Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2024

Technology and Design

Unit 2

Option C:
Product Design

[GTY23]

GTY23

WEDNESDAY 12 JUNE, MORNING

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Questions which require drawing or sketching should be completed using an H.B. pencil.
All written questions must be completed using black ink only.
Do not write in pencil or with a gel pen.
Answer **all** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Quality of written communication will be assessed in Question **8**.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

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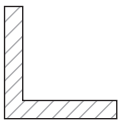
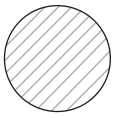
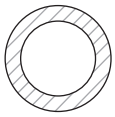
Answer **all** questions

1 **(a)** Lengths of plastic material are available in a range of common shapes.

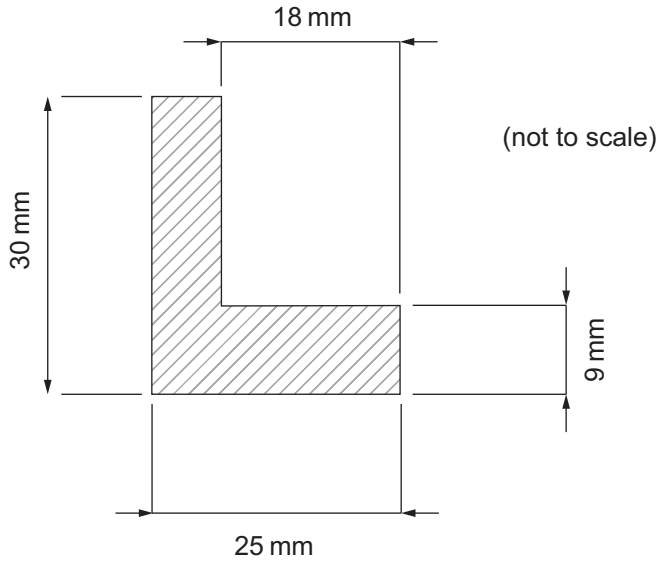
Using the first row as a guide, complete **Table 1**.

Table 1

Cross section profile	Cross section name
	Angle
	
	I-shaped section
	Sheet
	
	U-shaped channel

[5]

(b) (i) Calculate the cross-sectional area of the angle section shown in **Fig. 1**.



Source: CCEA

Fig. 1

Candidates need to show their working out in the space below.

_____ mm^2 [3]

(ii) Name the manufacturing process used to produce the angle section shown in **Fig. 1**.

_____ [1]

[Turn over

(c) **(i)** The manufacturer requires the angle section to be made to 0.05 mm tolerance. State what is meant by the term tolerance.

_____

_____ [1]

(ii) To test the tolerance of the angle section, the manufacturer uses sample testing. Explain what sample testing is and how it provides quality assurance for the angle section.

_____

_____

_____

_____

_____

_____ [2]

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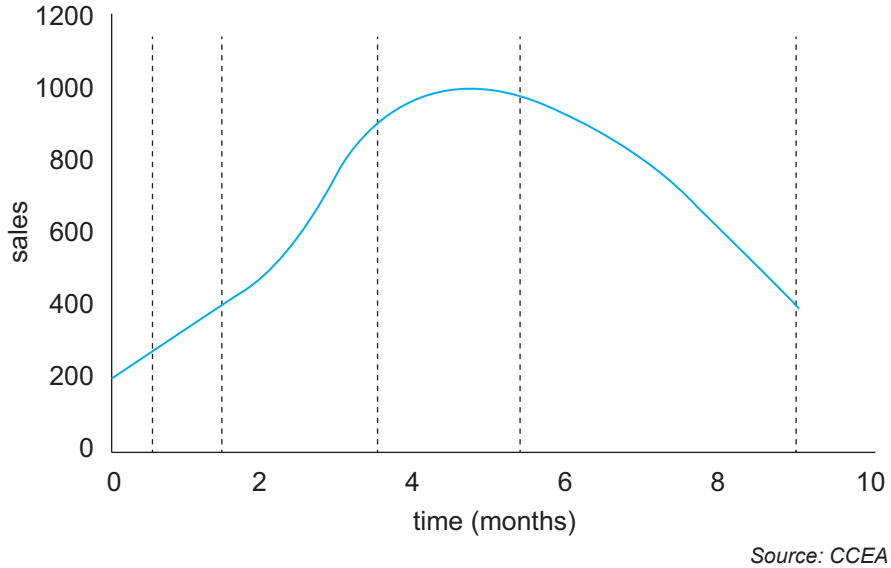
(Questions continue overleaf)

2 **Fig. 2** shows a graph plotting sales over time for a child's toy. This is a visual method to show the product life cycle of the toy.



Source: CCEA

Fig. 2

(a) **(i)** The toy's product life cycle has **five** main stages.

One of the stages of the product life cycle is maturity.

Mark the maturity stage on **Fig. 2**. [1]

(ii) Name the other **four** stages of the product life cycle.

_____

_____

_____

_____ [4]

(b) Describe what is happening to toy sales during the maturity stage of the product life cycle.

_____

_____

_____ [2]

(c) Outline **three** strategies the toy company could use to extend the length of the maturity stage of the product life cycle.

1. _____

_____ [1]

2. _____

_____ [1]

3. _____

_____ [1]

(d) The toy company has sealed the battery compartment of the toy. This contributes to built-in obsolescence. Define what is meant by the term built-in obsolescence and explain why the toy company uses this within their product.

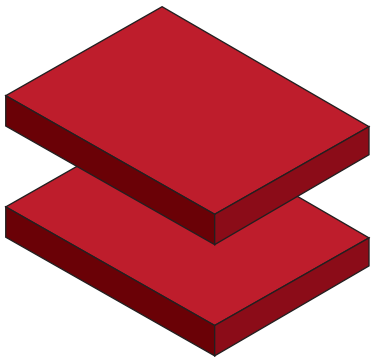
Definition _____

_____ [1]

Explanation _____

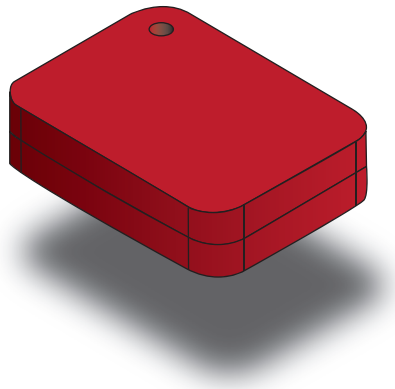
_____ [2]

3 **Fig. 3** shows two pieces of acrylic. They are to be used to make the key fob shown in **Fig. 4**.



Source: CCEA

Fig. 3



Source: CCEA

Fig. 4

(a) **(i)** **Table 2** shows the tasks involved in making the key fob and the time taken for each task. The tasks are not listed in the correct sequence. Complete the table. Use of wet and dry abrasive takes twice as long as polishing.

Table 2

Task	**Time (minutes)**
Polishing	5
Marking out and gluing	5
Wet and dry abrasive	
Filing and drilling	15

[1]

(ii) Using the correct sequence and assuming one person makes the key fob, complete the Gantt chart.

Task \ Time (minutes)	5	10	15	20	25	30	35
Polishing							
Marking out and gluing							
Wet and dry abrasive							
Filing and drilling							

[5]

(b) List **two** tools used to mark out the key fob.

1. _____

2. _____ [2]

4 **Fig. 5** shows a range of stainless steel dental care tools.

Source: © Getty Images

Fig. 5

(a) Give **two** reasons why stainless steel is an appropriate material for the tools.

1. _____

2. _____ [2]

(b) **(i)** The designer of the dental tools considered anthropometric data in the development of the design. Define what is meant by the term anthropometric data.

_____

_____ [1]

(ii) Considering the tools in **Fig. 5**, briefly explain **two** ergonomic features of their design.

1. _____

_____

2. _____

_____ [2]

Fig. 6 shows a set of orthodontic braces that are made from shape memory alloy.

Source: © Getty Images

Fig. 6

(c) **(i)** Name the material that is used to make shape memory alloy.

_____ [1]

(ii) Explain why shape memory alloy is suitable for the wire of the orthodontic braces.

_____

_____ [2]

[Turn over

5 **Fig. 7** shows a cedar barrel planter that may be used for plants and shrubs.

Source: CCEA

Fig. 7

(a) Is cedar a softwood or a hardwood?

_____ [1]

(b) A manufacturer employs 3 people to produce barrel planters and pays them £60 each per day.

(i) Calculate the labour costs for the company for a 5 day week.

Candidates need to show their working out in the space below.

£ _____ [2]

The manufacturer produces 16 barrel planters per day. The material costs £8 for one planter.

(ii) Calculate the direct costs for the company for each 5 day week.

Candidates need to show their working out in the space below.

£ _____ [4]

[Turn over

(c) The barrel planter needs to be moved to different locations.

Design a suitable device that the barrel planter could sit on to enable it to be moved easily. The device should securely support the weight of the barrel planter when filled with soil. The device should allow for water drainage from the barrel planter.

The diameter at the base of the barrel planter is 45 cm.

Using clear annotated sketches and details, produce a suitable design of a holder. Your solution should:

- show how the barrel planter can be easily moved;
- show how the holder securely supports the weight of the barrel planter and its contents;
- show how the water can drain from the barrel when using the holder.

[10]

6 The global marketplace involves companies operating in many countries.

(a) Discuss **three** impacts that globalisation may have upon a company.

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

(b) To support the increased demand for their products following globalisation, the company is reorganising its computer aided design (CAD) facilities.

State **three** technical reasons why the company would make these changes.

1. _____

_____

2. _____

_____

3. _____

_____ [3]

7 **Fig. 8** and **Fig. 9** show the 2012 London Olympic torch.

Source: © Getty Images

Fig. 8

(a) **(i)** The torch is manufactured from aluminium alloy with a gold effect finish. Suggest **two** properties that make aluminium alloy a suitable material for the torch.

1. _____

2. _____ [2]

(ii) Before shaping, the holes are cut from flat sheets of aluminium alloy. Give **three** reasons why CAM is a suitable method for cutting the holes.

1. _____

_____

2. _____

_____

3. _____

_____ [3]

Fig. 9 shows the holes in the torch.

Source: © Getty Images

Fig. 9

(iii) The main structure of the torch is created by layering **two** of the flat sheets of aluminium alloy and shaping them to create the triangular shape of the torch. Suggest **two** reasons why the designers have produced holes in both sheets.

1. _____

_____

2. _____

_____ [2]

(iv) The flame was passed in the Olympic relay from person to person. State **two** design features of the torch that make it suitable for use in a relay by a large variety of people.

1. _____

_____

2. _____

_____ [2]

[Turn over

(b) **(i)** Name the designers of the London Olympic torch shown in **Fig. 8** and **Fig. 9**.

_____ [2]

(ii) List **two** other products that these designers are known for.

1. _____

2. _____ [2]

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(Questions continue overleaf)

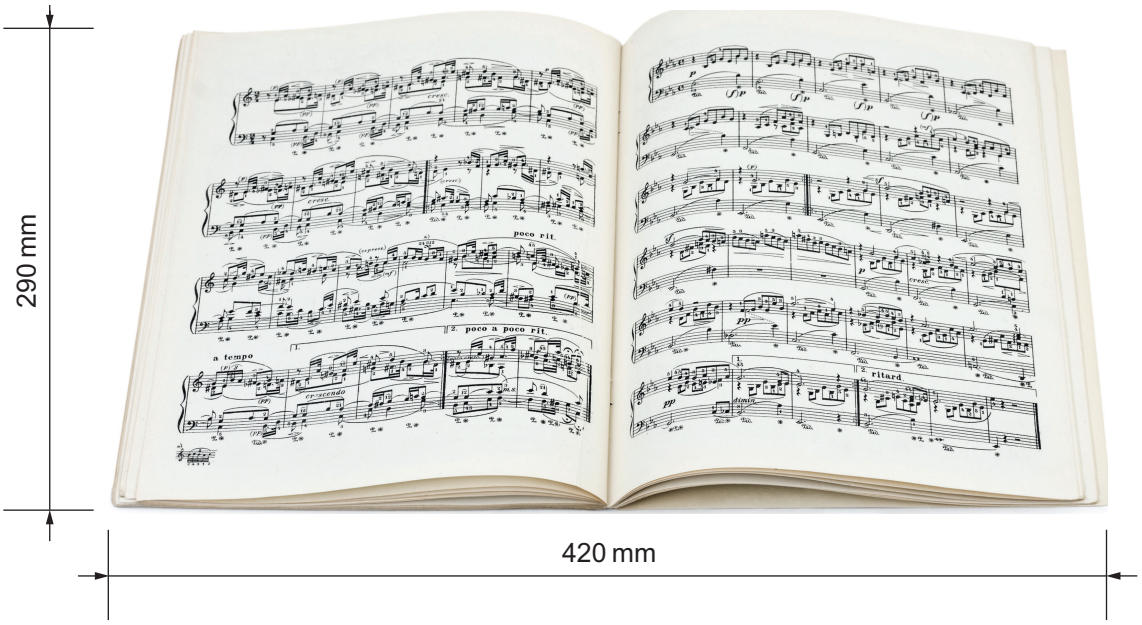
8 Using an annotated sketch or sketches, design a height adjustable music stand for sheet music. The stand should be easily moved. During use it should be freestanding on the floor.

The design solution should show evidence of the following features:

- Good quality annotated sketches giving consideration to line, shape, form and proportion.
- The height of the stand should be easily adjusted to suit the needs of the user.
- The sheet music should be securely supported and clearly visible when the stand is in use.
- The stand should be freestanding and stable, on the floor, when in use.
- Be aesthetically pleasing and have an appropriate surface finish.
- Identify and justify the selection and thickness of materials.
- Identify and justify the main manufacturing techniques used in the design's construction.
- Include three key dimensions. [20]

Use the following two pages for your answer.

Quality of written communication will be assessed in this question.



Source: Getty Images

Fig. 10

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Examiner Number

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