

Shopping List for Unit #13: Thermodynamics

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This Unit builds on the projects from Unit 12: Alternative Energy. If you haven't already built the [Steam Boat](#), [Solar Ovens](#), or [Stirling Engine](#) (this engine is just for grades 9-12), you'll want to go back and do those projects first. The focus of this unit is on temperature, heat transfer, how to use these ideas to build super-cool inventions in thermodynamics.

How many of these items do you already have? We've tried to keep it simple for you by making the majority of the items things most people have within reach (both physically and budget-wise), and even have broken down the materials by experiment category so you can decide if those are ones you want to do.

Temperature Experiments

- 2 water or soda bottles
- food dye
- index card
- pot, stove
- pepper
- ice cubes
- black paper, white paper
- aluminum foil
- rubbing alcohol
- dime, penny, and/or nickel
- gum wrapper (must be metallic on one side)
- index card
- six 7-9" balloons
- cooking oil (about a cup of the cheap kind)

OPTIONAL:

- 1 quart whole milk (do not substitute, unless your child has a milk allergy, then use soy or almond milk)
- 1 pint heavy cream (do not substitute, unless your child has a milk allergy, then skip)
- 1 cup sugar (or other sweetener)
- 1 tsp vanilla (use non-alcohol kind)
- rock salt (use table salt if you can't find it)
- lots of ice
- freezer-grade zipper-style bags (you'll need quart and gallon sizes)

Heat & Thermodynamics Experiments

- clear plastic (needle-less) syringe, 5– 20mL
- can of soda (leave unopened)
- four votive candles or tealights
- large glass jar (like a clean empty pickle jar)
- matches with adult help
- aluminum pie plate or cookie sheet
- [liquid crystal sheet](#)
- [silver highlighter marker](#) or aluminum foil
- block of foam (any scrap piece will work)
- 1/4-1/8" diameter x 12" metal tube (copper)
- thermometer
- bathtub
- stopwatch, ruler, tape, scissors
- [drinking bird](#)
- black paint and silver (or white) paint
- mug of hot water

For Grades 9-12:

- fresh peanuts
- test tubes and test tube clamp
- large paper clips