

Surname	Centre Number	Candidate Number
First name(s)		0



GCSE

C600U10-1



S25-C600U10-1



WEDNESDAY, 18 JUNE 2025 – MORNING

DESIGN AND TECHNOLOGY

Component 1

DESIGN AND TECHNOLOGY IN THE 21st CENTURY

2 hours

ADDITIONAL MATERIALS

You will need basic drawing equipment, coloured pencils and a calculator for this examination.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
Section A	1.	10
	2.	10
	3.	15
	4.	20
	5.	20
Section B	6.	25
	Total	100

C600U101
01

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 the spaces at the top of this page.

Answer questions 1 to 5 and any **one** question 6.

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

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

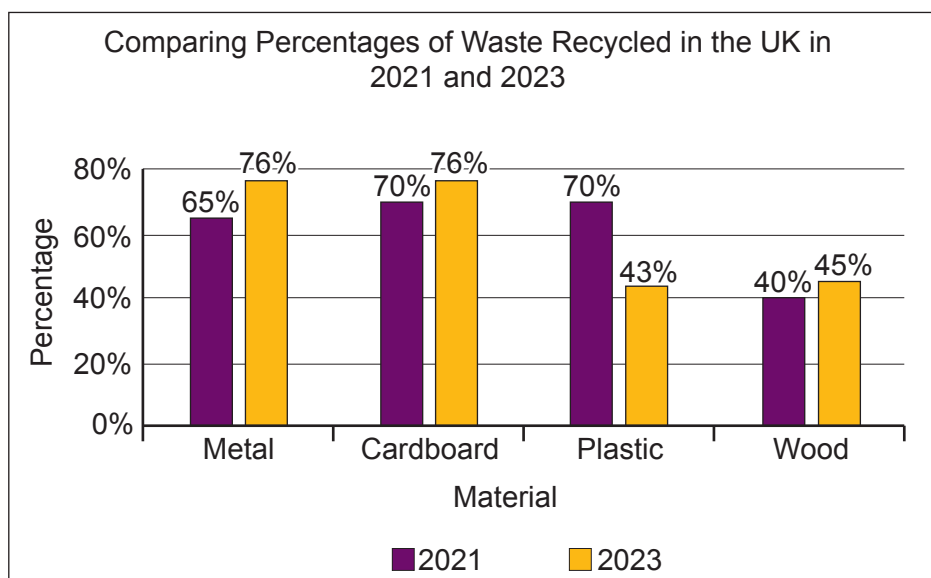


JUN25C600U10101

SECTION AAnswer **all** questions

This question is about Design and Technology and our world.

1. (a) The bar chart below compares the percentages of material waste recycled in the United Kingdom (UK) in 2021 and 2023.



- (i) State the percentage of wood that was recycled in 2021. [1]

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- (ii) Calculate the total percentage of material waste recycled in 2023 as a fraction in its lowest form. Show all workings. [3]

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(b) The images below show a selection of fad products.



(i) Describe the term fad product.

[2]

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(ii) The demand for fad products is influenced by market pull. State the meaning of the term market pull.

[1]

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(iii) In the space below, draw and label a graph to show the product lifecycle of a fad product.

[3]



This question is about smart, composite and technical materials.

2. (a) Composites combine the properties of two or more materials.

(i) GRP is an example of a composite material. State the meaning of GRP. [1]

G R P

Carbon fibre is a composite material used to manufacture high-performance sports equipment as shown below.



(ii) Describe **one** property of carbon fibre that makes it suitable for high-performance sports equipment. [2]

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(iii) Explain why designers might avoid using composite materials for modern sports equipment. [3]

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- (b) The body of the kettle shown in the pictures below is made from a smart material. As the water boils, the kettle changes colour.



blue colour (before boiling)



red colour (once boiled)

- (i) State the name of the smart material used for the kettle body. [1]

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- (ii) Discuss why consumers would purchase a kettle that changes colour when in use. [3]

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This question is about electronic systems, programmable components and mechanical devices.

3. (a) The picture below is of an electric bicycle that has many moving parts and converts different types of motion when in use.



- (i) Using examples of other products, complete the table below by naming a product that uses each of the motions listed. 3 x [1]

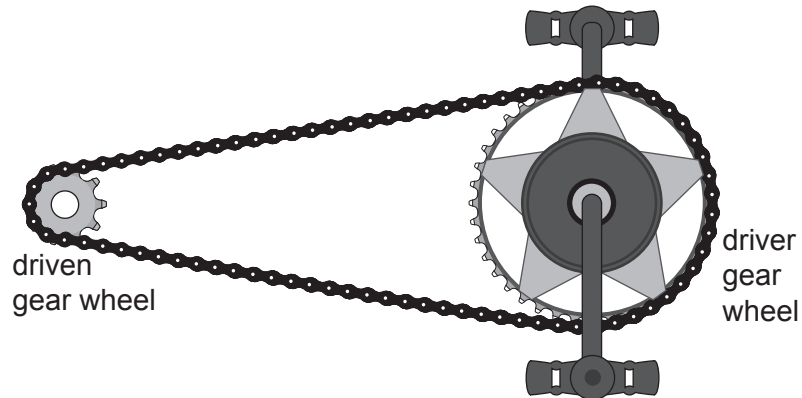
Motion	Product
Linear	
Reciprocating	
Oscillating	

- (ii) A bicycle brake system uses a bell crank lever. State the function of a bell crank lever. [1]

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- (b) The picture below shows the gear system of the electric bicycle.



- (i) The driven wheel of the bicycle's gear system has 10 teeth and the driver wheel has 40 teeth.

State how many rotations the driven gear makes if the driver gear rotates once. [1]

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- (ii) The diameter of the bicycle's wheel is 60 cm. Calculate the distance in metres the electric bicycle will travel after ten rotations. Show all workings. [3]

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- (iii) Other than cost, explain why a cyclist would buy a non-electric bicycle instead of an electric one. [2]

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- (c) A microcontroller is a key component of electric bicycles.

Define the meaning of the term microcontroller and explain how they can be used in electric bicycles.

[5]

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This question is about materials.

4. (a) The image below shows a paper lampshade for a child's bedroom.



- (i) The weight of paper is measured in grams per square metre (gsm).
Underline the weight of the paper most suitable for the lampshade.

[1]

35 gsm**170 gsm**

- (ii) Other than cost, state **one** reason for paper being chosen as a material for the lampshade.

[1]

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- (iii) Explain how the lampshade design could be improved to be used in a child's bedroom.

[2]

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- (b) The storage box in the image below has been made from brass and polyvinyl chloride (PVC).



- (i) Brass is an alloy. Identify the **two** primary metals that brass contains. 2 x [1]

Primary metal 1:

Primary metal 2:

- (ii) The storage box is to be kept in a bathroom. Identify **one** different property for each material that makes it suitable for the storage box. 2 x [1]

Brass property:

PVC property:



- (c) The puffer jacket pictured below is made from a nylon microfibre material.



- (i) Put **one** tick (✓) in the table below to identify whether nylon is a natural or synthetic material.

[1]

	Natural	Synthetic
Nylon		

- (ii) Define the term microfibre.

[1]

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- (iii) Evaluate the properties of nylon that make it a suitable material for the puffer jacket.

[4]

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- (iv) The puffer jacket contains an internal layer of non-woven fibres. Describe how this layer benefits the user of the puffer jacket. [2]

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- (d) The picture below shows sawn timber.



- (i) Timber is sold in a variety of stock forms. Identify **one** stock form. [1]

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- (ii) Timber is identified using a range of discriminators.

Describe the discriminators of wood that are considered when products are newly designed. [3]

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5. Carefully study the images of camping products below and select **one** product to refer to when answering questions (a) to (c). Place a **tick** (✓) in the box of your chosen product.

		
Cotton towel <input data-bbox="517 712 584 779" type="checkbox"/>	Paper plates, bowls and cups <input data-bbox="927 712 994 779" type="checkbox"/>	Plastic cutlery <input data-bbox="1334 712 1401 779" type="checkbox"/>
		
Metal chair <input data-bbox="517 1160 584 1227" type="checkbox"/>	LED lamp <input data-bbox="927 1160 994 1227" type="checkbox"/>	Timber picnic bench <input data-bbox="1334 1160 1401 1227" type="checkbox"/>

- (a) (i) State **one** anthropometric consideration for your chosen product. [1]

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- (ii) Describe how the chosen product could be made more attractive to the user. [3]

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- (b) Describe how your chosen product is suitable for use when camping. [2]

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- (c) Explain the reasons why exploded diagrams are included in detailed final design drawings. [3]

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- (d) Camping products are usually seasonal and manufactured using batch production.

- (i) Describe **one** environmental consequence of seasonal products. [2]

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- (ii) Analyse the benefits of using batch production for seasonal products. [4]

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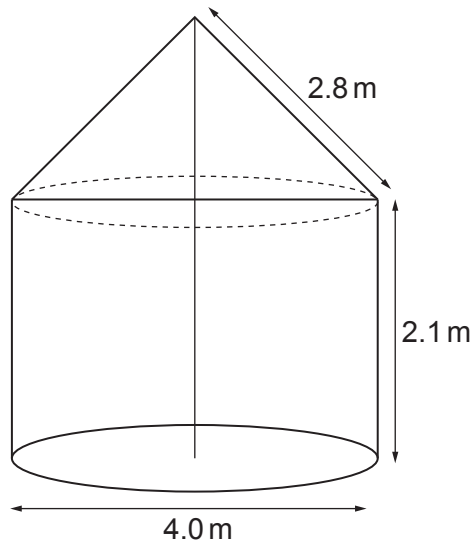
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- (e) The diagram below shows an outline of a camping tent. A conical shape tops the cylinder section.



Calculate the area of the material used for the camping tent. Assume there is no material at the base of the tent. Show all workings.

[5]

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SECTION B: OPTIONAL QUESTIONS

Choose **ONE** topic area only.

Place a tick (✓) in **one** of the boxes below, to show which topic you are answering.

Electronic systems, programmable components and mechanical devices	☐	Pages 18–21
Papers and boards	☐	22–25
Natural and manufactured timber	☐	26–29
Ferrous and non-ferrous metals	☐	30–33
Thermosetting and thermoforming plastics	☐	34–37
Fibres and textiles	☐	38–41

Now answer all parts of your chosen topic.



6. Electronic systems and mechanical devices

- (a) The picture below is of a component used in a portable speaker.

Component

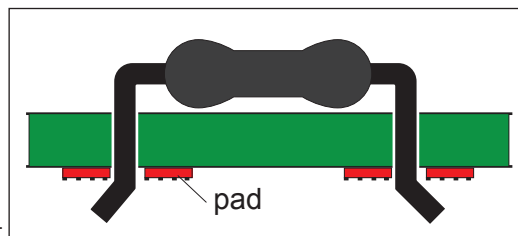


Speaker



- (i) State the name of the component. [1]

- (ii) A component on the speaker's circuit board is shown below.
State the name of the method used to populate the circuit board. [1]



- (iii) The speaker's circuit board is cut using a guillotine.
Describe **one** advantage of using a guillotine to cut the circuit board. [2]



- (iv) In the space below, use words and sketches to show how a printed circuit board (PCB) can be made in school. [5]



- (b) (i) The copper board used to make the circuit boards costs £6.00 per board (300 mm × 450 mm). Each circuit board measures 30 mm × 45 mm. Calculate the cost of the copper board required to manufacture a batch of 750 circuit boards. Show all workings [2]

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- (ii) The speaker's selling price is 500% higher than the cost of the circuit board. Calculate the selling price of the speaker. [1]

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- (iii) The cost of the copper board is reduced by $\frac{2}{5}$. Calculate the new cost of the copper board to 2 decimal places. Show all workings. [2]

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- (c) Analyse the benefits of using automated machinery to manufacture printed circuit boards compared to printed circuit boards made by hand. [5]

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- (d) Evaluate the reasons the designer uses CAD software to model the speaker circuit compared to physically making the circuit.

[6]

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6. Papers and boards

(a) The pictures below show some food packaging products.



Foil-lined paper bag



Moulded pulp egg box



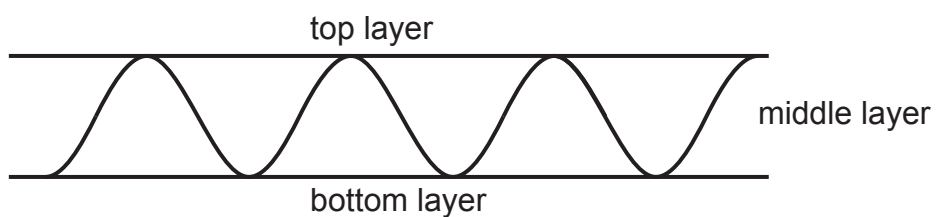
Pizza box



Duplex board cake box

(i) State the name of a suitable material for the pizza box. [1]

(ii) The material used for the pizza box is made of three layers, and a cross section of the material is shown below. State the name of the middle layer of the material shown in the picture below. [1]



- (iii) The pizza box is made using a die cutter.
Describe **one** advantage of using a die cutter to cut the material.

[2]

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- (iv) A model for the pizza box is made using a development or net.
In the space below, use words and sketches to show how a development or net
can be marked out and made using hand tools.

[5]



- (b) (i) The pizza box material costs the manufacturer £1.20 per metre. A pizza box requires 0.43 metres. Calculate the cost of the material to manufacture a batch of 750 pizza boxes. Show all workings. [2]

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- (ii) The selling price of the pizza boxes to a retailer is 180% higher than the cost of the material. Calculate the selling price of one pizza box. [1]

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- (iii) The pizza box is to be made using a thinner material that reduces the cost of the material by $\frac{1}{3}$. Calculate the new cost of one pizza box for the manufacturer to 2 decimal places. Show all workings. [2]

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- (c) Analyse how the characteristics and properties of pulp make it suitable for moulding the egg box packaging. [5]

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- (d) Evaluate why a designer selected a foil-lined paper bag for warm food and duplex board for the cake box. [6]

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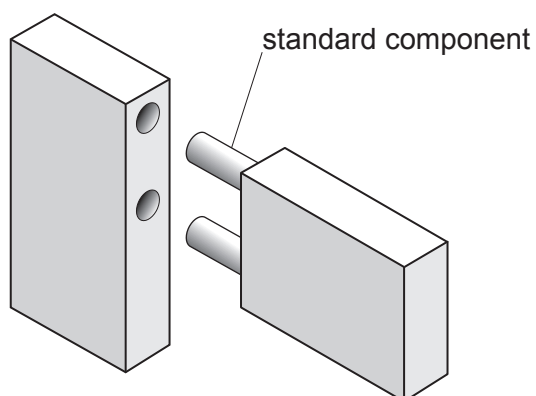
6. Natural and manufactured timber

- (a) The picture below shows a bookcase that is sold as a flat pack.



- (i) State the name of a suitable softwood for the construction of the carcass of the bookcase. [1]

The joints of the bookcase are strengthened using standard components.



- (ii) State the name of the standard component shown. [1]



- (iii) The bookcase material was cut along the grain.
Describe **one** advantage of cutting wood along the grain.

[2]

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- (iv) The top and bottom of the bookcase are joined together using a cam lock knock-down fitting.
Using notes and sketches, explain how a cam lock knock-down fitting would be used in the bookcase construction.

[5]



- (b) (i) The bookcase material costs the manufacturer £12.50 per metre. Each bookcase requires 4.4 metres. Calculate the cost of the wood needed to manufacture a batch of 750 bookcases. Show all workings. [2]

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- (ii) The selling price of the bookcase is 360% higher than the cost of the material. Calculate the selling price of one bookcase. [1]

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- (iii) The bookcase is to be scaled down, which reduces the cost of the materials by $\frac{1}{3}$. Calculate the new material cost of one bookcase to 2 decimal places. Show all workings. [2]

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- (c) Analyse the characteristics and properties of plywood and MDF (medium-density fibreboard) that make them suitable materials for flat-pack furniture manufacture. [5]

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- (d) Evaluate why the designer selected a softwood for the carcass and a manufactured board for the back of the bookcase. [6]

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6. Ferrous and non-ferrous metals

- (a) The picture below shows a gravel bicycle which can be used on or off-road.



- (i) State the name of a suitable metal for the bicycle frame. [1]

- (ii) State the manufacturing process used to produce the crank arm shown in the picture below. [1]



crank arm

- (iii) The sections of the gravel bicycle frame were cut with a radius on each end. Describe **one** advantage of cutting a radius on the end of each section of the bicycle frame. [2]

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- (iv) The hollow sections of the bicycle frame shown are joined together by welding. In the space below, use words and sketches to show how to weld a section of the bicycle frame. [5]



- (b) (i) The hollow section used to manufacture the bicycle frame costs the manufacturer £12.50 per metre. Each gravel bicycle requires 6.2 metres. Calculate the cost of the metal needed to manufacture a batch of 750 gravel bicycle frames. Show all workings. [2]

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- (ii) The selling price of the gravel bicycle is 360% higher than the cost of the material. Calculate the selling price of one gravel bicycle. [1]

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- (iii) The gravel bicycle frame is to be scaled down as a child's gravel bicycle, which reduces the cost of the material by $\frac{1}{3}$. Calculate the new material cost of one child's gravel bicycle frame to 2 decimal places. Show all workings. [2]

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- (c) Analyse the characteristics and properties of appropriate metals that make them suitable for gravel bicycle frame manufacture. [5]

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- (d) Evaluate the reasons the designer uses CAD software to model bicycle frames compared to physically making bicycle frames.

[6]

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6. Thermoforming and thermosetting plastics

(a) The pictures below show two sets of bowls.



thermosetting polymer bowl set

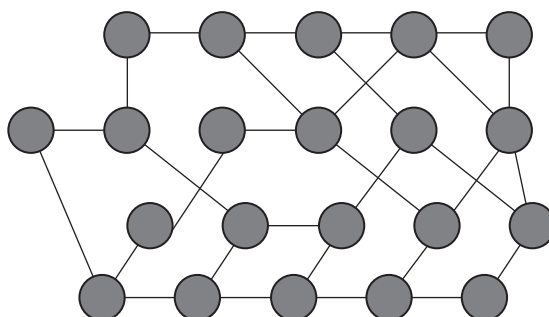


thermoforming polymer bowl set

(i) State the name of a specific polymer used to make the thermosetting bowl set. [1]

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(ii) State the name of the polymer molecular structure shown in the picture below. [1]



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- (iii) A prototype for the bowl was made using a vacuum former and was trimmed out using a gerbil.

Describe **one** advantage of using a gerbil rather than other techniques.

[2]

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- (iv) In the space below, use words and sketches to show how a prototype bowl is vacuum formed.

[5]



- (b) (i) The granules of polymer for injection moulding cost £1.80 per kilogram. Each bowl requires 0.10 kilograms to mould. Calculate the cost of the granules to manufacture a batch of 750 bowls. Show all workings. [2]

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- (ii) The selling price of the bowl is 420% higher than the cost of the polymer granules. Calculate the selling price of one bowl. [1]

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- (iii) The bowl is to be made using a different polymer, which reduces the cost of the granules by $\frac{1}{3}$. Calculate the new cost of the granules required for one bowl to 2 decimal places. Show all workings. [2]

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- (c) Analyse the characteristics and properties of thermosetting and thermoforming polymers that make them suitable for moulding the bowls. [5]

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- (d) Evaluate why the designer selected a thermosetting polymer for one type of bowl and a thermoforming polymer for the other type of bowl. [6]

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6. Fibres and textiles

- (a) The picture below shows a winter dress made from a polyester pile fabric.

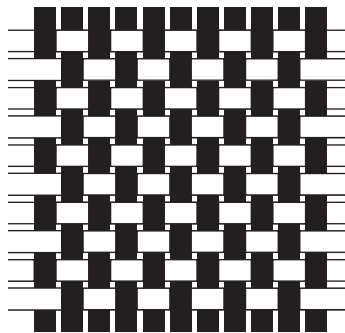


- (i) State the name of a pile fabric suitable for the dress.

[1]

- (ii) The dress sleeve cuffs are made from a woven fabric.
State the name of the woven construction shown in the picture below.

[1]



- (iii) The dress fabric was cut on the bias.
Describe **one** advantage of cutting fabric on the bias.

[2]



- (iv) The front and back of the dress are joined together with top-stitched plain seams. In the space below, use words and sketches to show how a top-stitched plain seam is manufactured. [5]



- (b) (i) The dress fabric costs the manufacturer £12.50 per metre. Each dress requires 2.2 metres. Calculate the cost of the fabric to manufacture a batch of 750 dresses. Show all workings. [2]

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- (ii) The selling price of the dress is 360% higher than the cost of the fabric. Calculate the selling price of one dress. [1]

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- (iii) The dress is to be manufactured in an alternative summer-weight linen fabric, which reduces the cost of the fabric by a $\frac{1}{3}$. Calculate the new material cost of one dress to 2 decimal places. Show all workings. [2]

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- (c) Analyse the characteristics of woven and knitted fabrics that make them suitable for garment manufacture. [5]

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- (d) Evaluate why the designer selected a polyester pile fabric for the winter dress and a linen fabric for the summer dress. [6]

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