Surname	Centre Number	Candidate Number
First name(s)		2

GCE AS

B602U10-1

S23-B602U10-1

MONDAY, 15 MAY 2023 – AFTERNOON

DESIGN AND TECHNOLOGY – AS component 1
Product Design

2 hours 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**10**	
2.	**16**	
3.	**8**	
4.	**9**	
5.	**10**	
6.	**5**	
7.	**12**	
8.	**9**	
9.	**9**	
10.	**12**	
Total	**100**	

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ADDITIONAL MATERIALS

You will need a ruler and a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the 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 additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

When and where appropriate, answers should be amplified and illustrated with sketches and/or diagrams.

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 number of marks available is 100.

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

You may use a calculator in this examination.

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Answer **all** questions.

1. The image below shows a high quality cake serving set made from stainless steel with 18 % chromium and 8 % nickel.



(a) Describe **two** properties of stainless steel that make it appropriate for the cake serving set.

Property 1: [2]

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Property 2: [2]

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(b) Effective functional qualities are critical when designing products.

Explain **two** functional qualities to be considered when designing the cake serving set.

Functional quality 1: [2]

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Functional quality 2: [2]

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The cake serving set has been batch produced.

(c) Explain **one** advantage of using batch production when manufacturing the cake serving set. [2]

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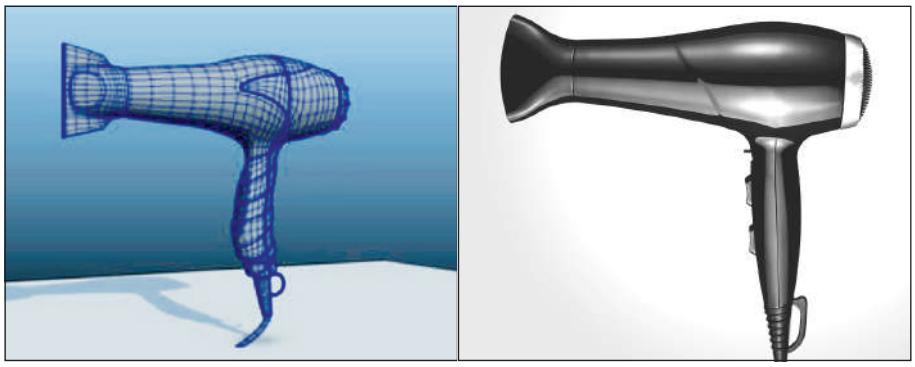
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2. The use of CAD/CAM has been used in the design and production of a hairdryer.



(a) Explain **two** advantages to the manufacturer when using CAD modelling in the design of the hairdryer.

Advantage 1: [2]

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Advantage 2: [2]

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(b) Explain how disassembly of an existing hairdryer may also help the manufacturer in the design of the hairdryer. [2]

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(c) The formula for calculating power is power = energy / time.

Power is measured in Watts (W), Energy is measured in Joules (J), Time is measured in seconds (s)

(i) The hairdryer transfers 120 000 J of energy in one minute. What is the power rating of the hairdryer? [2]
Show all workings.

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(ii) The cost of using the hairdryer is 14p per kilowatt used. Calculate how much it would cost to run the hairdryer for 15 minutes. [4]
Show all workings.

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(iii) Below is a table showing the winter usage of the central heating system in a home.

System	Power rating watts	Use per day	Pence per kilowatt
Central Heating	15 000	6 hours	14

In the summer months the amount of time the central heating is used is reduced by 70%.

Calculate the cost per day of running the central heating system in the summer months rounded to a whole pence. [4]
Show all workings.

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3. Study the image below showing children's toys.



(a) Use notes and diagrams to describe how the toys have been made using rotational moulding. [4]

(b) Explain **two** properties that make polyethylene suitable for this product.

Property 1: [2]

Property 2: [2]

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4. The small bottles pictured below are for carrying liquids abroad, meeting airport regulations.



The following symbol is printed onto the bottom of the bottles.



(a) Name a suitable material for the bottles and explain what the symbol means. [2]

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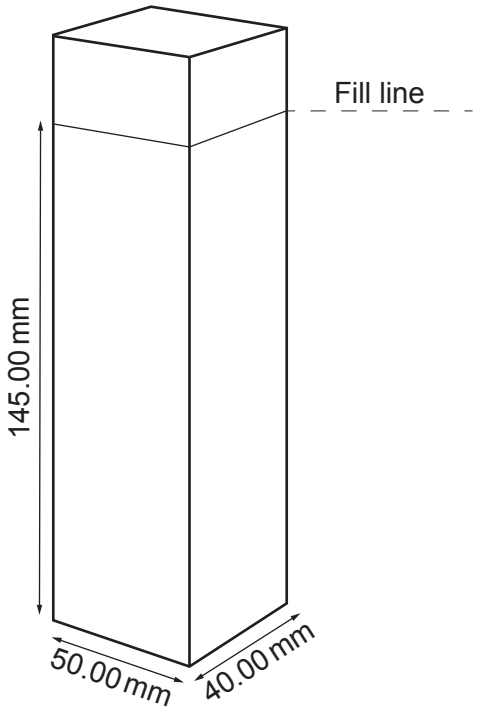
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(b) (i) Using the information on the diagram below. Calculate the volume of liquid, in centilitres, that the bottle can take up to the fill line. [3]
Show all workings.



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(ii) Each bottle costs 5.7p to manufacture. A major supermarket chain requires 10 000 units.

The manufacturer wants to make 25% profit. What would the manufacturer quote to the supplier as the whole cost of the 10 000 units. [2]
Show all workings.

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(c) The bottle has been blow moulded. Explain why this is a suitable method of production for this product. [2]

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5. (a) The bevel gears below are made from high carbon steel. The gears have been made using the sintering process.



Describe **two** reasons why sintering is a suitable manufacturing method for this product.

Reason 1: [2]

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Reason 2: [2]

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(b) Describe **two** advantages of using high carbon steel for the manufacturing of bevel gears.

Advantage 1: [2]

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Advantage 2: [2]

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(c) Explain how 3D modelling can aid the engineer in prototyping mechanical components such as the bevel gears shown opposite. [2]

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6. Explain how and why the designer has used the Art Deco style to produce this retro DAB radio. [5]



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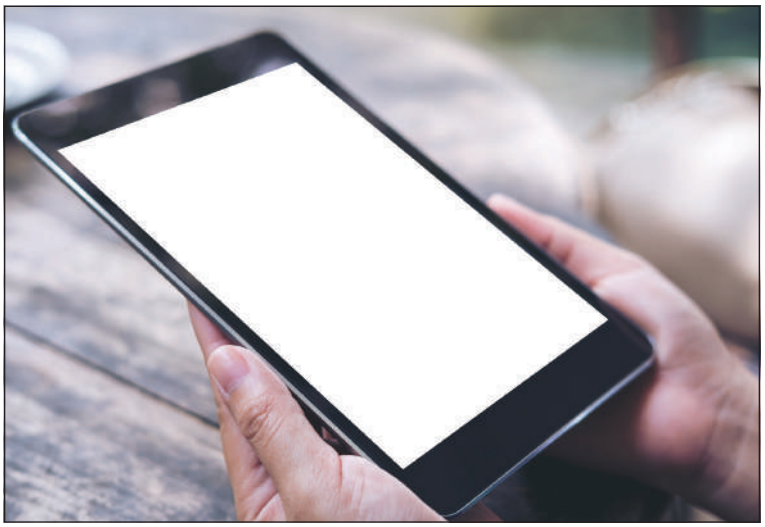
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7. Below is a modern hand-held tablet.



(a) Analyse how modern smart materials have been used in the design and manufacture of the hand-held tablet. [6]

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(b) Regarding the hand-held tablet, evaluate how planned obsolescence affects the consumer and the manufacturer. [6]

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8. The LED bulb lamp made from natural hardwood below is made as a one-off prototype.





Discuss how the manufacturer could make the LED bulb lamp using batch production tools and processes. [9]

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9. The security light below uses solar panels as an alternative to mains electricity.

Evaluate the advantages and disadvantages of using solar panels rather than mains electricity for this product. [9]



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10. Modern manufactured boards have had a significant impact on the design of home furniture.









Discuss the advantages and disadvantages of using manufactured boards in modern home furniture. [12]

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END OF PAPER

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