

The “Cool Off” Challenge

There are many machines and devices that require cooling to ensure effective functioning. Examples include automobile engines and cell phones. Cooling systems often depend on air cooling (such as fans that cool laptops) or liquid cooling (such as antifreeze coolant that circulates to cool an automobile engine). You are being challenged to design a cooling system that uses both of these methods.

Your Challenge: Get a temperature probe to the lowest possible temperature.

Materials Available:



Two temperature probes connected to an interface, or two separate digital thermometers (example shown in photo)



Cotton balls and weighing boats or other containers



Gloves



A variety of liquid substances

Other materials may also be available in your lab.

Extremely Important Safety Considerations:

- 1. Wear gloves when handling the liquids, so that you will not get any of the liquids on your skin.***
- 2. Wear goggles whenever experimenting, so that you will not get any of the liquids in your eyes.***
- 3. Be careful not to hit anyone with the temperature probe.***
- 4. Tie back long hair and roll up any loose clothing.***

Challenges to try:

- Using a temperature probe, how do you think you can achieve the coldest temperature? Predict first and then test your predictions.
- Use whatever materials you have available. What do you think is the best way to achieve the coldest temperature? Do some experimenting. As you try different things, write down what you learn. The goal is to determine why it works so that you can make it work even better.
- Report the lowest temperature you achieved. What did you do to get this temperature? Why did it work best?
- Think about your experiments and your approach. What additional materials do you wish you had? What other approaches or methods could you try? Explain your thinking.
- If you were trying to cool a laptop, what design constraints would this put on your approach? How would you need to modify your approach?