Write your name here

| Surname | Other names |
|---|---|
| | |

**Pearson**
**Edexcel GCE**

Centre Number | | | | | |

Candidate Number | | | | |

# Design and Technology

## Product Design: Resistant Materials Technology
## Advanced Subsidiary
## Unit 2: Design and Technology in Practice

Wednesday 14 May 2014 – Morning
**Time: 1 hour 30 minutes**

Paper Reference
**6RM02/01**

**You do not need any other materials.**

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches it must be dark (HB or B). Coloured pens, pencils and highlighter pens must not be used.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

### Information

- The total mark for this paper is 70.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

*Turn over* ▶

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1/1/1

P 4 3 3 7 6 A 0 1 1 6

PEARSON

**Answer ALL questions.**

**Write your answers in the spaces provided.**

**1** Metals can be classified as ferrous or non-ferrous.

(a) Give **three** characteristics of non-ferrous metals compared with ferrous metals.

**(3)**

1 .....

.....

2 .....

.....

3 .....

.....

(b) Name the **two** metals that are alloyed to make brass.

**(2)**

1 .....

2 .....

(c) Many non-ferrous metals can be joined using hard soldering.

Describe the process of hard soldering.

**(4)**

**(Total for Question 1 = 9 marks)**

**2** (a) Rack and pinion mechanisms are used in car steering systems and pillar drills.

Draw a diagram of a rack and pinion mechanism.

**(2)**

(b) Shape Memory Alloys (SMA) are often used in fire alarms and air-conditioning units.

Explain the smart property of a Shape Memory Alloy (SMA) that makes it suitable for these applications.

**(2)**

(c) Turbine blades in jet engines and brake discs in high performance cars are often made from thermo-ceramics.

Explain **three** advantages of thermo-ceramics that make them appropriate in these situations.

**(6)**

1 .....

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2 .....

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**(Total for Question 2 = 10 marks)**

**3** Lathes and milling machines are commonly found in workshops.

Figure 1 shows a diagram of a centre lathe for turning metal.

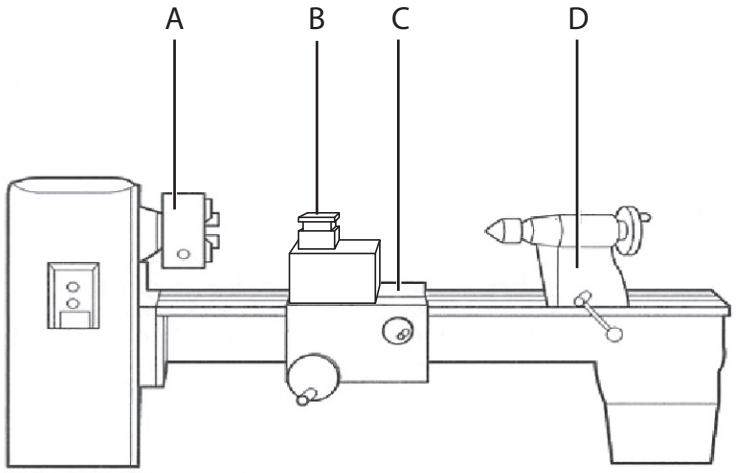


**Figure 1**

(a) Name the **four** parts of the lathe indicated with the letters A, B, C and D.

**(4)**

A .....

B .....

C .....

D .....

(b) Figure 2 shows a block of steel with a slot milled into the top surface.

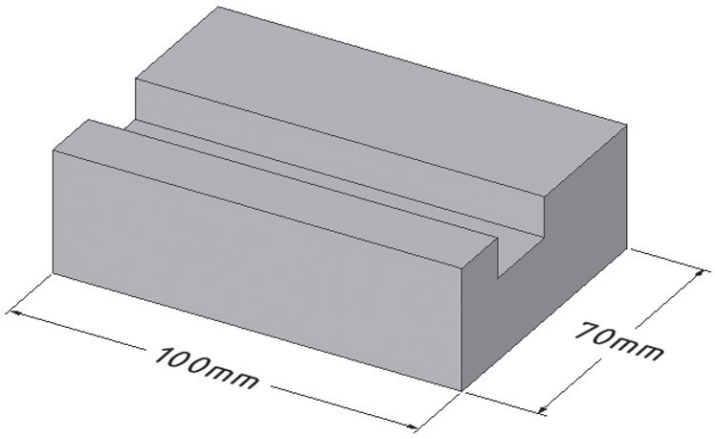


**Figure 2**

Describe the process of machining the slot in the steel block using a manual milling machine.

**(5)**

**(Total for Question 3 = 9 marks)**

**4** Figure 3 shows a picture of a kayak.


**Figure 3**

The kayak is made from glass reinforced plastic (GRP).

(a) Name a polymer used in GRP.

**(1)**

(b) Describe the steps involved in producing a glass reinforced plastic (GRP) moulding.

**(6)**

(c) Explain why the production of glass reinforced plastic (GRP) products is suited to batch production.

**(4)**

**(Total for Question 4 = 11 marks)**

**5** (a) Blow moulding is commonly used for the production of plastic bottles.

Describe, using notes and/or sketches, the blow moulding process.

**(6)**

(b) The use of tolerances is an essential part of quality control systems within manufacturing.

Explain **two** reasons why tolerances are set.

**(4)**

**(Total for Question 5 = 10 marks)**

**6** Figure 4 shows a coffee table with a mahogany veneered medium density fibreboard (MDF) top and solid mahogany frame.

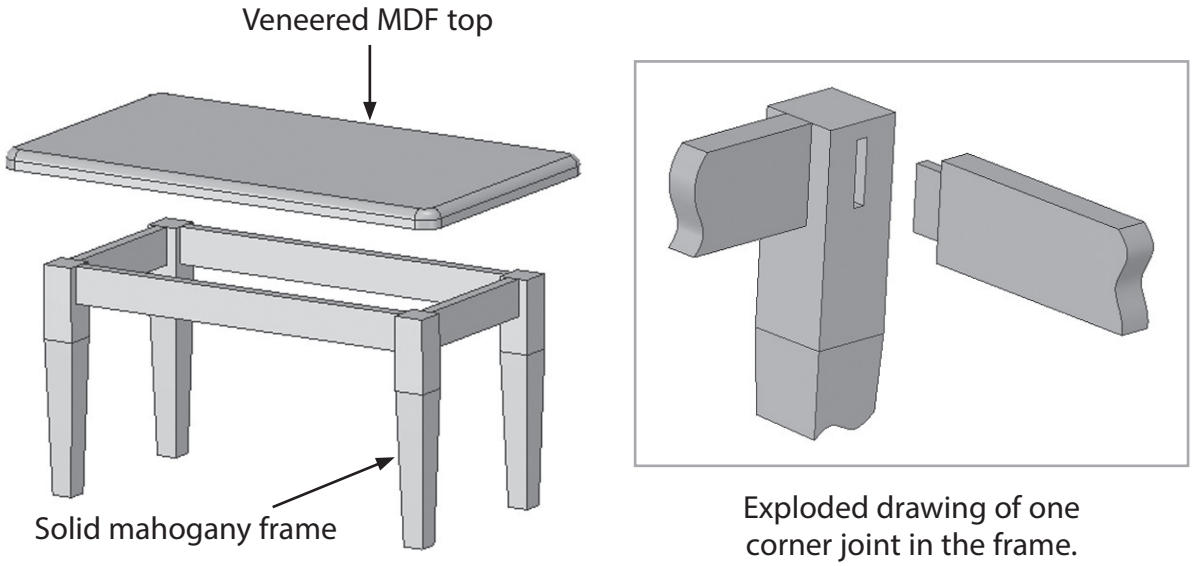


**Figure 4**

***(a)** Explain **three** reasons why the frame is made from solid mahogany rather than veneered medium density fibreboard (MDF).

**(6)**

(b) Figure 5 shows a hand-held router that was used in the manufacture of the table frame.


(Source: © 2013 Sitebox Ltd)

**Figure 5**

(i) A risk assessment is necessary before using power tools. To reduce the risk of injury, a range of personal protective equipment (PPE) is worn as a control measure.

Outline **five** further control measures for the safe use of a hand-held router.

**(5)**

(ii) Justify the requirement for risk assessments to be formally recorded and stored.

**(4)**

**(Total for Question 6 = 15 marks)**

***7** The role of the British Standards Institute (BSI) is to promote safety and quality throughout product manufacture and usage.

Evaluate the advantages and disadvantages to a business of ensuring their practices and products comply with BSI standards.

**(6)**

**(Total for Question 7 = 6 marks)**

**TOTAL FOR PAPER = 70 MARKS**

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