

# Sweating 2



## Apparatus

A smart wireless temperature sensor.

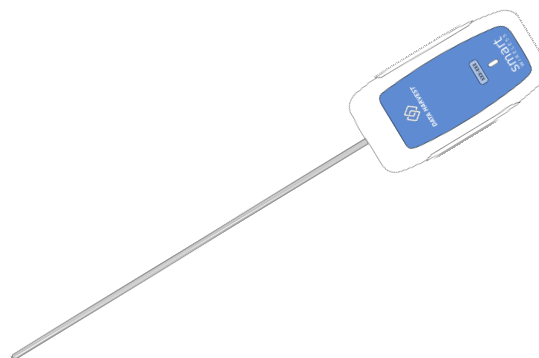
A boiling tube.

Pieces of cloth or paper towel.

Retort stand, boss and clamp

A fan.

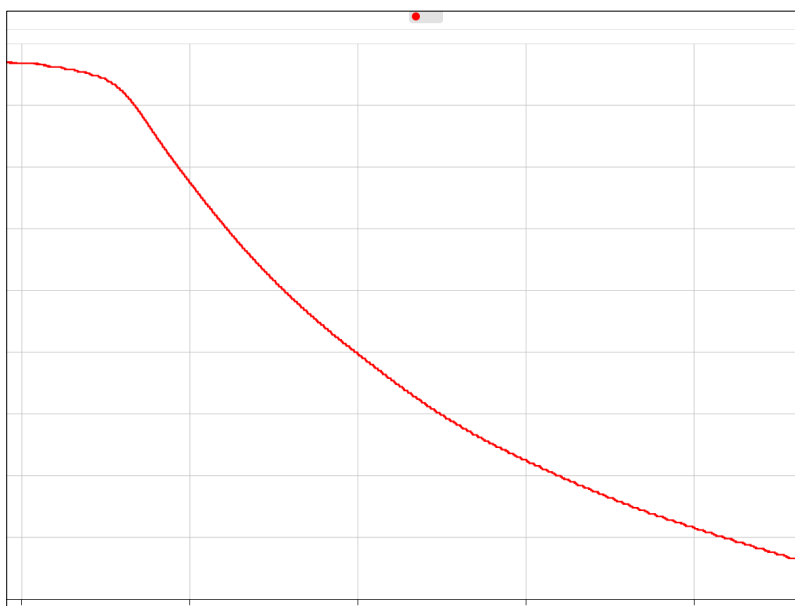
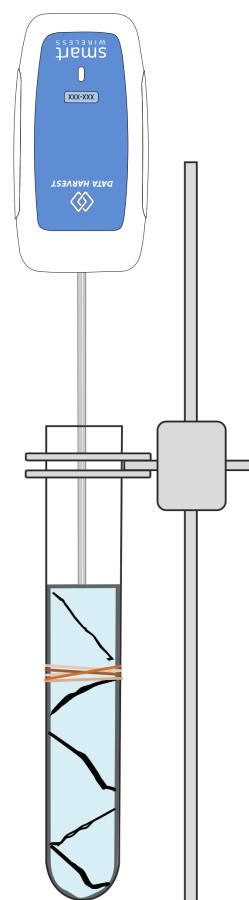
Optional. Alcohol (methylated spirits)

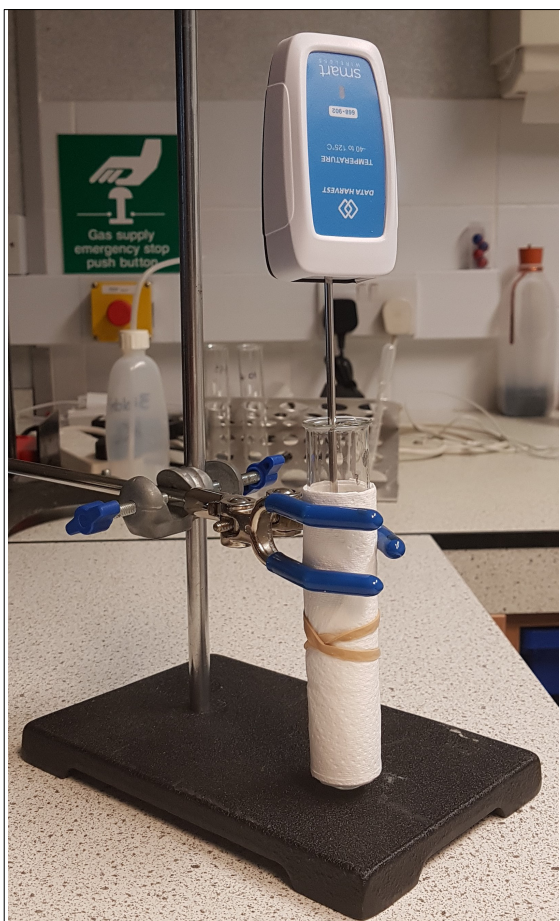


A quick activity to model the cooling effect of water evaporation off skin

## Method

1. Wrap the boiling tube in the cloth or paper towel and secure with a rubber band or tape. The cloth is going to model the sweating skin.
2. Fill the boiling tube with cold water and clamp the tube to a retort stand (or place in a boiling tube rack). See apparatus diagram.
3. Place the temperature sensor into the water in the boiling tube, support with additional clamps if necessary.
4. Start the software and connect the temperature sensor to your Bluetooth device.
5. Click on start and record the temperature for 1-2 minutes.
6. With the recording still going use a wash bottle or pipette and dribble cold water all over the towel to soak it. Continue collecting data for another 10 minutes. You may require a fan to move the air around.
7. Stop the recording and save the data.
8. Use tools to find the start value, maximum changed value.





## Extensions

1. If time allows try:
2. Hot water in the boiling tube.
3. Hot water onto the skin.
4. Use a volatile liquid on the “skin” (e.g. methylated spirit) to simulate cooling sprays.
5. Use a fan, change the fan speed.
6. Measure humidity between fan and boiling tube and after the boiling tube.
7. Try different textures of skin e.g. paper towel, disposable cleaning cloth, cotton, etc.

### Why use this practical.

The cooling effect of sweat is poorly understood by most people. Sweat has successfully been decoupled from a necessary physiological mechanism and re-attached to an undesirable cosmetic and personal hygiene problem. The activity gives clear proof that evaporation of water from a surface creates cooling.

Good for a practical activity when reaching homeostasis or skin as the teaching topic.

Passive removal of the sweat from the skin may not be as effective as when the air is moving over the skin. Using a fan shows the increased cooling by increased evaporation.

In a model of this size and scale the temperature changes are quite low, data logging and the software allow these small changes to be clearly seen.

The activity is low on resources and is possible for a class activity.

### Practical advice.

A boiling tube is an optimal sized “body” to use, it is large enough to be easy to prepare and it has sufficient surface area to the volume to allow the cooling effect to be seen.

Be prepared to use a fan, some days static evaporation will be very low (e.g. cold rainy days)

Expect to see about a 5 degree drop in temperature with a fan on low speed moving area around the apparatus. The exact drop will depend upon the ambient room temperature and the relative humidity.

Be prepared for questions about “sweaty armpits” and why? Current theory indicates that areas of pubic hair (groin and arms) use sweat to carry pheromones onto “radiating hair” for broadcast into the environment. The pheromones provide a rich source of food of skin bacteria that break them down and produce the characteristic “smelly armpit”