Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

3603U10-1

Z22-3603U10-1

WEDNESDAY, 15 JUNE 2022 – AFTERNOON

DESIGN AND TECHNOLOGY

Unit 1
PRODUCT DESIGN

2 hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**10**	
2.	**12**	
3.	**13**	
4.	**20**	
5.	**20**	
6.	**25**	
Total	**100**	

3603U101
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ADDITIONAL MATERIALS

In addition to this examination paper, you will need a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part question. You are advised to divide your time accordingly.

The total number of marks available is 100.

You are reminded of the need for good English and orderly, clear presentation in your answers.

The quality of your written communication, including appropriate use of punctuation and grammar, will be assessed in your answer to question **4**(a).

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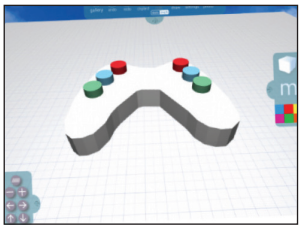
Answer **all** questions.

1. The images below show a new game controller at different stages of design.



CAD model

Foam model

Final prototype

(i) Describe why the designer of the new game controller would choose to create the CAD model. [2]

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(ii) Explain how testing the foam model of the new game controller can help the designer identify areas for further improvement. [3]

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(iii) Explain in detail the importance of producing a fully functioning high quality final prototype before full scale production starts. [5]

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2. The new solar bicycle light below has been developed as a result of market pull.

(i) Explain the advantages to the user of using the solar bicycle light. [2]

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(ii) Describe the meaning of the term 'market pull' and how this may have changed the way the bicycle light has been designed. [4]

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(iii) Identify and explain **two** possible problems that users might experience when using the solar bicycle light. 2 × [2]

Problem 1: .....

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Problem 2: .....

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(iv) The new solar bicycle light is intended to fit any bicycle. Explain how this has been achieved. [2]

Explanation: .....

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3. A student has designed and made a range of pewter jewellery items aimed at surfers.

(a) (i) Describe the properties of pewter that make it a suitable material for the pendant. [2]

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(ii) The student chose MDF (medium density fibreboard) to make the casting mould. Describe why MDF is an appropriate material for the mould before casting the pewter. [3]

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(iii) Identify **three** possible hazards that the student would need to consider when casting the pewter. 3 × [1]

Hazard 1: .....

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Hazard 2: .....

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Hazard 3: .....

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(b) The jewellery items are displayed on transparent stands made from a thermoplastic.

(i) Name a specific thermoplastic suitable for making the stands. [1]

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(ii) Describe a suitable process for cutting the stands from sheet material and achieving the shape of the stand shown above. [4]

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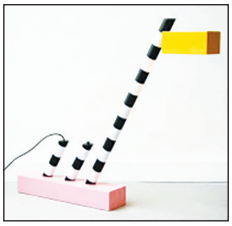
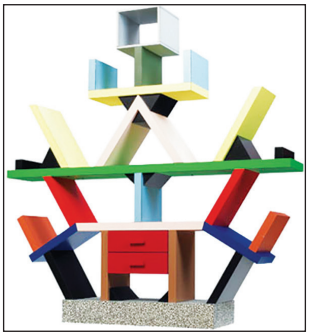
4. Study, in detail, the products shown below.





(a) Analyse how designers have used different sources of inspiration to develop these products. [10]

Marks will be awarded for the content of the answer and the quality of written communication.

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(b) Evaluate the reasons why modern flat pack furniture is very popular with consumers. [10]

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5. The new garden tool below has been designed to replace an existing garden tool for cutting and pruning plants and shrubs.

New garden tool		Existing garden tool

(a) The body of the new garden tool is made from aluminium with a Teflon coating.

(i) Describe **two** properties of aluminium that make it suitable for the body of the new garden tool. 2 × [2]

Property 1: .....

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Property 2: .....

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(ii) Explain the reason for applying the Teflon coating to the body of the new garden tool. [2]

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(b) The black cutting blade used in the new garden tool is made from carbon steel, and can be easily removed from the rest of the tool.

(i) Explain why carbon steel is an appropriate material for the cutting blade. [2]

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(ii) Describe **two** benefits to the user of being able to remove the cutting blade easily. 2 × [2]

Benefit 1: .....

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Benefit 2: .....

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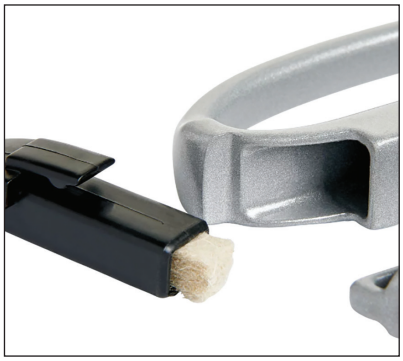
(c) A detachable cleaning brush is included in the new garden tool.



Describe the properties of nylon that make it suitable for the bristles of the cleaning brush. [3]

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(d) Study the changes in the design of the handle of the new garden tool compared to the existing garden tool, explaining the impact these will have on the user. [5]

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6. The images below show a new swimming aid that has been developed in a range of colours.

(a) (i) Describe **two** reasons why the swimming aid is manufactured in a range of colours. 2 × [2]

Reason 1: .....

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Reason 2: .....

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(ii) State and explain the most appropriate scale of production for making the range of swimming aids. [1] + [3]

Scale of production: .....

Explanation: .....

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(b) The swimming aid is made from an expanded foam and weighs 240 g. It will support users weighing between 15 kg and 100 kg.

(i) Describe why the properties of the expanded foam make it a suitable material for the swimming aid. [2]

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(ii) The **two** adjustable straps used in the swimming aid have velcro fastenings.

Explain why velcro is an effective fastening for the swimming aid. [4]

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(iii) The swimming aid has passed both Toy Safety and Buoyancy Aid International Safety Standards. Explain how this is important to the consumer. [2]

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(c) The strap can be adjusted using the buckle as shown.

(i) Buckles are bought in bulk as a standard part. Explain the benefits that this brings to the manufacturer of the swimming aid. [4]

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(ii) A range of differently sized straps are available for the swimming aid. Explain how this both benefits the consumer and extends the product's life. [5]

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END OF PAPER

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For continuation only.