



PRESENTED

BY:



Tea Bag Rocket

Turn an everyday tea bag into an exciting rocket! Heat makes the air inside the tea bag less dense than the air outside of it. This creates a convection current that lifts the ash from your burning tea bag and sends it flying upward.

TEKS:

3.4A: Students recognize that patterns, relationships, and cycles exist in matter. Students will investigate the physical properties of matter and will learn that changes occur. They explore mixtures and investigate light, sound, and heat/thermal energy in everyday life. Students manipulate objects by pushing and pulling to demonstrate changes in motion and position.

3.6A: The student is expected to explore different forms of energy, including mechanical, light, sound, and heat/thermal in everyday life.

Materials:

- Lighter
- Plate or pan (metal or ceramic; NOT paper or plastic)
- Scissors
- Tea bag

How To:

1. Cut off the top of the tea bag, removing the staple and string.
2. Empty the tea leaves into the trash can.
3. Unfold and straighten the tea bag. It should look like a hollow cylinder. It doesn't need to be perfect, but it does need to be opened up. Your tea bag should be hollow inside—like a tube.
4. Stand the straightened tea bag up on the plate or pan with the tube opening facing upward.
5. Before you can launch your tea bag rocket, move to an open area with no wind to make sure that your rocket launches safely. A garage is a great place to do this activity, or outside if there is no wind. Do not launch your rocket inside as it may start a fire!
6. **Adult supervision is necessary to launch the tea bag rocket.** With an adult helping you, light the top edge of the tea bag (you want it to catch fire). Let it burn all the way down and then watch it lift off and soar into the air! It will float gently back down. What remains?

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STEM Explanation:

Why does your tea bag rocket fly up into the air? When you set fire to the tea bag, the heat from the fire causes the air molecules inside the tea bag to become energized and move around quickly. The air molecules inside the tea bag are moving so fast that they spread up and out of the tea bag. This makes the air inside the tea bag less dense, or less tightly packed together, than the colder (more tightly packed together) air outside of the tea bag. Density is the measurement of how compact (or tightly packed together) something is. For example, a bag of feathers is less dense than a bag of cement of equal volume. Can you think of other objects' densities you can compare?

It is the density difference between the warm and cool air that causes your tea bag rocket to fly. As the diagram below shows, the warmer, less dense air inside the tea bag rises up above the cooler, denser air. As warmer air moves up, colder air moves in to replace it. This causes a thermal convection current to form that lifts up the tea bag.



Red represents warm air and blue represents cool air. This diagram shows that the warm air inside of the tea bag rises up above the cool air surrounding it on the outside.

http://www.popsci.com/sites/popsci.com/files/styles/large_1x_/public/import/2014/MANUAL_tea%20bag.jpg?itok=Mi5Ad5mj

As the tea bag burns, it turns into very lightweight ash. The ash is easily lifted up by the force of rising hot air. When the ash cools, it falls back down, hopefully landing right back on the plate!

Career Connection:

Thermal engineers specialize in thermodynamics. Thermodynamics is the study of heat energy changing into other forms of energy like chemical, mechanical, and electrical. Thermal engineers can work with heating/cooling equipment or at power companies such as gas, electric, and nuclear.

Aerospace engineers are responsible for the design, construction, and application of the science behind the forces and physical properties of aircrafts, rockets, and spacecraft. This field also covers the aerodynamic characteristics and behaviors of aircraft, such as airfoil, control surfaces, lift, drag, and other properties.

Resource:

<http://www.stevespanglerscience.com/lab/experiments/tea-bag-liftoff/>

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