



# Thermal Energy Put to Work

## Grade Levels: 7-10

### Background

When air is heated, the molecules move around faster and get further apart (if there is room to spread). The cooler air (with its molecules closer together) starts to sink, pushing the warmer air up. This is where we get the phrase "hot air rises."

### Question

Can thermal energy be made to do useful work?

### Possible Hypothesis

Thermal energy is/not useful energy that can be used for work.

### Materials

- Plastic 1-liter bottle
- Large balloon
- Bowl of hot (not boiling) water
- Bowl of ice water
- Small rock

### Procedure

1. Cool the balloon and the bottle in the freezer for 5 minutes.
2. Fill the bowl with hot, not boiling, water.
3. Put the balloon over the mouth of the bottle making sure that the air has been squeezed from the balloon. Place the bottle into the hot water.
4. The air inside the bottle should expand and inflate the balloon. After it is inflated, put the bottle in the bowl of ice water and observe it deflate.
5. Design a device to convert this expansion and contraction into usable work, such as lifting a rock. Design a device that circulates hot, then cold, water so that the balloon deflates and inflates without moving the bottle.

### Analysis and Conclusion

Were you able to make a device that performed useful work? Can you think of devices that convert thermal energy into motion? Can you think of a way to convert thermal energy into electrical energy?

### Real World Connection

Research internal combustion engines and turbine generators.

