

WEDNESDAY, 18 JUNE 2025 – MORNING

DESIGN AND TECHNOLOGY

Component 1

DESIGN AND TECHNOLOGY IN THE 21st CENTURY

**2 hours plus your additional time
allowance**

Surname _____

First name(s) _____

Centre Number _____

Candidate Number 0

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

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 pages 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.

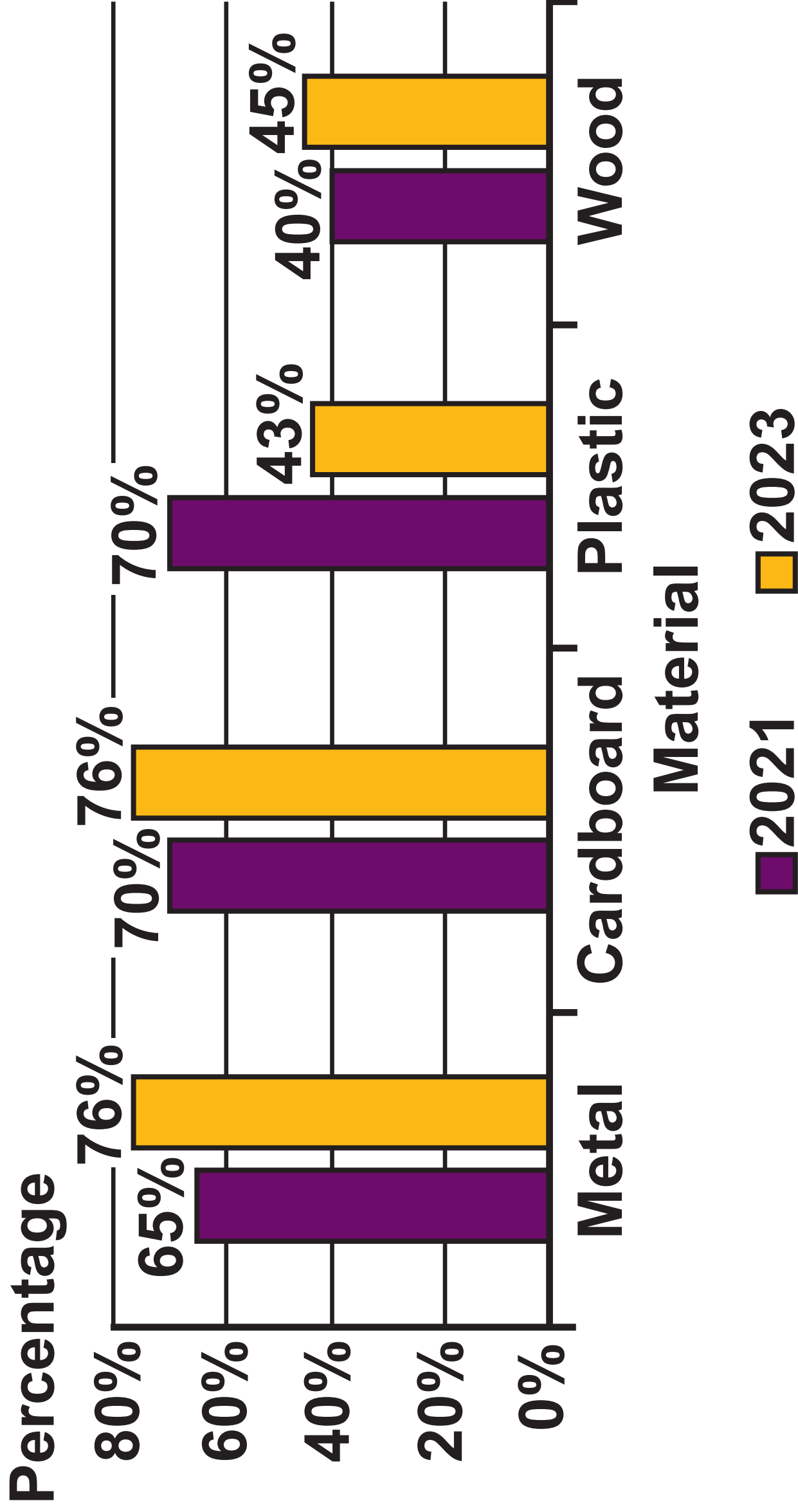
(Turn over)

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

THIS IS A BLANK PAGE

TURN OVER

Comparing Percentages of Waste Recycled in the UK in 2021 and 2023



SECTION A

Answer ALL questions

This question is about Design and Technology and our world.

1 (a) The bar chart on the opposite page 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 mark]

(Turn over)

1 (a)(ii)

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

(Turn over)

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



**(i) Describe the term fad product.
[2 marks]**

(Turn over)

1 (b)(ii)

**The demand for fad products is influenced by market pull. State the meaning of the term market pull.
[1 mark]**

(Turn over)

1 (b)(iii)

In the space below, draw and label a graph to show the product lifecycle of a fad product. [3 marks]

(Turn over)

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 mark]**

G _____

P _____

R _____

(Turn over)

2 (a) continued

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 marks]

(Turn over)

2 (a)(iii)

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

(Turn over)

2 (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 mark]

(Turn over)

2 (b)(ii)

Discuss why consumers would purchase a kettle that changes colour when in use. [3 marks]

(Turn over)

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.



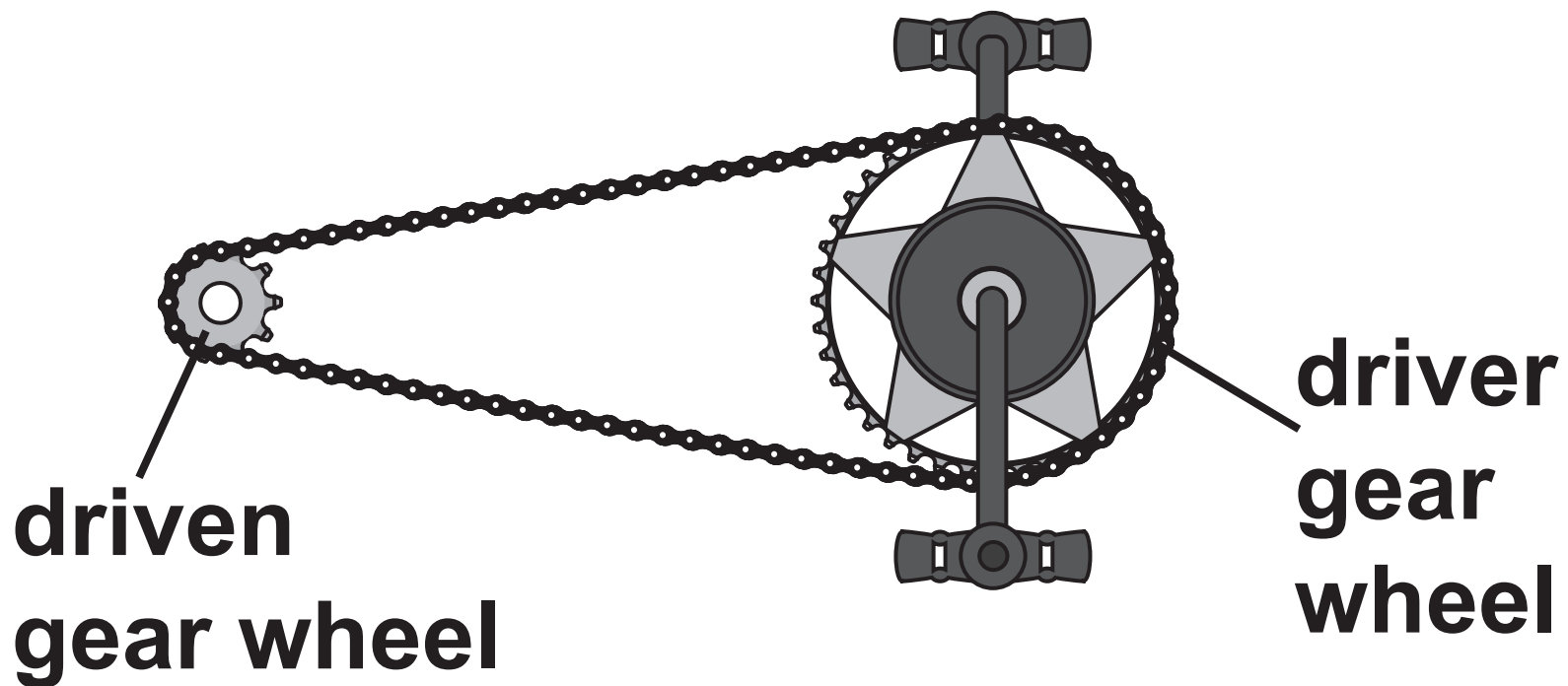
(Turn over)

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

MOTION	PRODUCT
Linear	
Reciprocating	
Oscillating	

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

3 (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 mark]

(Turn over)

3 (b)(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 marks]

3 (b)(iii)

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

(Turn over)

3 (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 marks]**

continue answer on the next page

(Turn over)

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 mark]

35gsm

170gsm

(Turn over)

4 (a)(ii)

Other than cost, state ONE reason for paper being chosen as a material for the lampshade. [1 mark]

(iii) Explain how the lampshade design could be improved to be used in a child's bedroom. [2 marks]

(Turn over)

4 (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 mark]**

Primary metal 1: _____

Primary metal 2: _____

(Turn over)

4 (b)(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 mark]

Brass property: _____

PVC property: _____

(Turn over)

4 (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 mark]

	NATURAL	SYNTHETIC
Nylon		

(Turn over)

4 (c)(ii)

Define the term microfibre. [1 mark]

(iii) Evaluate the properties of nylon that make it a suitable material for the puffer jacket. [4 marks]

continue answer on the next page

(Turn over)

4 (c)(iv)

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

(Turn over)

4 (d) The picture below shows sawn timber.



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

(Turn over)

4 (d)(ii)

Timber is identified using a range of discriminators.

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

continue answer on the next page

(Turn over)

THIS IS A BLANK PAGE

TURN OVER

	
Cotton towel <input data-bbox="863 804 1003 943" type="checkbox"/>	Paper plates, bowls and cups <input data-bbox="1772 804 1913 943" type="checkbox"/>
	
Plastic cutlery <input data-bbox="863 1507 1003 1647" type="checkbox"/>	Metal chair <input data-bbox="1772 1507 1913 1647" type="checkbox"/>
	
LED lamp <input data-bbox="863 2205 1003 2344" type="checkbox"/>	Timber picnic bench <input data-bbox="1772 2205 1913 2344" type="checkbox"/>

5 Carefully study the images of camping products on the opposite page and select ONE product to refer to when answering questions (a) to (c). Place a TICK (✓) in the box of your chosen product.

(a)(i) State ONE anthropometric consideration for your chosen product. [1 mark]

5 (a)(ii)

**Describe how the chosen product
could be made more attractive to the
user. [3 marks]**

(Turn over)

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

(Turn over)

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

(Turn over)

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

**(i) Describe ONE environmental consequence of seasonal products.
[2 marks]**

(Turn over)

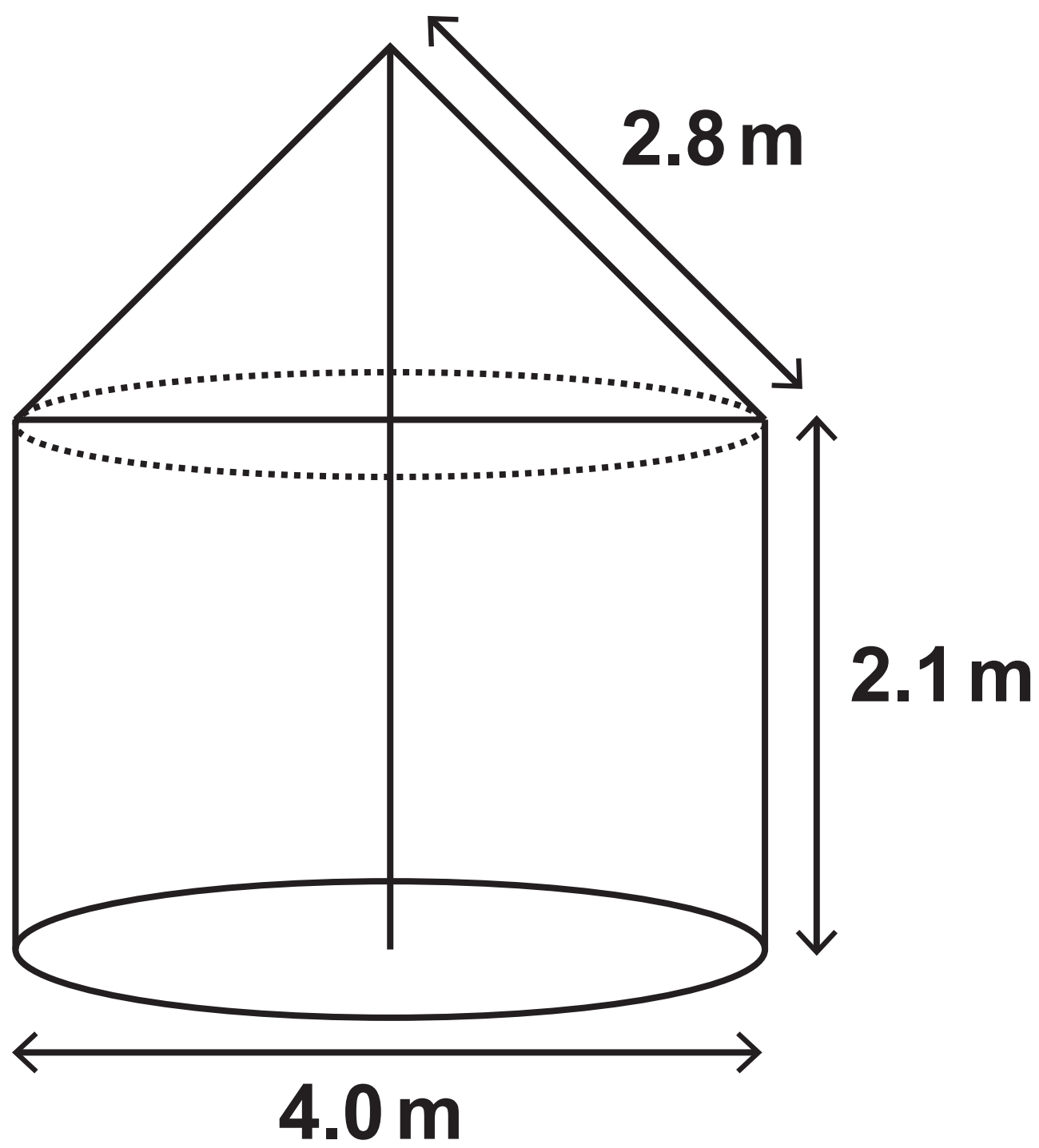
5 (d)(ii)

**Analyse the benefits of using batch production for seasonal products.
[4 marks]**

**continue answer on the next page
(Turn over)**

THIS IS A BLANK PAGE

TURN OVER



5 (e) The diagram on the opposite page 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 marks]

continue answer on the next page

(Turn over)

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.

	Pages
☐ Electronic systems, programmable components and mechanical devices	42–53
☐ Papers and boards	54–65
☐ Natural and manufactured timber	66–77
☐ Ferrous and non-ferrous metals	78–89
☐ Thermosetting and thermoforming plastics	90–101
☐ Fibres and textiles	102–113

Now answer all parts of your chosen topic.
(Turn over)

6 ELECTRONIC SYSTEMS AND MECHANICAL DEVICES

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

Component



Speaker

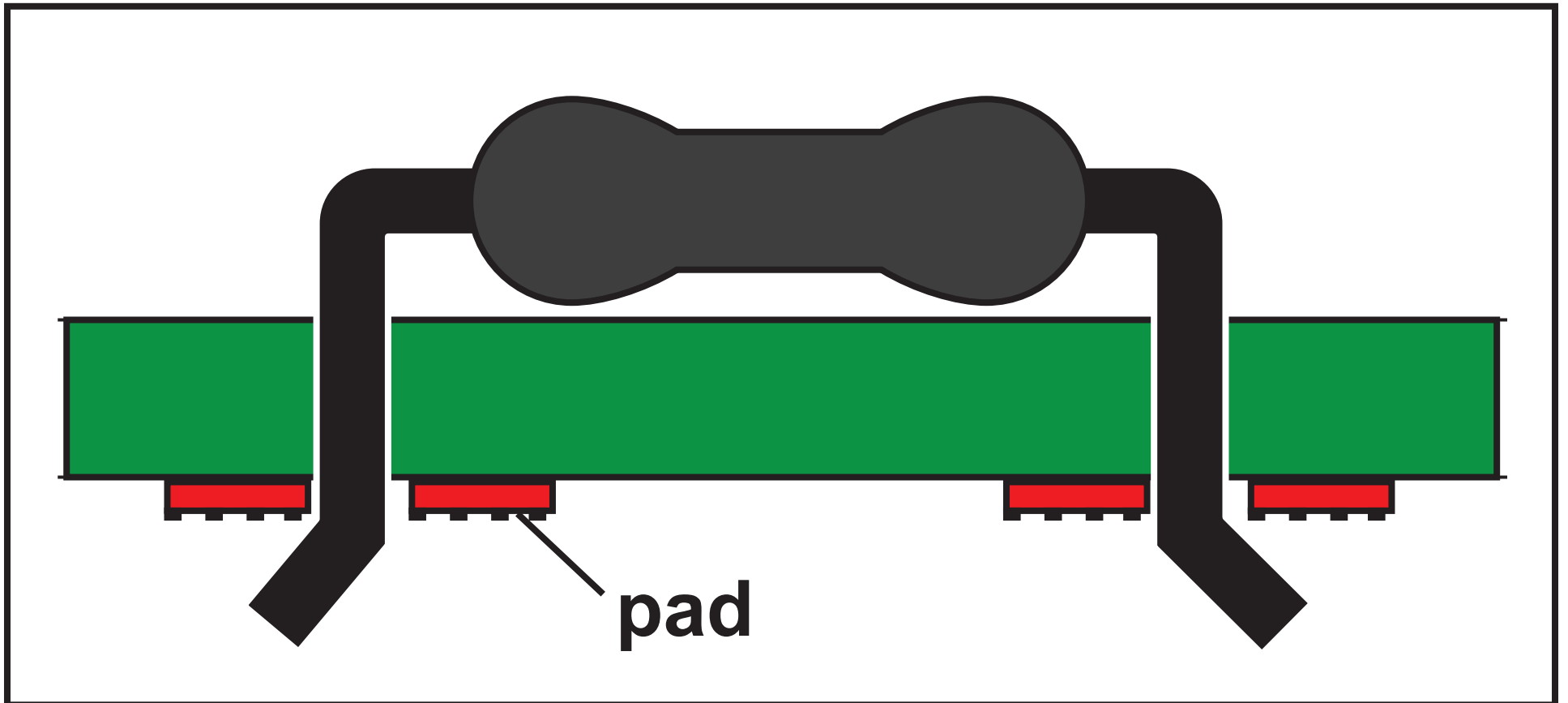


- (i) State the name of the component.
[1 mark]

(Turn over)

6 (a)(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 mark]

(Turn over)

6 (a)(iii)

The speaker's circuit board is cut using a guillotine.

Describe ONE advantage of using a guillotine to cut the circuit board.

[2 marks]

(Turn over)

6 (a)(iv)

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

(Turn over)

6 (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 marks]

(Turn over)

6 (b)(ii)

The speaker's selling price is 500% higher than the cost of the circuit board.

Calculate the selling price of the speaker. [1 mark]

(Turn over)

6 (b)(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 marks]

(Turn over)

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

continue answer on the next page

(Turn over)

**6 (d) Evaluate the reasons the designer uses CAD software to model the speaker circuit compared to physically making the circuit.
[6 marks]**

continue answer on the next page

(Turn over)

continue answer on the next page

(Turn over)

THIS IS A BLANK PAGE

TURN OVER



**Foil-lined
paper bag**



**moulded pulp
egg box**



Pizza box



**Duplex board
cake box**

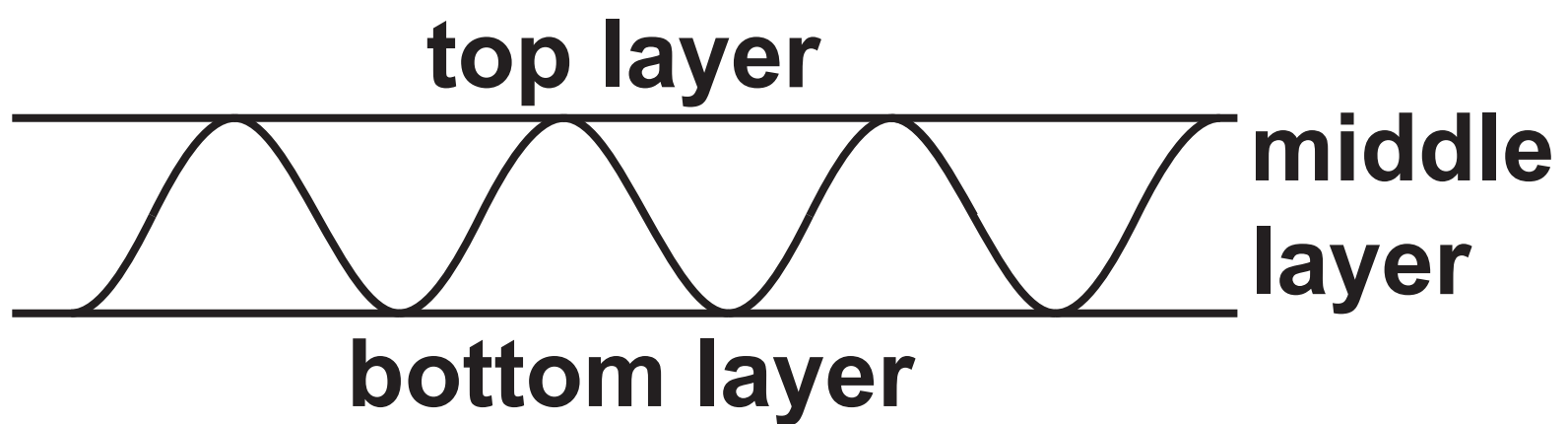
6 PAPERS AND BOARDS

(a) The pictures on the opposite page to show some food packaging products.

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

6 (a)(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 above. [1 mark]

(Turn over)

6 (a)(iii)

**The pizza box is made using a die cutter. Describe ONE advantage of using a die cutter to cut the material.
[2 marks]**

(Turn over)

6 (a)(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 marks]

(Turn over)

6 (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 marks]

(Turn over)

6 (b)(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 mark]

(Turn over)

6 (b)(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 marks]

(Turn over)

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

**continue answer on the next page
(Turn over)**

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

**continue answer on the next page
(Turn over)**

continue answer on the next page

(Turn over)

6 NATURAL AND MANUFACTURED TIMBER

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



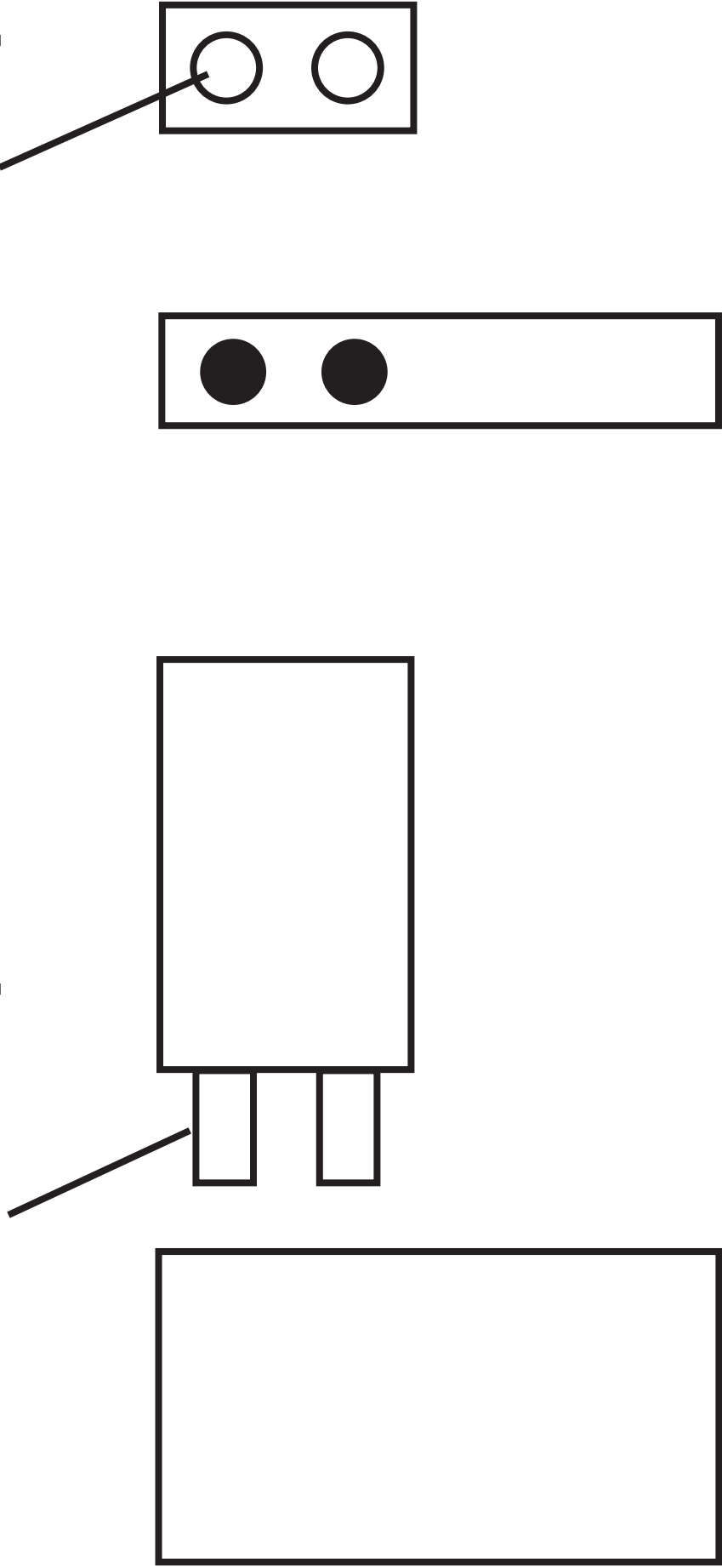
- (i) State the name of a suitable softwood for the construction of the carcass of the bookcase. [1 mark]**
-
-

(Turn over)

THIS IS A BLANK PAGE

TURN OVER

standard component standard component



Front view

Side view

6 (a) continued

The joints of the bookcase are strengthened using standard components.

(ii) State the name of the standard component shown on the opposite page. [1 mark]

6 (a)(iii)

The bookcase material was cut along the grain.

Describe ONE advantage of cutting wood along the grain. [2 marks]

(Turn over)

6 (a)(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 marks]

(Turn over)

6 (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 marks]

(Turn over)

6 (b)(ii)

The selling price of the bookcase is 360% higher than the cost of the material.

Calculate the selling price of one bookcase. [1 mark]

(Turn over)

6 (b)(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 marks]

(Turn over)

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

continue answer on the next page

(Turn over)

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

continue answer on the next page

(Turn over)

(Turn over)

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 mark]

(Turn over)

6 (a)(ii)

State the manufacturing process used to produce the crank arm shown in the picture below. [1 mark]



**crank
arm**

(Turn over)

6 (a)(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 marks]

(Turn over)

THIS IS A BLANK PAGE

TURN OVER

6 (a)(iv)

The hollow sections of the bicycle frame shown are joined together by welding. In the space on the opposite page, use words and sketches to show how to weld a section of the bicycle frame. [5 marks]



(Turn over)

6 (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 marks]

(Turn over)

6 (b)(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 mark]

(Turn over)

6 (b)(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 marks]

(Turn over)

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

continue answer on the next page

(Turn over)

6 (d) Evaluate the reasons the designer uses CAD software to model bicycle frames compared to physically making bicycle frames. [6 marks]

continue answer on the next page

(Turn over)

(Turn over)

6 THERMOFORMING AND THERMOSETTING PLASTICS

- (a) The pictures below shows two sets of bowls.



**thermosetting
polymer bowl set**



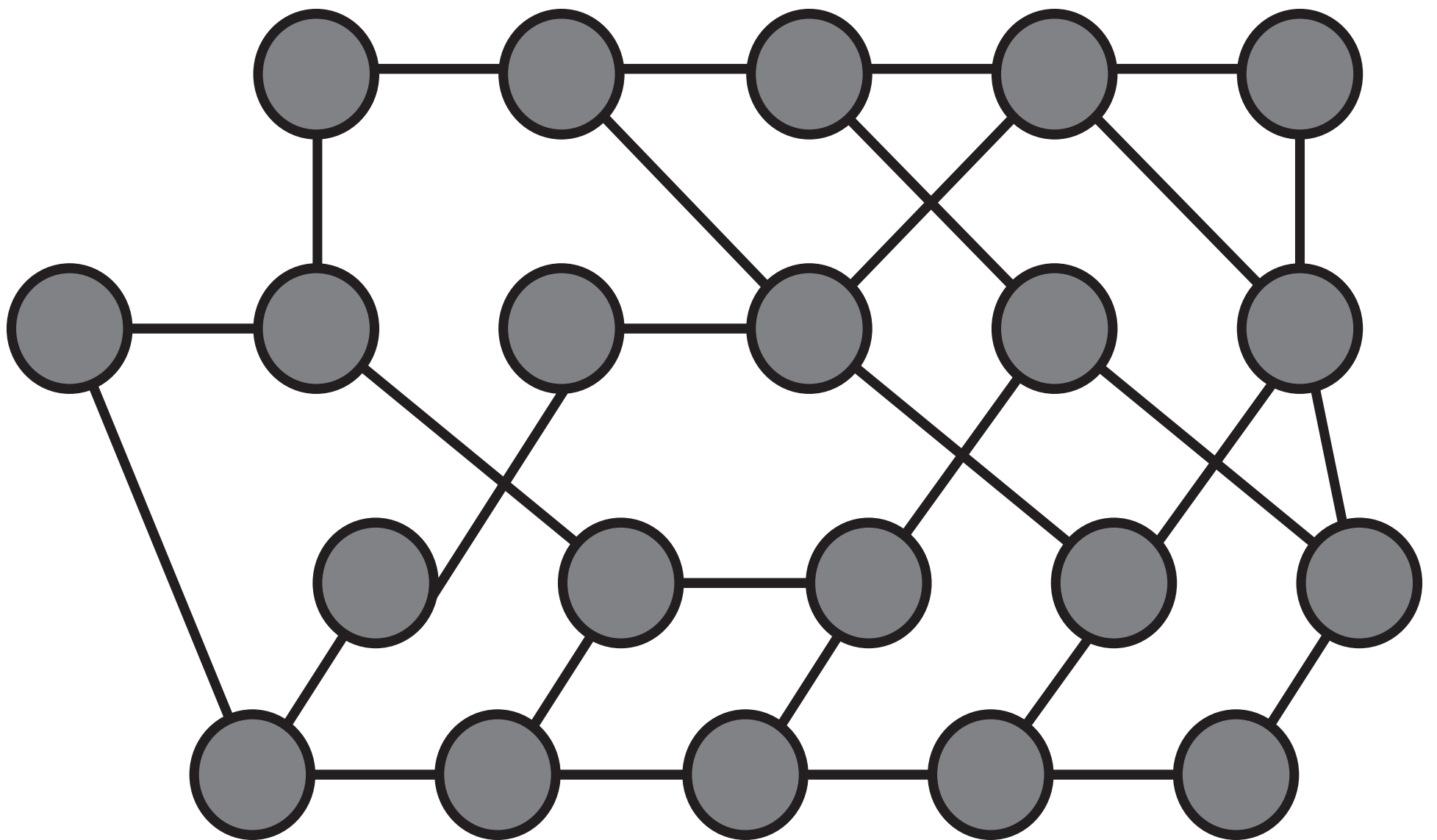
**thermoforming
polymer bowl set**

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

(Turn over)

6 (a)(ii)

State the name of the polymer molecular structure shown in the picture below. [1 mark]



(Turn over)

6 (a)(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 marks]**

(Turn over)

6 (a)(iv)

In the space below, use words and sketches to show how a prototype bowl is vacuum formed. [5 marks]

(Turn over)

6 (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 marks]**

(Turn over)

6 (b)(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 mark]

(Turn over)

6 (b)(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 marks]

(Turn over)

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

continue answer on the next page

(Turn over)

6 (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 marks]

continue answer on the next page

(Turn over)

100

[illegible]

continue answer on the next page

(Turn over)

6 FIBRES AND TEXTILES

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

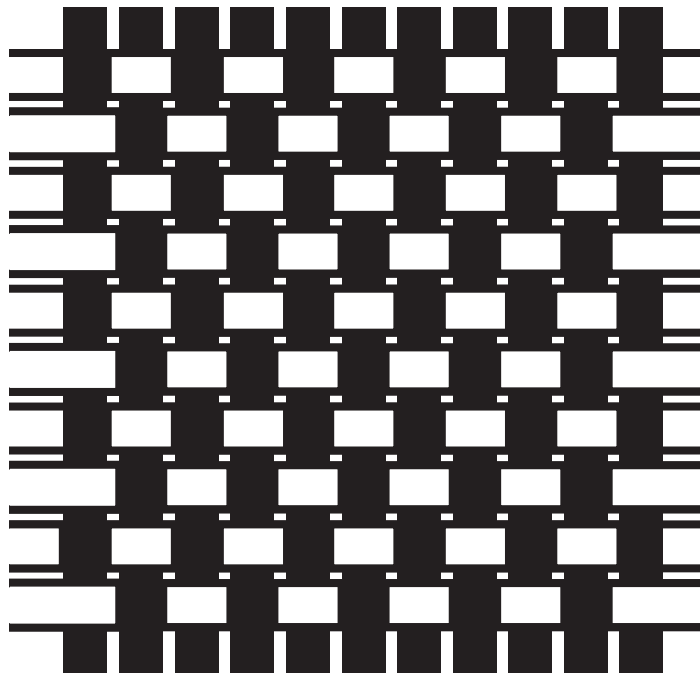


- (i) State the name of a pile fabric suitable for the dress. [1 mark]

(Turn over)

6 (a)(ii)

The dress sleeve cuffs are made from a woven fabric.



State the name of the woven construction shown in the picture above. [1 mark]

(Turn over)

6 (a)(iii)

**The dress fabric was cut on the bias.
Describe ONE advantage of cutting
fabric on the bias. [2 marks]**

(Turn over)

THIS IS A BLANK PAGE

TURN OVER

6 (a)(iv)

The front and back of the dress are joined together with top-stitched plain seams.

In the space on the opposite page, use words and sketches to show how a top-stitched plain seam is manufactured. [5 marks]

(Turn over)

6 (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 marks]

(Turn over)

6 (b)(ii)

The selling price of the dress is 360% higher than the cost of the fabric. Calculate the selling price of one dress. [1 mark]

(Turn over)

6 (b)(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 marks]**

(Turn over)

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

**continue answer on the next page
(Turn over)**

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

continue answer on the next page

(Turn over)

continue answer on the next page
(Turn over)

END OF PAPER

Question number	Additional page, if required. Write the question numbers in the left-hand margin.

Question number	Additional page, if required. Write the question numbers in the left-hand margin.

[illegible]

Question number	Additional page, if required. Write the question numbers in the left-hand margin.

[illegible]