Is it possible to detect which beans have been cooked in salted water and which have not?

What steps can you take to make sure this experiment is fair?

How many testers will you use?

How many taste tests will you do?

How many times does the tester get it right?

Does the length of cooking time affect the results?

Do you find the same results with rice or potatoes?

Equipment required:

Fresh green beans
Salt
Cup
2 saucepans
Measuring jug
Balance / weighing scales
Plates and forks
Rice (optional)
Potatoes (optional)

To be used by an adult:

Cooker

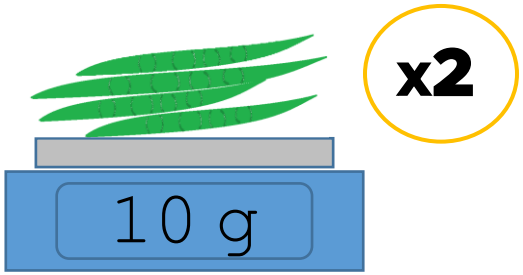
Can you explain your findings?

Kitchen Chemistry: Cooking with Salt

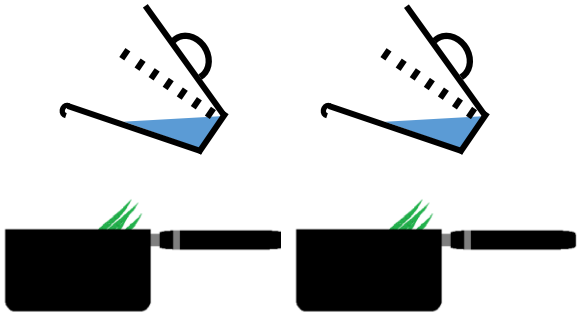
DEPARTMENT OF CHEMISTRY

UNIVERSITY OF OXFORD

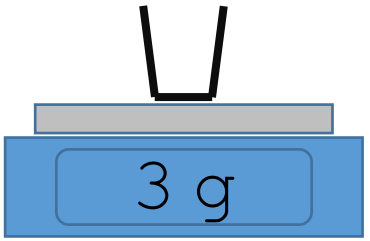
1 Weigh **2 x 10 g** portions of fresh green beans and then wash them.



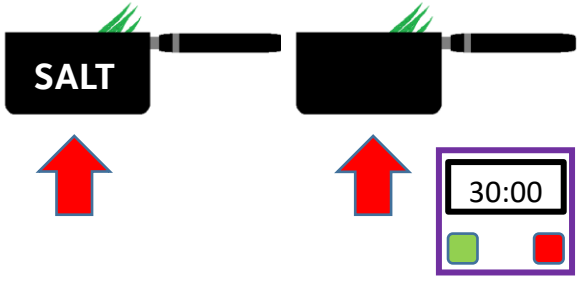
2 Fill 2 saucepans with **500 mL** of water and **10 g** of green beans each.



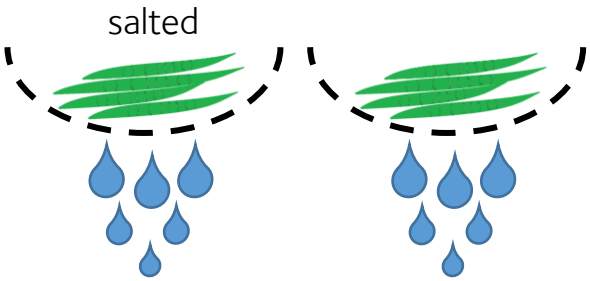
3 Weigh **3 g** of salt on a balance. Add the salt to one of the saucepans.



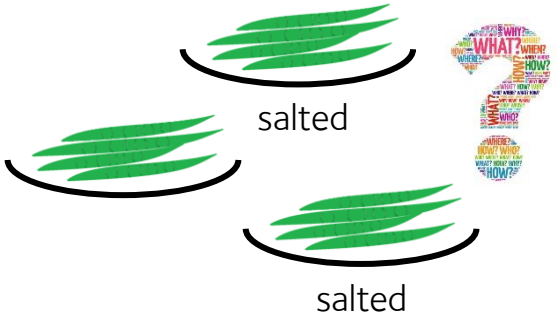
4 Ask an adult to boil the beans for **30 minutes.**



5 Once cooked, drain the water and transfer the beans to plates.



6 Serve your taster 2 portions of salted beans and 1 of unsalted beans.



This set of resources are adapted from the RSC Kitchen Chemistry resource, written by Ted Lister in collaboration with Heston Blumenthal. The integrated instructions are inspired by the work of David Paterson.

Kitchen Chemistry: Cooking with Salt

Background

Common table salt (sodium chloride) is used as a common laboratory reagent as well as being present in almost every kitchen in the world. Salt can lower the freezing point and raise the boiling point of water, making it handy for heating and cooling processes. It is commonly used by cooks and chefs when cooking vegetables such as green beans. The reasoning(s) behind this may include:

- it keeps the beans green
- it prevents the beans going soggy
- it improves the flavour

The aim of this experiment is to find out whether there is a discernible difference in taste when cooking fresh green beans with and without salt. Trials suggest that salt can be tasted down to the levels of 0.5 g / L, however, typically, very little salt (estimated at only 1 / 10,000 g) is absorbed onto the surface of a bean during cooking.

It is vital in this experiment to ensure a fair and reliable taste test. One way this can be done is to present your tester with 3 samples of beans, 2 of which contain beans cooked in salt and 1 of which has not been cooked in salt. A successful test would result in the tester guessing the correct odd one out, thus regarding both salted green beans in the same category. As taste is subjective, however, you may wish to run the taste test with other testers.

You may wish to investigate the other reasons chefs give for using salt. Remember to only change ***one*** variable at a time, keeping all the others the same.

Practical investigation:

Equipment:

- ☐ Fresh green beans (20 g for each experiment)
- ☐ 2 saucepans
- ☐ Salt (3 g for each experiment)
- ☐ Balance/ weighing scales
- ☐ Cup
- ☐ Measuring jug
- ☐ Knife*
- ☐ Cooker*
- ☐ Rice (optional)
- ☐ Potatoes (optional)

* Adult use only

Method

1. Use a balance to weigh 2 x 10 g portions of fresh green beans and then wash them.
2. Measure 500 mL of water and add to a saucepan along with one portion of 10 g of green beans. Repeat this with a second saucepan.
3. Use a cup to weigh 3 g of salt on a balance then add this to one of the saucepans (remember which one you put it in).
4. Cook the beans in the saucepans on a cooker for 30 minutes*, using the same amount of gas/ heat. Stir to dissolve the salt while cooking.
5. Once cooled, drain the water and cut the beans using a knife* into 1cm pieces and serve to your tester. Give them two portions of salted beans and one portion of unsalted beans to see whether your tester is reliable.
6. Record your results in a table.

* Adult use only

Questions:

a) What steps can you take to make sure this experiment is fair? [Ensure you keep the volume of water, mass of beans, heat, and the duration of cooking the same for the two saucepans. It may help to blindfold your tester, as the beans may look different after cooking. If you investigate different foods, keep your tester(s) the same.]

b) How many testers will you use? [Taste is very subjective. You may wish to have a number of testers.]

c) How many taste tests will you do? [It can be helpful to ask your tester to spot the 'odd one out' by providing two salted and one unsalted plate.]

d) How many times does the tester get it right? [Record your results in a table.]

e) Does the length of cooking time or the mass of salt affect the results? [Hint: remember to change only one variable and keep the others the same.]

f) Do you find the same results with rice or potatoes?

Common table salt is made up of crystals. The Department of Chemistry at the University of Oxford has world class facilities to look at crystal structure using x-rays. Find out more about why x-ray crystallography is so important at:
A Case of Crystal Clarity