if you can think of a solid, liquid, and a gas

- Matter exists in three different states.
- Solids have a definite shape and size (You can hold your pencil or pen).
- Liquids do not have definite shapes and have a definite volume (You can't hold water very well). Because water does not have a definite shape, it takes the shape of whatever container you put it in, from a water bottle to a balloon.
- Gases do not have definite shapes and do not have a definite volume (If you blow on your hands, you can't hold the air you blow out. Gases will expand to fill any space you allow them to fill.

At home, you can do the following experiments with parental supervision or watch the included pre-recorded videos:

Materials Needed for Experiments

- Beaker or Plastic Water Bottle (x2)
- Balloons
- Baking Soda
- Vinegar
- Funnel
- Tongs
- Dry Ice
- Food Coloring
- Safety Glasses
- Safety Gloves

Baking Soda and Vinegar Experiment ([Watch Baking Soda and Vinegar Experiment Video](#))

Get baking soda and vinegar, pour the vinegar into a bottle or beaker. Carefully funnel in some baking soda into a balloon. Stretch the balloon over the bottle. Pour the baking soda in! The balloon blows up. Here we have all three states of matter! Solid (baking soda), liquid (vinegar), and gas (inside the balloon)

Let's do the experiment again, but with some food coloring and soap. The soap bubbles up and you can see the gas forming when the baking soda mixes with the vinegar!



Dry Ice Experiment (Watch Dry Ice Experiment Video)

Another experiment you can do with parent supervision is with dry ice. We can see the gas coming off the dry ice as it melts. The real term for this is sublimation, as the dry ice is going directly from a solid, to a gas. Compare this to an ice cube in your hand. As it melts, the solid turns into a liquid, not a gas!

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