

UP, UP AND AWAY

EXPERIMENT: HOT AIR BALLOON



Move some molecules as you explore thermal energy. Float to your destination as you build a tissue paper balloon and then use hot air to make it soar.

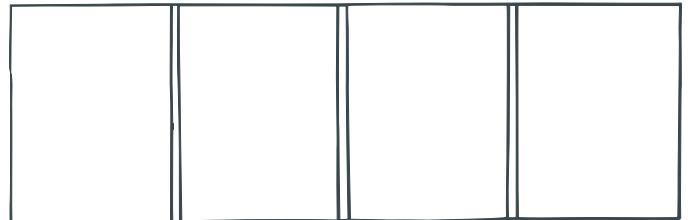
MATERIALS

- Glue stick
- Scissors
- Meter stick
- Small toy figurine
- Paper clips
- String
- Masking tape
- Lightweight basket (optional)
- 6 sheets of tissue paper (20 inch by 26 inch)
- Heat gun (a hair dryer will work, but not as well)

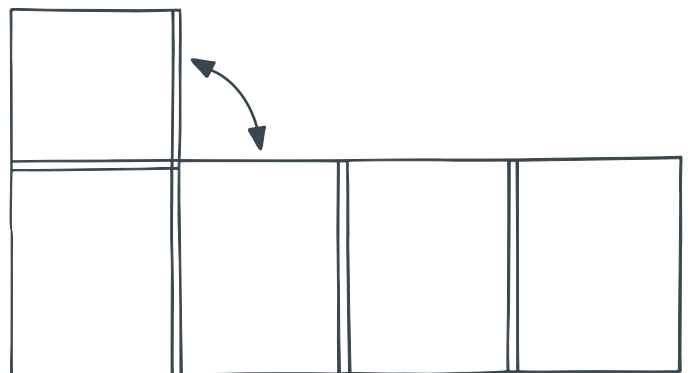


INSTRUCTIONS

Glue two sheets of tissue paper together on the long edge so they overlap by about half an inch. Be careful to not tear the tissue paper as you're gluing—your balloon can't have any holes in it in order to work. Glue two more sheets along the long end of your first set so you have four tissue paper panels glued together, overlapping each sheet by half an inch.



Cut the remaining two pieces of tissue paper into squares that are 20 inches per side. Glue one edge of the square to the short, top edge of the first full-sized sheet, overlapping the paper by half an inch.

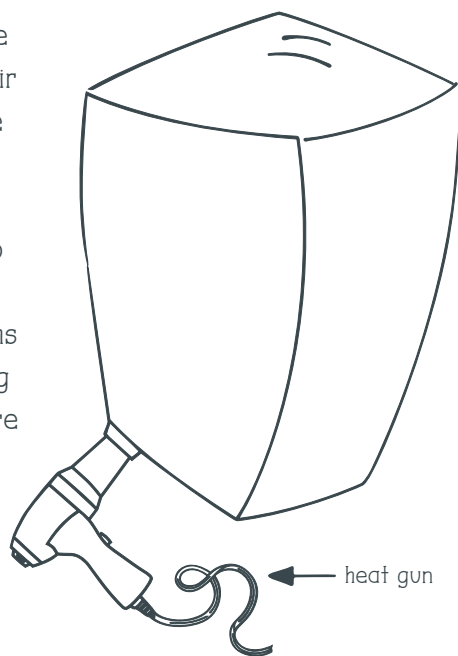


Now it gets a bit tricky because we will give the balloon three-dimensional shape instead of being flat. Glue the remaining three edges of the square to the short edges of the remaining three full-size sheets, with the tissue paper overlapping by half an inch. Glue the last two long edges together. The resulting shape should look like a rectangular box that's open on one end.

Take the second square and glue it along the remaining open edges, like you did on the top. When you are done, you should have a sealed, rectangular box with six sides. Check your seams and make sure they are sealed. If you have any rips or holes, add a patch by cutting a small piece of scrap tissue paper and gluing it over the hole.

Pick one corner of the box and cut a small hole that's big enough to fit the nozzle of the heat gun or hair dryer. Put masking tape around the edge of the hole to strengthen it.

To launch, gently flatten the balloon and fill it with hot air by putting the nozzle of the heat gun inside the hole. Be careful—the heat gun gets very hot! Have a friend help keep the balloon upright as it fills with air. Once it seems full, keep the hot air blowing for a bit longer to make sure it's thoroughly heated. Then turn off the heat gun and let go!



WHAT'S HAPPENING?

You have probably heard that hot air rises, but why does that happen? Air takes up space, which you can see when a balloon is filled up with air. But air also has weight. Air is made up of microscopic molecules, and when you heat them up, the molecules move around and fewer of them will fit in a space like your balloon. That means the air inside the balloon weighs less than the air around it (it has a lower density). Things with a lower density will float. When the air inside the balloon cools, the density of the air increases so the balloon comes back to the ground.

GAME ON

Try making hot air balloons of different shapes, like one that looks like the balloons that take passengers in the sky. Can you make one that's twice as big? How about one that's able to carry a small passenger, like your favorite LEGO® figure?

TIPS

Safety note: Use caution when using the heat gun. A hair dryer will also work, but it won't heat the air inside the balloon as much, so your balloon may not fly as high. Tissue paper is really fragile. You don't want any tears in your balloon, so glue carefully.

LEARN MORE

Explore the science of convection as you send huge hot air balloons soaring three stories high in MSI's *Science Storms* exhibition.

RECOMMENDED READING

The Hot Air Balloon Book: Build and Launch Kongming Lanterns, Solar Tetrons, and More by Clive Catterall

The Amazing Air Balloon by Jean Van Leeuwen

