

C6.1.13 Different Materials

Previous knowledge:

Conductivity – allows heat/electricity to pass through

Compressive strength – measure of how strong a material is when squashed

Hardness – the difficulty involved in scratching a material

Tensile strength - measure of how strong a material is when stretched

Toughness – how much energy it takes to break a material with an impact force

Previous knowledge recap quiz

- Answer the office forms quiz questions

Learning Objectives

- Describe the typical properties of ceramics
- Use data to select a material for a particular use
- Use the structure of ceramics to explain their properties

Properties of materials

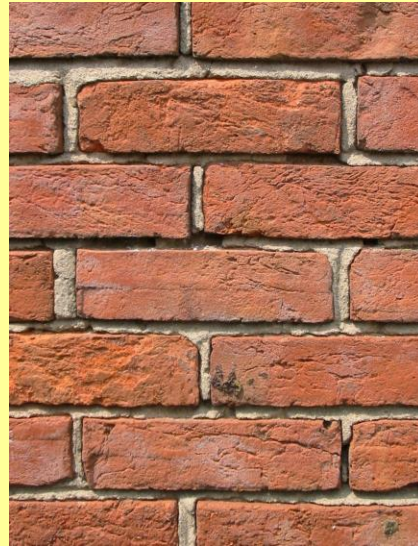
- **Conductivity** – allows heat/electricity to pass through
- **Compressive strength** – measure of how strong a material is when squashed
- **Hardness** – the difficulty involved in scratching a material
- **Tensile strength** - measure of how strong a material is when stretched
- **Toughness** – how much energy it takes to break a material with an impact force

What is a ceramic?

A hard, non-metallic material

Examples

- Brick
- China
- Glass
- Clay



- They are giant lattices of atoms (giant covalent) or ions (ionic compounds)

Typical properties of a ceramic

1. Hard
2. Brittle
3. High melting points
4. Stiff
5. Poor conductors of electricity

1, 3 and 4 are due to high bond strengths

2 is because, unlike metals, the atoms or ions cannot easily slide over each other

5 is due to there being no mobile charged particles

We can use our knowledge of the properties of ceramics to determine if materials are ceramics or not

Material	Conducts electricity	Relative Hardness	Melting point °C
A	No	9.0	3532
B	Yes	7.5	2100
C	No	2.0	130
D	No	8.4	4099

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Police bullet-resistant vests could be made from steel or Kevlar[®].

The table shows some information about steel and Kevlar[®].

	Steel	Kevlar [®]
Density (g / cm ³)	7.85	1.44
Relative strength	1	5
Flexibility	low	high
Resistance to corrosion	low	high



Describe and explain **two** reasons why bullet-resistant vests are made from Kevlar[®] instead of steel.



Needs to be low, or the vest will be too heavy to wear comfortably

needs to be strong, to stop being penetrated by a bullet

The table shows some information about steel and Kevlar®.

	Steel	Kevlar®
Density (g / cm ³)	7.85	1.44
Relative strength	1	5
Flexibility	low	high
Resistance to corrosion	low	high

Needs to be flexible, as this will make it more comfortable to wear

needs to resist corrosion so that it will last longer

Describe and explain **two** reasons why bullet-resistant vests are made from Kevlar® instead of steel.

TASK 1:

Answer this exam question

A new plastic called 'NPFC' has been developed.

'NPFC' has the following properties.

- easy to colour with dyes
- poor conductor of heat
- easy to cut with a knife
- starts to soften at 50 °C
- biodegradable

A food company investigated the use of this plastic to make containers for take away fish and chips.

(a) State the property which makes 'NPFC' a good material for a disposable container and give a reason for your answer. [2]

(b) Using the properties given, explain why the food company decided not to use 'NPFC' to make fish and chip containers. [2]

Task 2: Mark your answer

a

NPFC is biodegradable (1)

This reduces the need for landfill (1)

b

NPFC starts to soften at 50 degrees (1)

Since the food will be hot the container will lose its shape (1)

Lesson recap quiz

- Answer the office forms quiz questions