

### Introduction

Chocolate is a datalogging investigation activity. It is set in the context of helping the McChocs company to make better quality chocolate. The pupils investigate a new way to crystallise liquid chocolate. Checking the quality of chocolate means accurately measuring its melting point – better chocolate is harder to melt. For this, pupils use temperature sensors and datalogging. They present their findings, with a scientific explanation in terms of particles, to the company directors.

### Requirements (for the class as a whole)

*Beaker of liquid chocolate (for 'new cooling method')*

- Approx 3 x 200g bars of Lindt dark chocolate (not milk) or other dark chocolate (it should not contain vegetable fat, ie not Cadbury Bournville. The only fat should be cocoa butter, to give a clear melting point).
- Melted, by heating to approx 45°C, supplied as 'liquid chocolate'

Chocolate samples for tasting (under clean, safe conditions).

*Premium chocolate*

- 1 bar of dark chocolate as above, cut into enough pieces for each pupil to taste

*McChocs dark – standard method*

- Melt 1 bar of dark chocolate. Pour the liquid into the compartments of a clean ice cube tray. Cool it quickly in the fridge/freezer. When solidified, extract the pieces from the tray.

*McChocs dark – new method (tasting at end)*

Prepare a bar of dark chocolate by the following method:

1. Melt it in a boiling tube.
2. Place in a bath of cold water. Stir until the temperature drops below 25°C
2. When it starts to crystallise, remove the tube. Put it into a hot water bath. Wait until the temperature reaches 30°C.
3. Pour the liquid into the compartments of a clean ice cube tray. Let it cool slowly, and extract the pieces from the tray.

### Requirements (for each group)

*For 'new method of cooling experiment'*

Boiling tube

Test tube rack

2 Beakers (or bowls)

Hot water from tap (for hot water bath)

Ice (for cold water bath)

Paper towels

*For melting point quality test*

Temperature sensor

Datalogging equipment

Way to keep sensor upright in boiling tube chocolate (clamp or clothes peg)

*Teacher demonstration: melting point of 'standard method' chocolate*

Dark chocolate, melted in a boiling tube, and solidified around a temperature sensor

Datalogger

Way to keep sensor upright

### Safety

- Tasting chocolate samples should not normally be carried out in a laboratory
- Students need to take care with hot chocolate and water bath to avoid scalds.
- Do not try to remove the temperature sensor when the chocolate is a solid.