

# Full of Hot Air



## Objective

Students will be able to demonstrate the insulating qualities of trapped air and will be able to infer how fur or feathers helps insulate animals.

## Materials

### per student group

- Full of Hot Air worksheet
- clay at room temperature
- two student lab thermometers
- newspaper
- two small zip-top plastic bags
- waterproof tape
- ice
- water
- one 5-inch-deep plastic container

## Background

1. Distribute Full of Hot Air worksheet and other materials to student groups.
2. Form the clay into two equal-sized solid balls 2 to 3 inches in diameter. Check thermometers to make sure they are both the same temperature and record the readings. Put the thermometer ends into the centers of each clay ball.
3. Put a clay ball into each zip-top bag, with thermometers extending out of bag tops.
4. Tear newspaper into thin strips. Fill one bag with newspaper, surrounding the clay ball. Don't pack newspaper too tightly. Leave the other bag without newspaper strips.
5. Use tape to seal both bags tightly around thermometer stems. Fill the container with ice and water. Record the beginning thermometer temperatures in the bags. Have students predict and estimate how readings will change once the bags are immersed in ice water. Will one be colder? Will both bags stay the same temperature?
6. Immerse both bags in the ice water up to the tape level. After five minutes, read the thermometers and record the temperatures. Which bag lost the least amount of heat?
7. Discuss how the bag with newspaper strips is like a coat of feathers or fur. Air trapped in an animal's coat helps insulate the animal against the cold.

## Deeper Depths

Ask students to redesign the above experiment to demonstrate different ways a warm-blooded animal may lose excess heat. For instance, begin with warmed clay or another substance. Measure how fast heat is dissipated. Heat is lost through conduction (from a warm object touching a cold object), convection (movement of fluid or air over an object) and evaporation (when liquid changes to gas). Can students cool an object to demonstrate these three ways?

# Full of Hot Air



Student names: \_\_\_\_\_  
\_\_\_\_\_

	beginning temperature	estimated temperature	actual 5 minute temperature
Bags with newspaper	_____°C (_____°F)	_____°C (_____°F)	_____°C (_____°F)
Bag without newspaper	_____°C (_____°F)	_____°C (_____°F)	_____°C (_____°F)

1. Which bag's thermometer reading was the coldest?

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2. What kept the clay in this bag warmer?

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