

Learning intent: Understand the properties of engineering materials, their uses and how they are tested (LO2)

## Engineering materials revision

**What the exam board say:**

LO2 understand properties of engineering materials	AC2.1 describe properties required of materials for engineering products	9-15	15-25%
	AC2.2 explain how materials are tested for properties		
	AC2.3 select materials for a purpose		

Use <http://www.technologystudent.com> to help

**This means you need to be able to:**

- Identify different engineering materials
- Describe what they are like (hard, soft, tensile strength etc)
- Explain how they are tested for different properties
- Analyse why a specific material is used for a product

**Learning intent:**

Understanding different properties of engineering materials, their uses and how they are tested.

**Success Criteria:**

L2 Distinction: (**bold below**) Explain reasoned examples of different materials and their uses and explain their properties using engineering terminology. Explain clearly how engineering materials are tested.

L2 Merit: (underlined below) Describe engineering materials, their uses and their properties using some engineering terminology. Explain how engineering materials are tested.

L2 Pass: (*italics below*) Identify engineering materials, their uses and their properties, using basic engineering terminology. Explain briefly how it can be tested.

**WAGOLL:** Glass is an engineered material which is produced by heating sand to high temperatures and shaping. This can be used for making glasses to drink from or improve people's sight. It is also used in windows to allow light into a building. *It is used for drinking glasses as it can be shaped, is rigid and water resistant. It is used for vision glasses as it changes the light rays a person sees, allowing images to become clearer. It is used in windows as it is transparent, however it has limited thermal insulating properties.* **This is usually overcome by using two layers of glass to trap a layer of air in-between, therefore improving the thermal efficiency. A negative characteristic about glass is that it can shatter and produce sharp shards. It can be strengthened to overcome this through adding numerous layers and protective coatings. Glass can be tested by placing over a bridge and applying weights from a specific height to see what it withstands. The weights could be increased or dropped from different heights as variables in this test and the level of marking or breaking will be recorded.**



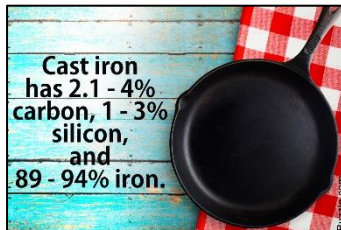
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### **Ferrous metals:**

Identify different types of ferrous metals and their uses in the space below.



Describe different properties of ferrous metals and how these make them suitable for their uses in the space below.



Explain how the properties of ferrous metals will be tested to ensure that they are suitable for purpose in the space below.



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### Non - Ferrous metals:

Identify different types of non-ferrous metals and their uses in the space below.



Describe different properties of non-ferrous metals and how these make them suitable for their uses in the space below.



Explain how the properties of non-ferrous metals will be tested to ensure that they are suitable for purpose in the space below.



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### Thermosetting plastics:

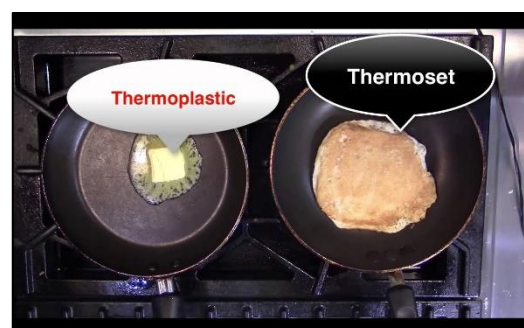
Identify different types of thermosetting plastics and their uses in the space below.



Describe different properties of thermosetting plastics and how these make them suitable for their uses in the space below.



Explain how the properties of thermosetting plastics will be tested to ensure that they are suitable for purpose in the space below.



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### **Thermosoftening plastics:**

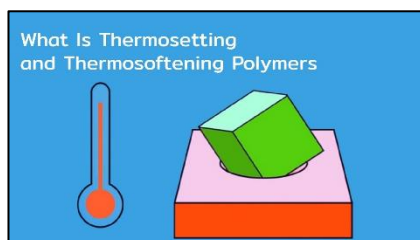
Identify different types of thermosoftening plastics and their uses in the space below.



Describe different properties of thermosoftening plastics and how these make them suitable for their uses in the space below.



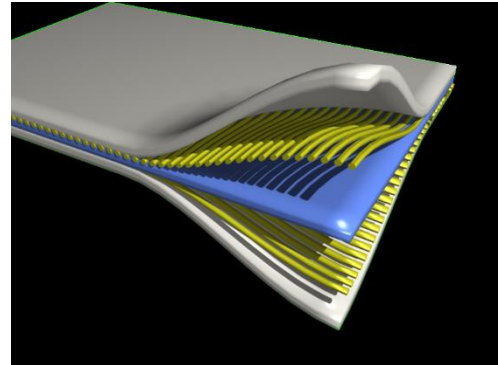
Explain how the properties of thermosoftening plastics will be tested to ensure that they are suitable for purpose in the space below.



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### **Composite materials:**

Identify different types of composite materials and their uses in the space below.



Describe different properties of composite materials and how these make them suitable for their uses in the space below.



Explain how the properties of composite materials will be tested to ensure that they are suitable for purpose in the space below.

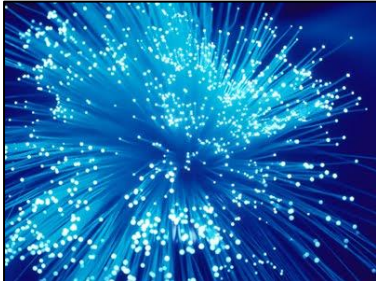




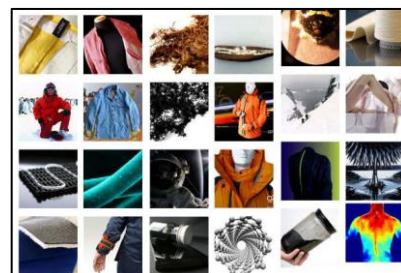
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### **Smart materials:**

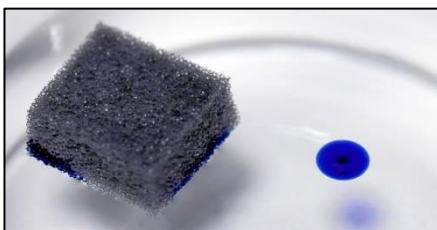
Identify different types of smart materials and their uses in the space below.



Describe different properties of smart materials and how these make them suitable for their uses in the space below.



Explain how the properties of smart materials will be tested to ensure that they are suitable for purpose in the space below.



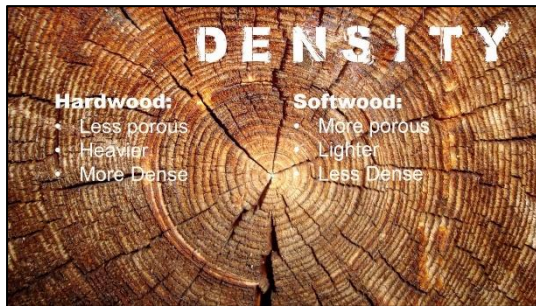
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### **Natural timbers:**

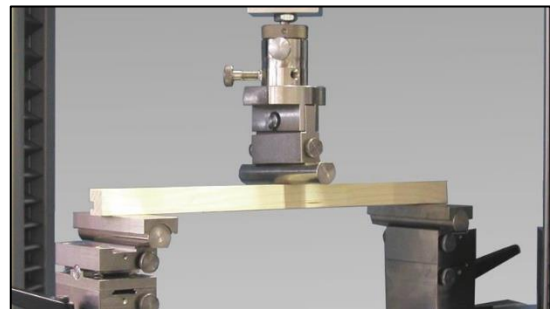
Identify different types of natural timbers and their uses in the space below.



Describe different properties of natural timbers and how these make them suitable for their uses in the space below.



Explain how the properties of natural timbers will be tested to ensure that they are suitable for purpose in the space below.





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## Materials testing

### Learning intent:

*Understand properties of materials in engineering and how these can be accurately tested.*

### Success criteria

*L2 merit* – complete **accurate materials testing** and explain uses and **evaluations** of each test.

*L2 pass* – complete **accurate materials testing** giving uses of each test.

*L1 pass* – complete **materials testing** and **explain** how each may be used.

Materials being tested & predictions of properties:

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Why are materials tested in engineering?

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What are the issues with testing materials in engineering?

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**Tests to be carried out:**

	How is it carried out?	How is this a fair test?	What were the results?	What properties does this show?	How can these be used in engineered products?
Hardness test:	Hitting with a centre punch on an iron block				
Density test:	Measuring weight vs size of object				
Ductility test:	Measure length of stretch of material with controlled pressure				
Impact test:	Drop weight over a wooden bridge from a controlled height.				
Controlled shear test:	Swing weight into an object using stand.				

**Properties of materials**

Learning Intent: Understand the properties of materials

Success Criteria:

**L2 Distinction:** Explanation of properties and their impact on products.

**L2 Merit:** Description of properties and their impact on products.

**L2 Pass:** Identification of properties and their impact on products.

1. What is a tensile test?

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2. On the graph below label the following and then explain what each term is:

a) Elastic deformation

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b) Yield strength

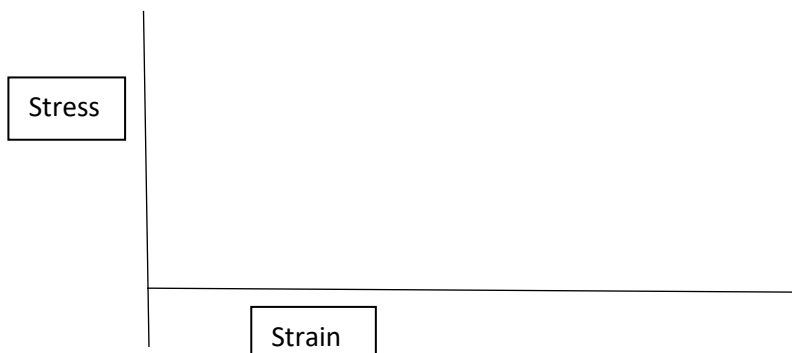
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c) Ultimate strength

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d) Fracture point

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3. How would a more flexible material be shown on the above graph?

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4. How would a less flexible material be shown on the above graph?

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5. What is toughness?

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6. What is ductility?

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7. Describe the engineering properties of a spring steel.

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8. Give an example of a brittle material and explain what this means.

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9. What makes steel more brittle?

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10. What is heat treatment?

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	What is the process	What materials does it affect?	What is a real-world example of where it happens?
Corrosion due to water			
Corrosion due to oxygen			
Corrosion due to solvents			
Environmental degradation			
Thermal conductivity			
Thermal expansion			