

# Quicksand

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## ***Acknowledgements***

This resource was originally developed by Liverpool John Moores University 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](https://rsc.li/3CJX7M3).

## Learning objectives

By the end of this session, you will be able to:

- Follow instructions for making a non-Newtonian fluid.
- Describe the properties of a non-Newtonian fluid.
- Apply information about the properties of a non-Newtonian fluid to another context.

## Non-Newtonian fluids

- A non-Newtonian fluid can change its behaviour to act as either a solid or a liquid depending on the force applied to it and the conditions surrounding it.
- Examples of non-Newtonian fluids include slime, ketchup, shaving foam and quicksand.
- Quicksand is a non-Newtonian fluid usually found near riverbeds or the seashore. It is made when water floods into sand quickly and is often formed where there are floods or underground springs.
- Quicksand has unusual properties that make it difficult to escape from, so humans and animals can get stuck and sink in it.

### Career links

#### **Consumer products technician**

Chemistry is important when designing materials and products. Watch the video job profile on **slide 4** of the PowerPoint, also available from [rsc.li/3HR7C31](https://rsc.li/3HR7C31), to learn about Robert's role as a consumer products technician. He studies the different materials' behaviours to develop and improve the properties of products.

#### **Environmental chemist**

Read James' job profile on **slide 6** or at [rsc.li/3X33pyG](https://rsc.li/3X33pyG) to find out about green careers, such as environmental chemists. James helps to protect the environment by assessing the risks to life from certain chemicals in soil, water and air.

## Activity 1: what is the best way to escape from quicksand?

You will make and explore the properties of ooze, a non-Newtonian fluid.

### Safety and hazards

Wear safety glasses.

### Equipment

- 150 cm<sup>3</sup> cornflour
- 75 cm<sup>3</sup> water
- Food colouring
- 250 cm<sup>3</sup> plastic beaker or bowl
- 100 cm<sup>3</sup> measuring cylinder
- Stirring rod (not glass)
- Newspaper/bin bags to cover desks with

### To do

1. Cover your work area with newspaper or a bin bag.
2. Put the cornflour into the bowl.
3. Add a drop or two of food colouring.
4. Add water slowly, mixing the cornflour and water with your fingers or a stirring rod until all the powder is wet.
5. Keep adding water until the ooze feels like a liquid when you're mixing it slowly.
6. Tap the surface with your finger or a stirring rod. When ooze is ready, it won't splash and will feel solid.
7. If your ooze is too powdery, add a little more water. If it's too wet, add more cornflour.

## To explore

If you fall into quicksand, is it best to move slowly, using swimming movements, or quickly?

To answer this question, explore how your homemade ooze behaves and record your observations below.

- Pick up a handful of ooze and squeeze it. Stop squeezing. What happens?
- Rest your fingers on the surface of the ooze. Let them sink down to the bottom of the bowl. Then try to pull them out fast.
- Take a blob of ooze and roll it between your hands to make a ball. Then stop rolling. What happens?
- Put a small plastic toy on the surface of the ooze. Does it stay there, or does it sink?
- Smack your ooze hard with a spoon. Does it splash?

## To answer

(a) What did you discover about the properties of non-Newtonian fluids?

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(b) What is the best way to escape from quicksand?

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**Challenge**

i. Could you walk on ooze if there was enough available?

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ii. Explain your answer to part i.

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iii. Do some research to find as many examples of non-Newtonian fluids as you can. Write a list of all the examples you find.

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