

#### Extension activity 4

# Cooking with sunlight and producing electricity using Peltier modules

## Peltier performance with different setups

Students understand that a Peltier module needs heat and cold sources to work. They can then perform experiments to understand how to produce the highest electrical power.

They use three heat/cold source pairs: candle/water, alcohol lamp/water, and alcohol lamp/ice. This activity should take around 60 min.

### Materials

- Peltier modules
- Metal heat sink
- Cooling materials (water or ice)
- Heat sources (candle, alcohol lamp)
- Container
- Thermal conductive paste (or vegetable oil)
- Voltmeter
- Lighter
- Electric cables, crocodile clips
- 1.5 V battery
- 12 V supply

**Note:** Thermal conductive paste can be replaced with vegetable oil. Thermal paste and a heat sink are useful to avoid the thermal equilibrium between the two sides of the Peltier module.

### Procedure

1. Build the test setup as in Activity 2.
2. Study three heat/cold source pairs: candle/water, alcohol lamp/water lamp, and alcohol lamp/ice.
3. For each pair:
  - a. Measure the temperature at each side of the Peltier module.
  - b. A small motor is powered and the evolution of the voltage and electric current over time is measured using a voltmeter and an ammeter, respectively.
4. Use a spreadsheet to calculate the electrical power using the mathematical relationship  $P = IU$  and draw the corresponding graphs.
5. Plot a graph of the temperature evolution at each side of the Peltier module.

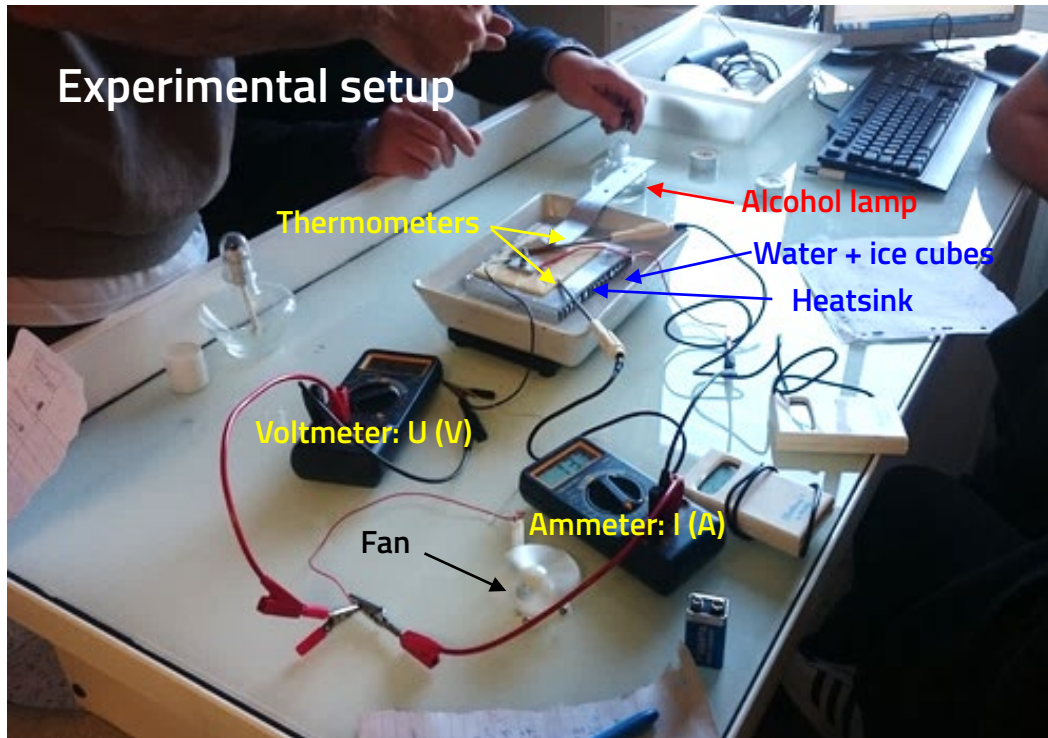


Image courtesy of the author

### Discussion

Through these experiments, student understand that the greater the temperature difference between the two sides of the Peltier module, the greater the power output.

They learn how to convert thermal energy into electricity and the reverse process using the thermoelectric effect.

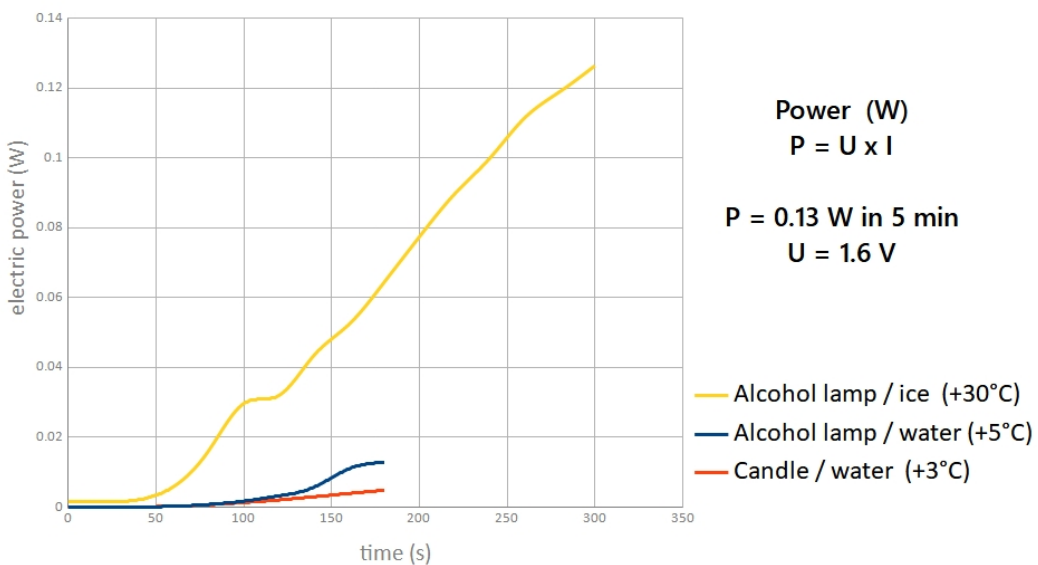


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