



GCE A LEVEL



A602U10-1

WEDNESDAY, 7 JUNE 2023 – AFTERNOON

DESIGN AND TECHNOLOGY – A level component 1

Product Design

3 hours plus your additional time allowance

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, black ball-point pen or your usual method.

You may use a pencil for graphs and diagrams only.

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.

PPE face shield produced by a school



Answer ALL questions.

- 1. Study the image opposite of a face shield produced by a school in response to the PPE shortage experienced during the COVID-19 pandemic.**
 - (a) Identify ONE specific material that could be used to produce a part of the face shield and explain why this material is suitable. [3 marks]**
 - (b) Identify a suitable Computer Aided Manufacturing (CAM) method that could be used to produce a batch of face shields and explain why this method of manufacture is suitable. [5 marks]**

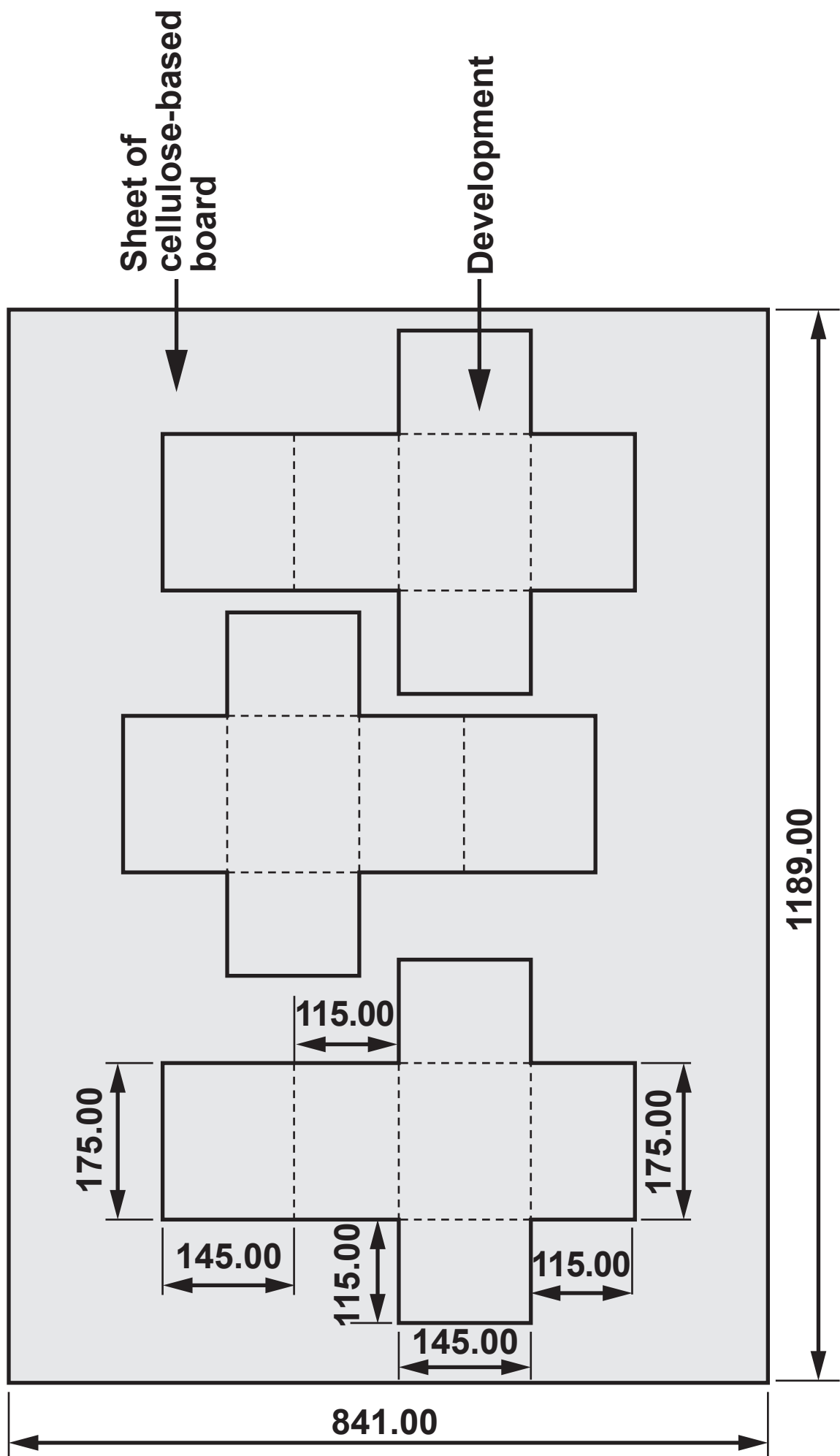
(Turn over)

Cellulose-based corrugated board packaging



- 2. Product packaging, such as the example shown opposite, is often made from cellulose-based corrugated board.**
- (a) Discuss the properties of cellulose-based corrugated board that make it suitable for packaging. [4 marks]**
- (b) Explain the main stages of processing cellulose-based corrugated board from the primary source to produce a useable stock form. [4 marks]**

Three surface developments on one board



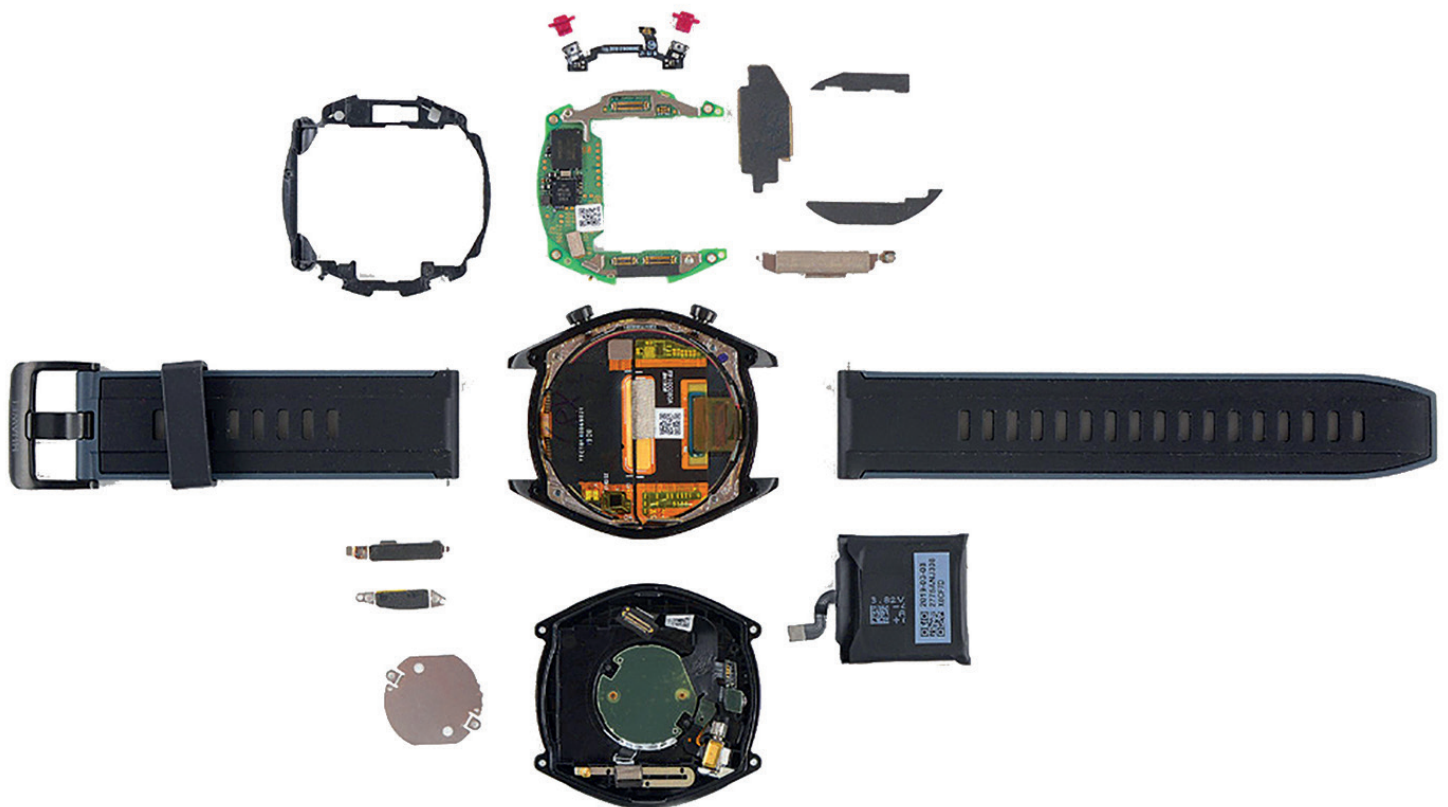
The dimensions of the surface development for the packaging are shown opposite. There are three identical surface developments to be die cut from one sheet of board.

Note: Gluing tabs are not included.

- 2 (c) Calculate the amount of waste stock produced in one sheet of cellulose-based board and calculate the amount as a percentage. [6 marks]**

Show all calculations

Smart watch disassembly



- 3. The image opposite shows a disassembled smart watch.**
- (a) The smart watch has been manufactured using a range of permanent and temporary fixings. Explain why temporary fixings are used when assembling the smart watch. [2 marks]**
- (b) Explain how disassembling an existing product can help a designer when generating and developing design ideas. [4 marks]**



Go/no-go gauge



4. Tools are often used to carry out quality control checks during production.

(a) Explain how the digital vernier calliper pictured opposite can be used to check that dimensions are within stated tolerances. [3 marks]

‘Go’ and ‘no-go’ gauges such as the one shown opposite are used in manufacturing on larger production runs to test tolerances.

(b) Explain how this gauge helps speed up quality control checks. [3 marks]

Side table designed by a student



KEY INFORMATION	
Tabletop diameter	350 mm
Tabletop thickness	15 mm
Height of table from ground to tabletop	350 mm
Density of oak tabletop	720 kg/M ₃
Density = mass/volume	

4 (c) A student has designed the simple side table shown opposite.

- (i) A working drawing shows the table must be 350 mm from the ground to the top of the table. The height must be manufactured with a $\pm 2\%$ tolerance.**

Calculate the maximum and minimum height the table can be. [2 marks]

Show all calculations

- (ii) A working drawing of the design states that the legs must be made from 25 mm diameter aluminium tube with a tolerance of ± 1 mm. A supplier catalogue contains 25 mm aluminium tube $\pm 2.5\%$.**

Calculate whether the tube in the catalogue will be suitable. [2 marks]

Show all calculations

- (iii) Calculate the mass of the oak tabletop. Express your answer in kilograms. [5 marks]**
Show all calculations (correct to 2 decimal places, note $\pi = 3.14$)

(Turn over)

Alessi bird kettle



Digital radio



- 5. The 'bird kettle' shown opposite is considered by many to be an iconic design.**
- (a) Explain what makes a product 'iconic'. You may refer to the kettle opposite or other iconic designs in your answer. [5 marks]**
- (b) The image opposite is of a contemporary digital radio. Explain how historic influences have affected the aesthetic detailing of this product. [5 marks]**

Dyson hairdryer



6. Companies such as Dyson use collaboration as a design strategy to generate and develop design ideas.

Explain why collaboration is a useful strategy when designing products such as the hairdryer pictured opposite. [5 marks]

- 7. Large commercial brands spend a lot of time and use many techniques when conducting research before developing specifications and design ideas.**
- (a) Analyse the effectiveness of research data when gathered from a focus group. [4 marks]**
- (b) Evaluate ways in which quantitative data can be used to judge the success of a design. [4 marks]**
- (c) Explain the importance of a specification when developing design ideas. [4 marks]**



One-off handmade guitar



Mass-produced guitar

8. Two acoustic guitars are shown opposite. One is a one-off handmade piece and the other is mass-produced.

Explain, in relation to time, quality and cost the differences you would expect to find between the two guitars. [9 marks]



9. Explain how closed loop systems use feedback to enhance the functionality of smart products like the ones shown opposite. [9 marks]
10. Companies such as **Ikea**, **Coca-Cola** and **Apple** design for a global market but often tailor their designs and brand imagery to suit local markets. Evaluate the impact cultural trends can have on products designed for a global market. [12 marks]

END OF PAPER