

# Hot Chocolate

Chemical Engineers (sometimes called Process Engineers) are involved in many stages of chocolate production.

They develop and design the processes and equipment used to make, mix, cook and package ingredients and products.

They have to make sure that, for example, a certain chocolate bar is made in exactly the same way every time. To do this they have to write and follow really clear, precise instructions. These are called **standard procedures**.

Imagine you're a chemical engineer. You're developing a new hot chocolate drink. To make sure it tastes great, you have been asked to write a standard procedure for a taste-testing session. You want taste-testers all across the country to taste the same drink, so it's important that everyone makes their hot chocolate in exactly the same way.

## Your task

You are going to write a standard procedure for a hot chocolate taste test.

## What you will need

- 50 g drinking chocolate (powder)
- up to 300 cm<sup>3</sup> of milk
- cup or mug
- teaspoon
- measuring jug
- kitchen scales or top-pan balance
- thermometer (to measure up to 100 °C)
- a method of heating the milk (microwave oven, cooker ring and saucepan, or hotplate)

## Safety

You must not prepare the hot chocolate in a science laboratory – equipment might be contaminated.



### What you need to do

1. Look at these instructions from a packet of drinking chocolate.
2. Identify any vague or ambiguous pieces of information. In other words, which bits don't give you 'exact' information?
3. Think about how you can alter these bits of information to make them unambiguous. In other words, how can you make sure there is absolutely no doubt what the instructions mean?
4. Look for any vague amounts in the instructions. Change them into exact measurements.
5. Decide what measuring equipment should be used for the taste test.
6. Change the instructions so they become unambiguous. Use a writing frame like this:

To make the perfect hot chocolate drink...



add three heaped teaspoons of hot chocolate powder to a mug or cup of hot milk and stir.

Standard procedure for making a drink of hot chocolate	
Equipment and materials	Procedure
•	1.
•	2.
•	3.
•	<i>and so on...</i>

4. Follow your improved instructions to make a drink of hot chocolate.
5. Have a taste-testing session. Discuss the flavour in your group. (There is no need to record your discussion).
6. From your discussions, do you think customers actually need instructions for measuring heaped teaspoons, the volume of a cup or mug, and the temperature of the milk?



### Questions

- Other groups will have made their drinks in slightly different ways. How do your thoughts on flavour compare with the thoughts of other groups?
- Do the results from different groups show that the original instructions are ambiguous – and that this can produce big differences in flavour? Or do they show that the manufacturer is correct to print ambiguous instructions, because exact instructions don't actually make much difference?
- Why is it important to use a standard procedure for a taste test?
- Suppose you wanted to do a hot chocolate taste test with the whole school. Can you collectively decide on a standard procedure to use?
- Why don't manufacturers put a standard procedure on their drinking chocolate packets?

### Extension

- Explain the terms soluble, insoluble, solute, solvent and solution.
- Use diagrams to show how water and sugar particles mix.
- Your standard procedure was written to make one cup of hot chocolate. How would you have to change it, if you wanted to make a huge vat of hot chocolate?

### Engineers

- There are four engineers shown on the poster. What other engineers do you think might be needed to help make chocolate products and other sweets?
- As well as helping to make chocolate products, where else might you find a chemical (or process) engineer? Try to think of at least three areas of work.

