

# Hot Air Balloon



Science  
Film  
Festival

Knowledge  
Through  
Entertainment

## FILM

 GUB Explorer Channel - Warm Air Rises

## KEY OBJECTIVES

- 1 **To demonstrate to students that hot air is less dense than cold air at the same pressure.**
- 2 **Investigate how heat can change air**
- 3 **To explain the principle that warm air rises when heated and cool air sinks.**

## INTRODUCTION

If you actually need to get somewhere, a hot air balloon is a fairly impractical vehicle. A hot-air balloon is a lighter than air aircraft consisting of a bag, called an envelope, which contains heated air. You can't really steer it, and it only travels as fast as the wind blows. But if you simply want to enjoy the experience of flying, there's nothing quite like it. Many people describe flying in a hot air balloon as one of the most serene, enjoyable activities they've ever experienced.

The basis of how the balloon works is that warmer air rises in cooler air. This is because hot air is lighter than cool air as it has less mass per unit of volume. Mass can be defined by the measure of how much matter something contains. The actual balloon has to be so large as it takes such a large amount of heated air to lift it off the ground.

## GUIDING QUESTIONS

- What happens to air molecules when they are heated?
- What happens to weather balloons when they are released into the air?

### TOPICS

Earth science heat convection  
thermal radiation thermodynamics  
physics geography

### KEYWORDS

Less dense buoyant force heat  
mass Volume

### LEVEL

Early Learner Primary School

### RESOURCE TYPE

Experiment

### INTENDED AUDIENCE SIZE

Small group

### MODE OF DELIVERY

Live Online

### TIME FOR ACTIVITY

15-20 min.

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## MATERIALS/PREPARATION

- A very dark ultra-thin plastic bag (full length) dry cleaning bag/a solar hot air balloon
- A powerful hairdryer

## TASKS/PROCEDURE

- 1 Insert the hairdryer into the mouth of the plastic bag and begin to inject hot air into the bag.
- 2 Use a medium power setting until the bag is fairly fully inflated so that you don't melt the plastic. Once the bag is relatively inflated, switch to the highest heat setting.
- 3 Continue to blow hot air into the bag until all the air inside the bag is hot.
- 4 If you're using a dry cleaning bag, you can seal the bottom of the bag around the neck of the hairdryer and allow air to flow out of the small hanger hole at the other end of the bag.
- 5 If you're using a solar hot air balloon, leave some space so that cold air can escape as hot air enters the balloon.
- 6 Once the bag is completely full of hot air, let it go and it should rise up into the air. The solar hot air balloon will float all the way to the ceiling, while a dry cleaning bag will rise several meters upward before it collapses. Point out that the pressures inside and outside the bag are equal—if they weren't, air would accelerate toward the lower pressure.

## FOSTERING DISCUSSIONS

Hot air balloons work because hot air rises. By heating the air inside the balloon/bag with the burner/blow dryer, it becomes lighter than the cooler air on the outside. There are fewer air molecules in the bag than there would be if the bag were full of cooler air, the bag's overall weight is less and it's pushed upward by the buoyant force. This causes the balloon to float upwards, as if it were in water. Obviously, if the air is allowed to cool, the balloon begins to slowly come down. Pilots have a great deal of control over the altitude of hot air balloons which they monitor with various instruments. They develop incredible anticipation skills over time and can often control a balloon's descent within centimeters.

## SAFETY INSTRUCTIONS

**The blow dryer can be hot therefore be careful when handling it.**

## POSSIBLE EXTENSIONS

- 1 Have the students construct another hot air balloon using different sizes and types of plastic bags.
- 2 Have the students research the part that balloons played in the history of flight.

## AUTHORS AND SOURCES

Submitted by Discovery Centre Kenya