



National  
Qualifications  
2022

**X819/76/11**

**Design and Manufacture**

TUESDAY, 10 MAY  
9:00 AM – 11:15 AM

**Total marks — 80**

**SECTION 1 — 25 marks**

Attempt ALL questions.

**SECTION 2 — 55 marks**

Attempt ALL questions.

Write your answers clearly in the answer booklet provided. In the answer booklet you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Before leaving the examination room you must give your answer booklet to the Invigilator; if you do not, you may lose all the marks for this paper.



**SECTION 1 — 25 marks**

**Attempt ALL questions**

1. Two children's diggers are shown below with product information.

**Playground sand-digger**

**Materials**

tubular stainless steel frame

textured ABS seat

nylon bearings

**Additional details**

360°rotation

permanently fixed to ground

vandal proof nuts/bolts used

designed for commercial use

**Price — £499.00**



**Garden digger**

**Materials**

tubular mild steel frame (painted)

solid polypropylene seat

hollow ABS wheels

mild steel scoop (painted)

rubber handles

**Additional details**

self-assembly (tools included)

designed for domestic use

**Price — £47.99**

	MARKS
<b>1. (continued)</b>	
(a) Explain why the materials chosen are suitable for these products. (You must give <i>six different explanations.</i> )	6
(b) Name <b>three</b> appropriate manufacturing processes used in the production of the diggers <b>and</b> explain why each one is suitable.	6
(c) Describe how anthropometrics and physiology have influenced the design of the diggers.	4
(d) Describe how the design of the diggers have been influenced by function and safety.	5
(e) Describe how production and planning systems could be used to improve efficiency during the manufacture of the diggers.	4

[Turn over

## SECTION 2 — 55 marks

Attempt ALL questions

2. A range of kitchen utensils is shown below.



The utensils have been compression moulded using a thermo-setting plastic.

- (a) Explain why a thermo-setting plastic is suitable for the utensils.

2

- (b) Explain why compression moulding is suitable for the manufacture of the utensils.

2

The designer used idea generation techniques to produce initial ideas for the utensils.

- (c) Describe two idea generation techniques that could have been used.

4

*(You may use sketches/diagrams to illustrate your answer.)*

3. A bicycle is shown below.



Standard components have been used in the assembly of this bicycle.

(a) Outline **two** benefits to the **consumer** of using standard components.

2

This bicycle was designed using CAD software.

(b) Outline the benefits of using CAD software in the design of products such as the bicycle.

3

This bicycle was manufactured using fully automated production methods.

(c) Explain the impact of fully automated production methods on the workforce.

2

[Turn over

4. 3D printing is used in the manufacture of products such as the prosthetic leg shown below.



- (a) Explain the advantages that 3D printing has over traditional manufacturing processes for products such as the prosthetic leg.

2

The designer must ensure the prosthetic leg is fit for purpose.

- (b) Describe appropriate methods of carrying out research into the needs of the end user **and** outline the information that would be gathered.

4

Different types of specifications are produced for a variety of reasons.

- (c) Describe the purpose of the following types of specifications and give an example of the type of information found in each one.

- (i) Product design specification.

2

- (ii) Technical specification.

2



5. A DeLonghi kettle is shown below.



- (a) Discuss the aesthetics of the kettle.

4

*(You must refer to **four** different aesthetic aspects.)*

DeLonghi has a patent which protects its intellectual property rights (IPR).

- (b) Identify another method of protecting IPR and give an example of what it would be used to protect.

2

6. To design successful products, designers must consult with many other professionals including:

- ergonomists
- market researchers
- project managers.

Describe the role of each of the members of the design team named above.

6

[Turn over

7. With reference to a product(s) with which you are familiar.

(a) (i) Describe methods that could be used to identify the materials used in a product. 4

(ii) Describe how manufacturing features are used to aid accurate and efficient assembly. 2

Manufacturers are now more aware of the negative impact their products can have on the environment.

(b) Describe steps that manufacturers can take to reduce the environmental impact of their products. 4

8. A variety of models can be used to gain information during the design of products.

Describe how models may be used during the design of products. 8

*(You should make reference to different types of models, stages of the design process and information gained.)*

**[END OF QUESTION PAPER]**

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Question 1 (Red digger) Image of Legler “Digger on Wheels”.

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Question 2 Veniamin Kraskov/Shutterstock

Question 3 Bike Wheel - tatui suwat / Shutterstock.com

Full Bike - iamlukyeee / Shutterstock.com

Question 4 Image of prosthetic leg is taken from [www.lumecluster.com](http://www.lumecluster.com).

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Question 5 Image of “De’Longhi Icona Capitals kettle” is reproduced by kind permission of De’Longhi Appliances Srl.