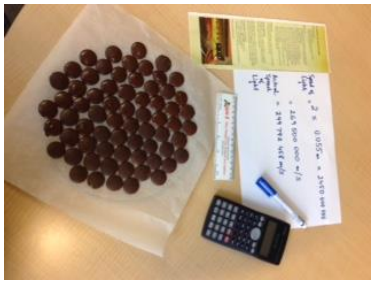
# Calculating Speed of Light using Chocolate

Prepared by Nardia Bordas and Magdalena Wajrak
(http://www.planet-science.com/ accessed on 13.14.16)



**What you need:**

- A microwave oven
- A bag of round cooking chocolate pellets
- Large plate, small soufflé dish, ruler, calculator, cooking paper

**Instructions:**

1. Find on the oven's compliance plate (inside the door or on the back) and write down the microwave frequency (it is usually2450 MHz). See Figure 1.
2. Remove the turntable from the microwave and place unturned soufflé dish in the middle of the oven on top of the spindle (Figure 2).
3. Place chocolate pellets on cooking paper on the plate, next to each other as shown in Figure 3.

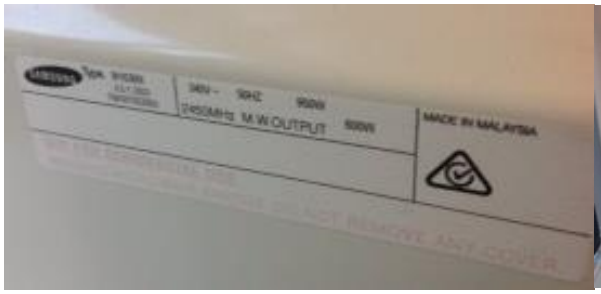


Figure 1

Figure 2

Figure 3

4. Place the plate on top of the soufflé dish such that the plate does not turn (see Figure 4).

Figure 4

5. Run the microwave on low for 30sec or so until some of the chocolate pellets start to melt. Do not melt all the chocolate pellets, stop as soon as you observe small melted patches.

6. Take the plate with chocolate out of the microwave and use the ruler to measure the distance between the centres of the two adjacent melted patches as shown in Figure 5.

Figure 5

7. Calculate the speed of light by using the following equation:

   Speed of light (m/s) = wavelength (m) x frequency (Hz) = 2 x measured distance x frequency

   For example: if the measured distance between melted patches is 0.06m then the speed of light = 2 x 0.06 x 2450 000 000 Hz = 294 000 000 m/s (actual speed of light = 299 792 458 m/s)

**Explanation:**
Microwaves are a form of light. Knowing the wavelength and frequency allows us to calculate the speed of light fairly accurately, even in a kitchen.

When the plate doesn't rotate the microwaves warm the food unevenly, and the melted patches are hot spots corresponding to the crests and throughs of the lightwaves. These are half a wavelength apart so we need to double the distance to get the wavelength.

SAFETY: Only use microwave oven safe crockery and don't overheat the chocolate. Beware of hot spots in the food. DISPOSAL: Chocolate can be eaten.