# GCE A LEVEL

A602U10-1

Z22-A602U10-1

**THURSDAY, 9 JUNE 2022 – AFTERNOON**

# DESIGN AND TECHNOLOGY – A level component 1
## Product Design

3 hours

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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.** The image below is of a mass-produced sideboard made from seasoned timber.



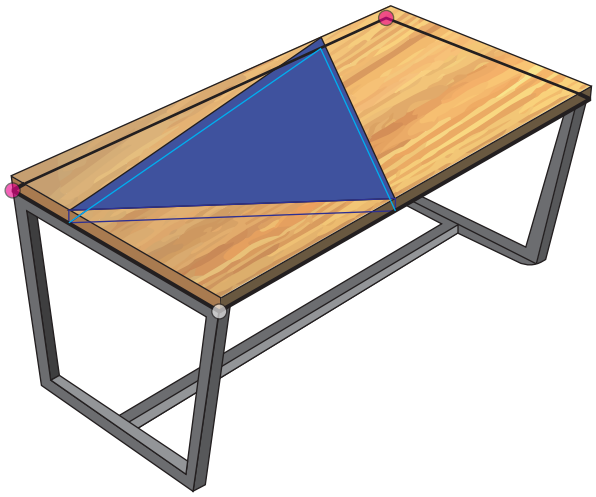
(a) Name **one** method used to season timber. [1]

(b) Explain why using seasoned timber is necessary to manufacture the sideboard. [3]

(c) Describe, in detail, the process of seasoning wood most commonly used for products such as the mass-produced sideboard. [4]

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**2.** Below is a CAD drawing of a table design. The design feature on the top will be an epoxy resin cast with a blue tint.



CAD drawing

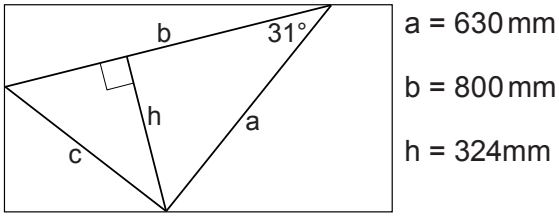



Table top plan view

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(a) (i) Calculate the surface area of the epoxy resin cast part of the table. [3]
Show all calculations.

(ii) The designer has decided to insert a strip of LED lights around the perimeter of the epoxy resin cast.
Calculate the length of LED strip lights required. [3]
Show all calculations.

(b) The LED strip lights will be bought-in components. Explain what is meant by the term 'bought-in components'. [2]

(c) Describe the benefits to the manufacturer of using bought-in components. [3]

(d) Explain the risks to the manufacturer of relying on the use of bought-in components. [3]

**3.** The main body of the keyboard shown is made from aluminium.



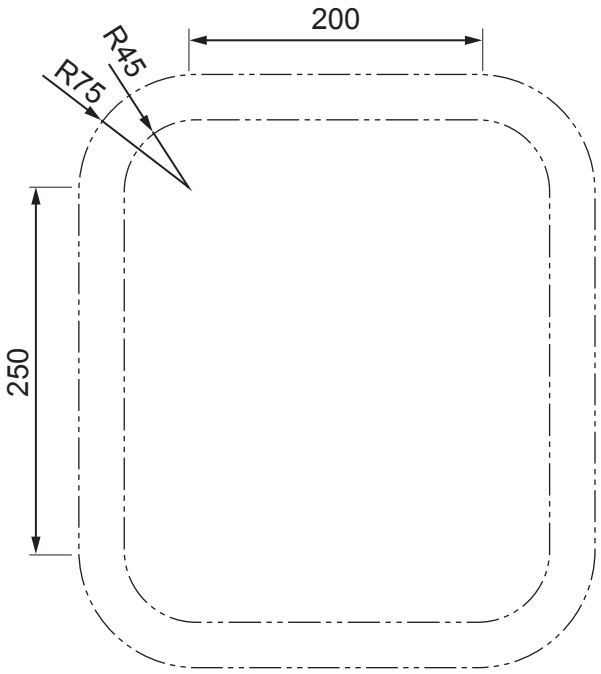


(a) Briefly describe the process of extracting aluminium from its natural source. [2]

(b) Explain the environmental impact of extracting aluminium. [6]

**4.** Below is an image and details of a stool designed by a student. It features 30 mm diameter mild steel tube legs that have been powder coated.






Drawing of leg showing key measurements

(a) (i) Describe the process of powder coating a steel tube. [2]

(ii) Explain **one** benefit of powder coating as a finish for mild steel. [2]

(b) Calculate the length of steel tubing required to make **both** legs of the stool. [7]
Show all calculations.

(c) The 30 mm diameter mild steel tubing weighs 0.9 kg per linear metre. Using your answer from **4.**(b), calculate the weight of the stool legs. [2]
Show all calculations.

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**5.** During the design and manufacture of products, such as the scooter pictured below, a range of tests are carried out.



(a) Explain the difference between destructive and non-destructive material testing. [2]

(b) Describe the reasons why designers and manufacturers carry out both types of tests when designing the scooter. [4]

(c) Using notes and sketches, describe an industrial test that could be carried out to assess a material's relative toughness for the scooter. [4]

**6.** Explain the benefits of Computer Integrated Manufacturing (CIM) to the **designer and manufacturer** when producing products such as an adjustable office chair. [5]

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**7.** Study the images of the baby car seats shown below.

| | | |
|---|---|---|
|  |  |  |
| Baby car seat from the 1970s. | Baby car seat from the 1990s. | Baby car seat from 2017. |

(a) Analyse how 'market pull' forces have impacted on the development of baby car seats over time. [6]

(b) Study the child booster seat shown below and evaluate why polypropylene is a suitable material for use in this product. [6]



**8.** Analyse the range of methods that can be used to conduct market research when carrying out 'User-Centred Design'. [9]

**9.** Explain how designers and/or manufacturers carry out feasibility studies for the design and manufacture of new and innovative products such as hybrid cars or bladeless fans. [9]

**10.** The Consumer Protection Act is an example of legislation put in place to protect consumers.

Evaluate how effectively and thoroughly consumers are protected by legislation. [12]

**END OF PAPER**

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