

Cornflour Goo (Non-Newtonian fluids) Worksheet

Learning outcomes

In this hands-on, messy experiment you will learn about non-Newtonian fluids, understand how and where they are used in everyday life and learn more about the job roles connected to them.

Introduction

The Science-y bit!!

The word viscosity is used to describe how thick or thin a fluid is. Thick slow-flowing liquids have a high viscosity and thin fast-flowing liquids have a low viscosity. Sir Isaac Newton described how “normal” (Newtonian) fluids behaved, stating that their viscosity was constant and only changed with changes in temperature or pressure. For example, water freezes and turns solid at 0°C and turns into a gas at 100°C. Non-Newtonian fluids do not follow that rule. Their thickness or flow rate is not constant and can change under stress, which is when a force is applied to a body.

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The experiment

Now make your own non-Newtonian fluid! We've created a video guide to help with this activity and you can view it [here](#) (1)

Cornflour Goo Recipe

- ★ 2 parts cornflour to 1-part water
- ★ Add the cornflour into a large plastic mixing bowl
- ★ Slowly pour the water into the cornflour. Mix it with your hands or a spoon until it looks like custard. It should flow like a liquid when tipped slowly side to side but act like a solid if you hit it.
- ★ Add food colouring to the water if you wish but only if you want it to look better! This part is not necessary!

When you mix cornflour with water, the cornflour particles do not dissolve in the water. They stay 'suspended' (floating) in the liquid and can slip and slide past each other.

If you stir the mixture slowly it acts like a liquid, because the 'floating' particles have time to move past each other. But if you apply a sudden stress to the mixture, the water quickly flows out, but the particles do not have enough time to move out of the way. The cornflour particles 'lock together', which makes the goo mixture act like a solid.

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Different types of Non-Newtonian fluids

Not all non-Newtonian fluids behave in the same way when a stress is applied. Some become more solid and others become more fluid. Some non-Newtonian fluids react as a result of the amount of stress applied, while others react as a result of the length of time that stress is applied.

The table below summarises four types of non-Newtonian fluids and gives an example.

Type of behaviour	Description	Example
Thixotropic	Thickness decreases with stress over time	Honey – keep stirring and solid honey becomes liquid
Rheopectic	Thickness increases with stress over time	Cream – the longer you whip it the thicker it gets
Shear thinning	Thickness decreases with increased stress	Tomato sauce
Shear thickening	Thickness increases with increased stress	Cornflour goo

A **Physicist** (2) would explore the scientific laws to learn and understand what makes objects behave the way they do.

Non-Newtonian fluids in the real world

Liquid Body Armour

Liquid armour 'can stop bullets' (3)

The non-Newtonian fluid used in the liquid inside the armour allows it to mould to a person's body shape, but it becomes solid and resistant if struck by the force of a bullet.

Examples of jobs that would work on this type of design are **Materials technician** (4), **Materials engineer** (5) or a **Design engineer** (6)

Activity on next page...

Safety equipment in car racing

Scientists investigated whether non-Newtonian fluids could help to reduce the number of “whiplash” injuries in sports activities and accidents, such as those that can occur in car racing. Read this article to learn more: [“Application of Shear thickening non-Newtonian fluid to minimise head and neck injury”](#) (11)

Examples of jobs roles that would work on this type of project include:

[Automotive engineer](#) (12) , [Product designer](#) (13), [Production manager](#) (14), [Project manager](#) (15)

After looking at all these different job roles, do you see any skills that are common?

We’ve looked at job roles that would use this science, but you can find out more about a whole range of other job roles at [My World or Work](#) (16).

Website references

1. Cornflour Goo activity guide film <https://bit.ly/3daH3Ec>
2. Physicist <https://bit.ly/2XgpAo2>
3. Liquid armour can stop bullets <https://www.bbc.co.uk/news/10569761>
4. Materials technician <https://bit.ly/2TqiYCB>
5. Material engineer <https://bit.ly/3cPfG3g>
6. Design engineer <https://bit.ly/3bOd9VZ>
7. Sport & exercise scientist <https://bit.ly/2ZI4p6Y>
8. Garment technologist <https://bit.ly/2ToEJm4>
9. Quality control technician <https://bit.ly/2zPfO4h>
10. Quality control manager <https://bit.ly/3bQjMHb>
11. Safety equipment in car racing <https://bit.ly/2zWllysU>
12. Automotive engineer <https://bit.ly/2XeqhhB>
13. Product designer <https://bit.ly/3bJmDBz>
14. Production manager <https://bit.ly/2zRzeFF>
15. Project manager <https://bit.ly/2LGfOq2>
16. My World of Work www.myworldofwork.co.uk