

Baking

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Acknowledgements

This resource was originally developed by the University of Reading to support outreach work delivered as part of the Chemistry for All project.

To find out more about the project, and get more resources to help widen participation, visit our Outreach resources hub: rsc.li/3CJX7M3.

Guidance notes

This activity should be carried out in a food technology classroom or similar as learners will be baking and tasting cakes and eating is not allowed in science labs.

The investigation should take approximately one hour to complete in full. It was initially created for a target audience of 11–14 year-old learners but can be adapted for any age group.

Download the PowerPoint presentation, technician notes and student workbook that accompany this resource at [rsc.li/3O8OLBu](https://www.rsc.li/3O8OLBu).

Read our health & safety guidance, available from [rsc.li/3IAmFA0](https://www.rsc.li/3IAmFA0), and carry out a risk assessment before running any live practical.

Instruct learners to wear oven gloves when handling hot cupcake tins and aprons to help to protect clothes. The safety rules might be different where you live so it is worth checking local and school guidance. Be aware of any allergies and dietary requirements. If unsure, discuss any amendments with your food technology department.

Use **slides 3–5** of the PowerPoint to introduce the use and purpose of raising agents.

In Activity 1, divide learners into six groups, A–F. Each group will follow a different method to bake some small cupcakes. **Slide 7** introduces the basic ingredients needed in cake baking and **slides 8–9** explain the experimental method. This is a good opportunity to talk about controls – why is only one ingredient changed in each method?

In Activity 2, learners will consider the purpose of each of the ingredients. Learners will answer questions 1–4 in their student workbooks while they wait for their cupcakes to bake. This is a good opportunity to discuss chemistry careers in food.

In Activity 3, learners will taste and evaluate the cupcakes produced using each of the six methods.

Learning objectives

- Describe the role of raising agents in baking.
- Explain why it is important to follow baking recipes carefully.

Activity 1: does cake baking require all the ingredients? (10 minutes)

Slides 7–10 explain the ingredients, experiment, basic cupcake recipe and mixing techniques.

All six of the method sheets for groups A–F are included in the student workbook. Print and hand out the designated method sheet for each group. Instruct learners to follow the method and only use the ingredients described for their specified group.

The six different methods are:

- **Method A** – Learners using method A make the control batch of cupcakes. These cupcakes are baked using all of the usual ingredients, so they can be compared with the other groups' cupcakes.
- **Method B** – Learners using method B make cupcakes using all of the ingredients, except for sugar.
- **Method C** – Learners using method C make cupcakes using all of the ingredients, except for butter.
- **Method D** – Learners using method D make cupcakes using all of the ingredients, except for flour.
- **Method E** – Learners using method E make cupcakes using all of the ingredients, except for baking powder.
- **Method F** – Learners using method F make cupcakes using all of the ingredients, except for eggs.

Activity 2: baking ingredients (10–15 minutes)

While the cupcakes are baking, the learners should tidy up and answer the questions in the student workbook (also shown on **slide 12** of the PowerPoint).

Give learners 10 minutes to write their answers down before discussing them as a class and showing the answers to question 1 on **slide 13** of the PowerPoint. The answers to questions 2–4 are learner dependent and will vary depending on the method used.

Career link

Associate principal scientist

Use **slide 14** of the PowerPoint to introduce Robert's job profile, also available from rsc.li/3YmUIFS. He works as an associate principal scientist, combining chemistry and computer modelling to predict chemical reactions and develop new flavours and textures of food.

Activity 3: tasting the cakes (15–20 minutes)

As eating is not allowed in science labs, only allow learners to taste the cupcakes if this session is carried out in a food technology classroom or similar.

Once the cupcakes have been baked and have cooled, the learners should put their cupcakes on a paper plate with their group's letter (A–F) next to it. Cut each cupcake into thirds so the whole class can try each version. Ideally, place these plates on different tables so that learners can circulate around the room while tasting each of the different cupcakes.

Learners should complete the results table in their workbooks with their observations about each group's cupcake (the table is also shown on **slide 16** of the PowerPoint).

After 10 minutes, ask the learners to stop the tasting and discuss their observations as a class. Use their Activity 2 answers and **slides 17 and 18** of the PowerPoint to enhance the discussions.

Ask learners to explain any observed differences between the cupcake batches. Encourage them to refer back to the functions of the ingredients (**slide 13**). As an extension, ask them whether there is anything else they should consider when carrying out an experiment. Remind them about controls and highlight that this includes equipment and technique too – ask them whether different groups creamed, mixed and folded their mixtures in the same way and whether this could also have affected their cupcakes.