

## **Unit R109 – Engineering materials, processes and production**

### **Use of materials**

#### ***Instructions and answers for teachers***

*These instructions should accompany the OCR resource ‘Use of materials’ activity which supports OCR Cambridge Nationals in Engineering.*



#### **The Activity:**

This resource comprises of 1 task.



*This activity offers an opportunity for English skills development.*

#### **Associated materials:**

‘Use of materials’ activity sheet

#### **Suggested timings:**

**Task 1:** 1 hour

## Learning outcome 1 – Know about properties and uses of engineering materials

### Task 1

In this activity learners are required to match suitable materials to a range of engineered products and to justify their selection by giving a brief explanation of the properties of these materials.

The activity may be undertaken individually, in pairs or as part of a group activity at the teacher's discretion. It might also be undertaken as a research-based activity and learners could present their findings in alternative forms (eg as a PowerPoint presentation or a poster).

Solutions are given in the following table, however learners might identify further material properties that are valid.

The teacher might extend the activity by including further or alternative engineered products and materials.

The activity could be used to introduce a wider discussion about properties and applications of materials.


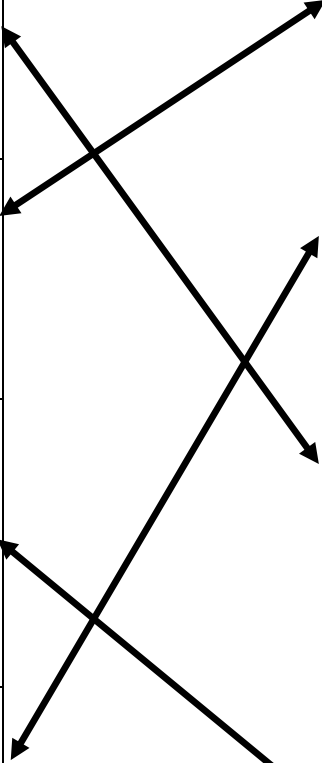



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Engineered Product		Match	Materials	Properties
	Machining bases		Bronze (non-ferrous)	<ul style="list-style-type: none"> <li>• Can be cast into complex shapes</li> <li>• Corrosion resistant</li> <li>• Strong</li> <li>• Durable</li> <li>• Minimal flexibility</li> </ul>
	Boat propellers		Phenol-formaldehyde	<ul style="list-style-type: none"> <li>• Easy to mould</li> <li>• Good strength and dimensional stability</li> <li>• Good impact resistance</li> <li>• Poor conductor of heat</li> <li>• Good electrical insulator</li> </ul>
	Telephone casing		Cast iron (ferrous)	<ul style="list-style-type: none"> <li>• Easy to cast</li> <li>• Low melting point</li> <li>• Easy to machine</li> <li>• Resistant to deformation and wear resistant</li> <li>• Brittle – but good in compression</li> <li>• Ferrous so corrodes (rusts)</li> </ul>
	Heat resistant pan handles		Acrylonitrile-Butadiene-Styrene (ABS)	<ul style="list-style-type: none"> <li>• Easy to mould</li> <li>• Impact resistant and tough</li> <li>• Good surface finish possible</li> <li>• Can be easily coloured</li> </ul>

Engineered Product		Match	Materials	Properties
	Cutting tool tips		Shape Memory Alloy (SMA)	<ul style="list-style-type: none"> <li>• Change to their environment</li> <li>• Remembers original shape</li> <li>• When heated will return to original shape</li> <li>• Lightweight</li> <li>• Easily bent</li> <li>• Strong</li> </ul>
	Bicycle frames		Tungsten carbide	<ul style="list-style-type: none"> <li>• Can be termed a powdered metal or ceramic material</li> <li>• Powder can be pressed and formed into shapes</li> <li>• Very stiff - twice as stiff as steel</li> <li>• Dense</li> <li>• Very hard</li> <li>• Very high temperature resistance</li> <li>• Low electrical resistance</li> </ul>
	Dental brace		Carbon fibre	<ul style="list-style-type: none"> <li>• High tensile strength</li> <li>• High Young's modulus (high stiffness to extension under load)</li> <li>• Lightweight</li> <li>• Stable properties at high temperature</li> <li>• Corrosion resistant</li> <li>• Can be made fire resistant</li> </ul>