

**nano**   
**wew**  
properties

## Introduction

It is really important that the children understand that the properties of materials can behave differently at the nanoscale. This is part of what makes nanoscience really exciting and enables it to open up a whole world of new possibilities. This is the reason why nanoscience is helping computers to become smaller and faster and it facilitates the development of new types of “smart” or “intelligent” materials. For the children to understand that the properties of materials behave differently on the nanoscale, they need to clearly understand what the word ‘properties’ means in relation to materials. This lesson has a PowerPoint presentation, worksheet and an activity.

## ICT links

This is an interactive lesson that enables the children to explore the properties of everyday materials such as paper and fabric. It can be used in school or for homework [www.bbc.co.uk/bitesize/topics/zrsgk7/articles/z9pgcdm](http://www.bbc.co.uk/bitesize/topics/zrsgk7/articles/z9pgcdm)

This site is a really interesting exploration of materials and their properties. This is a great start for definitions of different properties and the start of a webquest.

<https://kids.britannica.com/kids/article/materials/476293>

## Curriculum links

### Science

**Strand:** Materials

**Strand Units:** Properties and characteristics of materials, materials and change

### Maths

**Strand:** Measures

**Strand Unit:** Area

## WALT

- Understand the word ‘properties’ in relation to materials
- Recognise different properties of everyday materials
- Investigate the properties of everyday materials
- Identify how materials are used and why different materials are chosen for different tasks
- Understand that the properties of materials behave differently at the nanoscale

## Teaching tips

- The PowerPoint slides provided show images of different materials and can be used to generate discussion about the names of different materials, their histories and their uses.
- A discussion about the word ‘Properties’ and identifying the properties of everyday items in the classroom or home will prepare the children for the accompanying worksheet.
- The worksheet could be used as a means of assessment to ascertain if the children understand the idea that materials have different properties.
- Reinforce the key learning objectives when conducting activities.

## Journal suggestions

- Make a list of 4 items in your bedroom/ classroom/kitchen and identify their properties.
- Look at a picture of a raw egg. Identify the properties of the raw egg.
- In your journal describe different ways of cooking an egg and how the properties of the egg change when it is cooked.

What is your mobile phone made out of? Watch Video 1 on Properties and make a list of the different materials and their properties.



## Background information

**Definition of 'Properties':** Qualities or traits that belong to things.

Learning to understand how the properties of materials behave on the nanoscale and how we might be able to use these new materials to solve problems and explore our world is what nanoscience is all about.

**Properties on the Nanoscale** Nanoscientists have discovered that when they break materials down to nanoscale pieces, the properties of those materials, as we know them, can change or behave very differently.

### Examples

- A nano size piece of gold is not the gold colour we are familiar with – it can appear red!
- Flour (for baking) is not very flammable in large amounts, however in dust form it can become an explosive!
- A drop of water on the nano scale (about 5 nanometres across) does not begin to boil at 100°C but at 95.9°C.
- Large zinc oxide particles appear white, while at the nanoscale they are clear. This property is used in new clear suncreams.
- Aluminum is the shiny pliable metal which is used for soft drink cans. At the nanoscale, tiny particles of aluminum are extremely reactive and will explode!

We can start to understand the properties of materials at the nanoscale by looking at the properties of materials all around us. Take a tree for example. There are numerous different products we make from wood, from flooring and tables, which have one set of properties, down to paper and tissue paper, which are very different. The materials these products are made from have very different properties and therefore have very different applications. Materials scientists study the properties of materials, their applications, and also manufacturing processes we use to make different products. We apply the same thinking to tiny nanoscale materials – which can have very different properties to those we might expect.

# Trigger questions



## Trigger questions

These can be used during the PowerPoint presentation to promote a more in-depth discussion on properties.

**What are the properties of your school jumper / your pencil / a drinking glass?**

Is it flexible?

Is it absorbent?

Is it transparent?

Is it magnetic?

Is it strong?

Is it hard?

What colour is it?

Does it conduct electricity? (Optional: Subject to materials available)

Blank orange horizontal bars for writing answers.



