

# The Science of Baking



Everyone is a scientist when it comes to baking, even if they don't realise it. Read on to find out about how bakers use science to make tasty cakes and bread.

There are several things that a baker wants to happen when making a cake or bread. First, they need to create bubbles within the cake mix or bread dough. Then, they need to trap those gas bubbles to make a light but firm texture. Finally, they will use heat to bake the finished product.



## Creaming the Fat and Sugar

The first step in many cake recipes is creaming the fat. Fat used can be butter or a plant-based spread which is creamed with sugar. Creaming fat and sugar creates bubbles in the mixture as air is trapped on the surface of the sugar crystals.

In the 1600s, bakers discovered that adding eggs to their cake mix made the bubbles stronger and less likely to pop. Bakers today can use eggs, flax seeds or a commercial egg replacement to create a protective barrier around the air bubbles within the cake. Bakers can then increase the size of these air bubbles in two ways, by using yeast or a chemical leavening agent.

## Leavening Agents

People have used yeast in baking for hundreds of years. The first yeast used would have been wild yeast, which is a microscopic fungus found naturally in the air around us. A starter composed of a mixture of flour and water would be left out over several days to collect wild yeasts from the environment. This starter would then be used as the leavening agent to make a type of bread known as sourdough. It takes a long time for the bread to rise in this way but many bakers say that it makes the loaf tastier.



When the yeast feeds on sugar, it gives off carbon dioxide. Carbon dioxide is a gas and it creates bubbles inside the dough that cause the bread to rise. Today, you can buy yeast to add to your dough if you don't have a natural starter.

Another raising agent is bicarbonate of soda. Bicarbonate of soda is an alkali. When combined with acid and moisture, it reacts to form pockets of carbon dioxide in the cake mixture. Examples of acids that bakers might use include cream of tartar, buttermilk or lemon juice. Baking powder is bicarbonate of soda that already has the acid mixed in, usually in the form of cream of tartar, and self-raising flour is flour that has been pre-mixed with baking powder.



### Flour and Gluten

Flour contains gluten. When the flour is kneaded with liquid, the gluten forms a mesh in the dough in which gas bubbles form. The gluten mesh stops the bubbles from bursting. If the dough is kneaded for too long then there will be too many gluten strings and the bread will be tough.

### Using Heat

When a cake is placed in the oven, the egg (or vegan alternative) and the gluten set, creating permanent air bubbles in the mixture. Starch, present in the flour, absorbs moisture and dries the mixture out. If the oven is not hot enough then the batter will set too slowly to trap the air bubbles and a heavy cake with a collapsed top will be the result. If the oven is too hot, the air bubbles will expand too rapidly causing the middle of the cake to rise up too much and brown on the outside before the batter on the inside has set.

# Questions

1. What is yeast? Tick **one**.

- A type of grain
- A fungus
- A bacteria
- A seed

2. What is cream of tartar? Tick **two** answers.

- A raising agent
- A type of milk
- A protein in flour
- An acid

3. Which common cake ingredient contains gluten?

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4. What is flaxseed a replacement for?

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5. What was discovered in the 17<sup>th</sup> century?

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6. Describe how bicarbonate of soda makes cakes fluffy.

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7. A baker forgets to add sugar to their bread dough. Explain what will happen and why.

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8. A baker's cake is heavy, and the top has collapsed. Describe what you think they might have done wrong.

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9. Kneading bread dough too much causes the loaf to be tough when cooked. What do you think might happen if the bread dough is not kneaded enough?

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# Answers

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- A type of grain
- A fungus**
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- A seed

2. What is cream of tartar? Tick **two** answers.

- A raising agent**
- A type of milk
- A protein in flour
- An acid**

3. Which common cake ingredient contains gluten?

**Flour**

4. What is flaxseed a replacement for? One answer line please

**Egg**

5. What was discovered in the 17<sup>th</sup> century?

**That egg made bubbles stronger and less likely to break.**

6. Describe how bicarbonate of soda makes cakes fluffy.

**Answers should include the following: that it needs acid and moisture to work, that it produces carbon dioxide, that the carbon dioxide forms bubbles.**

7. A baker forgets to add sugar to their bread dough. Explain what will happen and why.

**Key ideas to include in a good answer: that yeast needs sugar to feed on, that no bubbles will form, that the bread will not rise, or it will be heavy with no bubbles.**

8. A baker's cake is heavy, and the top has collapsed. Describe what you think they might have done wrong.

**The oven was too cold, and the bubbles burst before the ingredients were set by the heat.**

9. Kneading bread dough too much causes the loaf to be tough when cooked. What do you think might happen if the bread dough is not kneaded enough?

**If the bread is not kneaded enough then the gluten will not form a mesh for the yeast to produce air bubbles. The bread will be hard and flat.**