GCE A LEVEL

A602U10-1

O21-A602U10-1

MONDAY, 11 OCTOBER 2021 – MORNING

DESIGN AND TECHNOLOGY – A level component 1
Product Design

3 hours

A602U101
01

ADDITIONAL MATERIALS

In addition to this paper you will need:
a WJEC pink 16-page answer booklet, a calculator, ruler, pencil and coloured pencils.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Answer **all** questions.
Write your answers in the separate answer booklet provided.

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. Shown below are images of a range of consumer products evident in most homes.
(Images are not to scale.)







(a) Describe **two** ways in which the designer can consider ease of maintenance by the consumer in products such as those shown above. [4]

(b) Explain how making a product easy to maintain can help build brand loyalty with the consumer. [4]

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2. Below is a table showing anthropometric information for hand lengths of boys aged 13-16 in the United Kingdom.

Hand length *(nearest mm)*	**Number of boys in sample**
146-150	7
151-155	10
156-160	13
161-165	18
166-170	36
171-175	79
176-180	98
181-185	79
186-190	36
191-195	18
196-200	13
201-205	10
206-210	7

(a) (i) Calculate the range of hand lengths that would need to be included to cover boys from the 5th to the 95th percentile.
(Show all calculations.) [3]

(ii) Gloves will be made from a material that could stretch 15 mm in hand length. Calculate the maximum sample that could be accommodated for a single glove as a percentage.
(Show all calculations. State your answer to the nearest whole number.) [3]

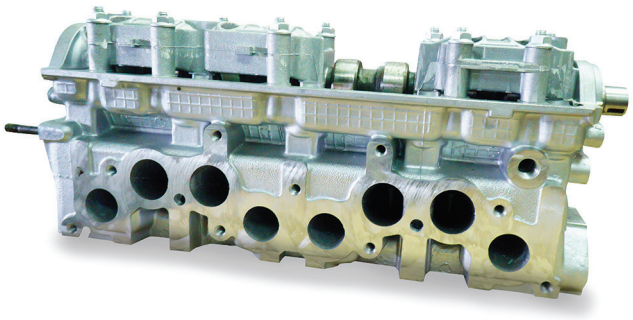
(b) Describe the relationship between anthropometric data and ergonomic design. [2]

(c) Explain where it would be appropriate to use the data for the 5th percentile and 95th percentile when designing products. [2]

(d) Discuss the importance to the designer of applying ergonomic principles when designing a wireless computer mouse. [4]

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3. The image below shows a cylinder head for a motorcycle.

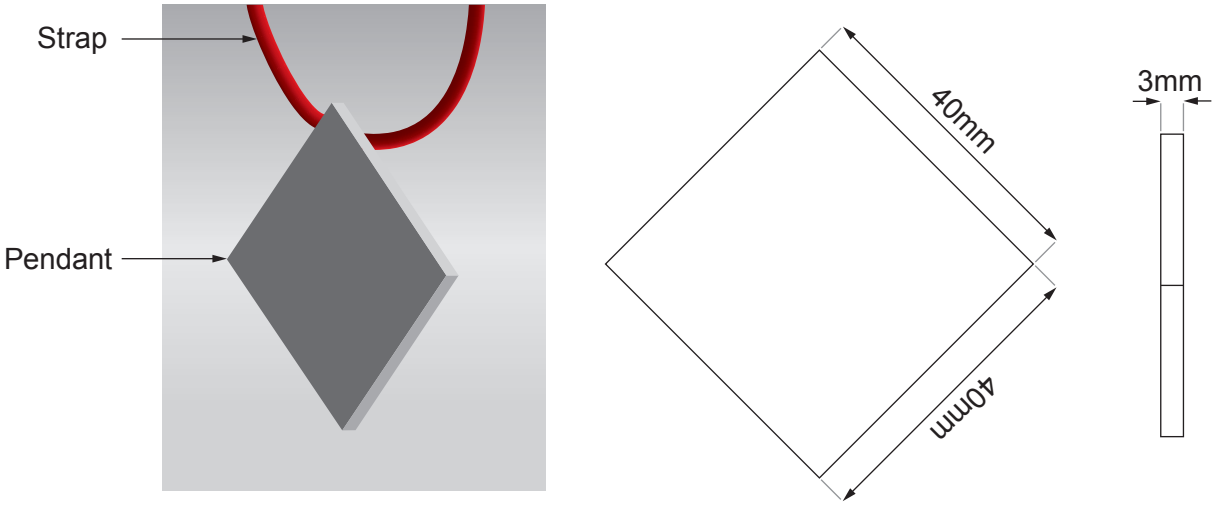


(a) Describe in detail the sequences of high pressure die casting used to produce the cylinder head shown above. [6]

(b) Explain why sand casting is suitable for one-off or very low volume components. [2]

4. The table below shows the densities of metals commonly used for jewellery.

Metal	Density (g/mm^3)
Gold	0.01932
Platinum	0.02415
Silver	0.01049
Pewter	0.00728



Pendant dimensions 40 mm, 40 mm, 3 mm

(a) (i) The pendant shown above is produced in silver and pewter. Calculate the difference in weight.
(Show all calculations.) [4]

(ii) When casting the jewellery in pewter 3 in every 100 fail to pour correctly and 2 in every 100 tarnish because of the mould properties. These outcomes are independent of one another. State the probability of one cast suffering from both of the issues. [1]

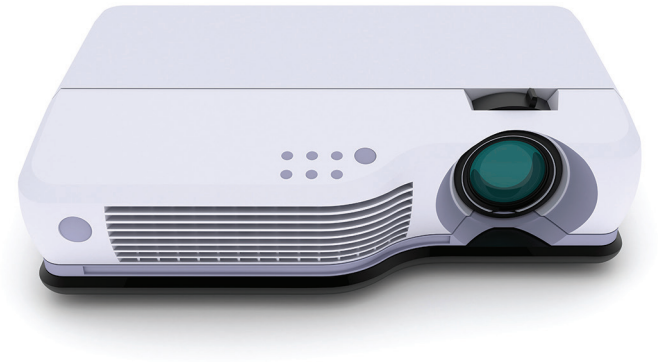
(b) A manufacturer has decided to laser cut the pendants from a sheet of aluminium. Calculate the maximum number of pendants that can be laser cut from a sheet 0.5 m × 0.7 m.
(Show all calculations.) [4]

(c) Qualitative testing and quantitative testing must be considered when selecting materials and processes for the design and manufacture of jewellery products.

Explain what you understand by both qualitative testing and quantitative testing in relation to jewellery products. [4]

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5. The home cinema projector shown below has been designed considering both the needs and wants of the target market.



(a) Describe the importance of using a specification when designing a product such as the home cinema projector. [5]

(b) Explain the importance of a 'User Centred Design' approach to investigating design opportunities for products such as the home cinema projector. [5]

6. Every year a number of innovative products are brought to market.

Explain why innovation is important to the success of commercial products. [5]

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7. Study the image of the chair shown below which has been cut using a CNC router.



(a) Analyse the benefits of using a CNC router to cut out the chair frame. [6]

(b) Evaluate the environmental impact of using CNC machines to produce commercial products. [6]

8. Client profiles are used by designers when developing design proposals.

Describe the type of information that is gathered when creating a client profile and analyse why this information is useful to designers. [9]

9. Explain how developments in modern material technology have had an impact on the design, manufacture and use of modern sports equipment. [9]

10. Evaluate the ways in which a product designer can reduce the environmental impact of their products at each stage of the product life cycle. [12]

END OF PAPER

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