## STEM CHALLENGE

# What's Up? <br> Building \& Launching Hot Air Balloons 

## OVERVIEW

Can you get molecules moving as you learn about thermal energy? You will construct a balloon from tissue paper and discover how hot air can make it move. How high can you make it go?

## HOT AIR BALLOON MATERIALS

## Glue Stick

Scissors
Masking Tape
6 sheets of tissue paper ( 20 inch by 20 inch)
Heat Gun or Hair Dryer (Ask an adult for assistance with this item)

## LET'S DO IT: BALLOON CONSTRUCTION

I. Use your glue stick to attach two sheets of tissue paper together along an edge so they overlap by about 1 cm . Be careful not to tear the tissue paper as you're gluing. Balloons with holes don't work so well.
2. Glue two more sheets the same way and attach them to make a row of four pieces of tissue paper.
Remember...you want them to overlap by about 1 cm .
3. Glue one edge of the remaining two squares of tissue paper to opposite edges of one of the four pieces in a row. Check out the diagram below as an example.

4. Now you want to make a three-dimensional shape from the flat squares. Carefully fold your row of four pieces and glue the ends to form a box with open ends.
5. Fold the flaps up and seal the edges to enclose all the sides. Try not to tear the tissue paper and make sure all your edges are sealed.
6. How many sides does your balloon have? What is the name of the shape you made?
7. Select one corner of your balloon and cut it to create a small opening that is big enough to fit the end of the heat gun or hair dryer.
8. Use masking tape to reinforce the edges of the hole and to prevent it from tearing.


## LET'S DO IT: BALLOON LAUNCH

I. Get ready to launch by carefully flattening your balloon to remove some of the air that is trapped inside.
2. SAFETY FIRST! Ask for an adult to help with the heat gun or hair dryer. It can get very hot!
3. Place the nozzle of the heat gun gently inside the hole of your balloon.
4. Turn on the heat gun and inflate your balloon with hot air, positioning it so the heat gun is facing up and the balloon is resting on top of it.
5. Can you feel the heat through the tissue paper? Once it is inflated and feels hot, continue blowing air for ten more seconds.
6. Then countdown...3-2-1, and let it go! How high does it go?
7. How might you change your design to make it go higher or travel faster?


If you like building hot air balloons, you could be a

- Aerospace Engineer
- Aviation Inspector/Mechanic
- Heating/Ventilation/Air Conditioning (HVAC) Technician
- Thermal Engineer


## WHAT'S THE SCIENCE?

Why did your balloon rise and float up into the air? Even though we can't see air, it takes up space. You can see how it takes up space when you inflate a balloon, and it expands and gets bigger.
Air not only takes up space, but it has weight. Air is made up of tiny particles called molecules. When you add heat, you are adding energy. This energy is called thermal energy. It makes the air molecules move around faster.

As they move around, fewer of them will fit in a space like the balloon you made. As a result, the hot air inside the balloon weighs less than the air on the outside.
Scientists would say this means the hot air inside has a lower density than the air on the outside. Things with a lower density will float, like your hot air balloon.

When the air inside your balloon starts to cool, its density increases. Lower density floats and higher density sinks. That is why your balloon eventually comes back to the ground.

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