



National  
Qualifications  
2022

**X819/76/11**

**Design and Manufacture**

TUESDAY, 10 MAY  
9:00 AM – 11:15 AM

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

[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

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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 (Silver digger) daseaford/shutterstock.com

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 - iamlukyeey / 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.