



GCSE



C600U10-1

WEDNESDAY, 15 JUNE 2022 – AFTERNOON

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 _____

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	

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.

You may use a pencil for graphs and diagrams only.

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

Answer questions 1 to 5 and ONLY ONE QUESTION 6.

(Turn over)

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.

(Turn over)

SECTION A

Answer ALL questions.

This question is about Design and Technology and our world.

1 (a) The table below shows a household's annual energy consumption.

ENERGY	kWh	COST
Electricity	2 930	
Gas		£639
TOTAL	14 975	£1 126

1 (a) (i)

**Complete the table on page 4 by
calculating the missing figures.**

[2 marks]

Show all workings.

1 (a) (ii)

**If the household installed solar panels, they would save a total of £210 per year. Calculate the saving as a percentage. [2 marks]
Show all workings.**

(Turn over)



1 (b) (i)

State the name of the logo shown opposite. [1 mark]

1 (b) (ii)

Explain why this logo is important for ethical production. [3 marks]



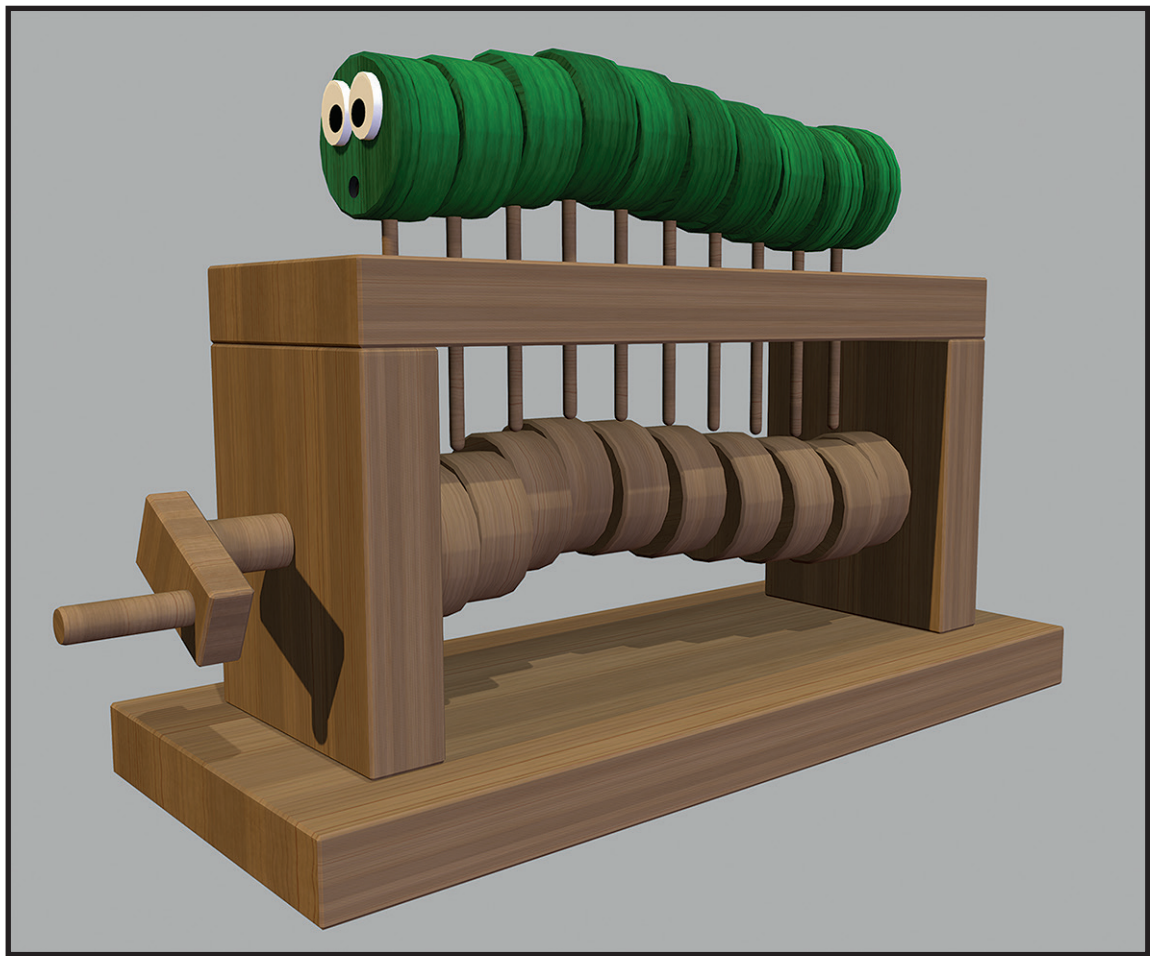
1 (b) (iii)

Describe why the logo opposite appears on product packaging.

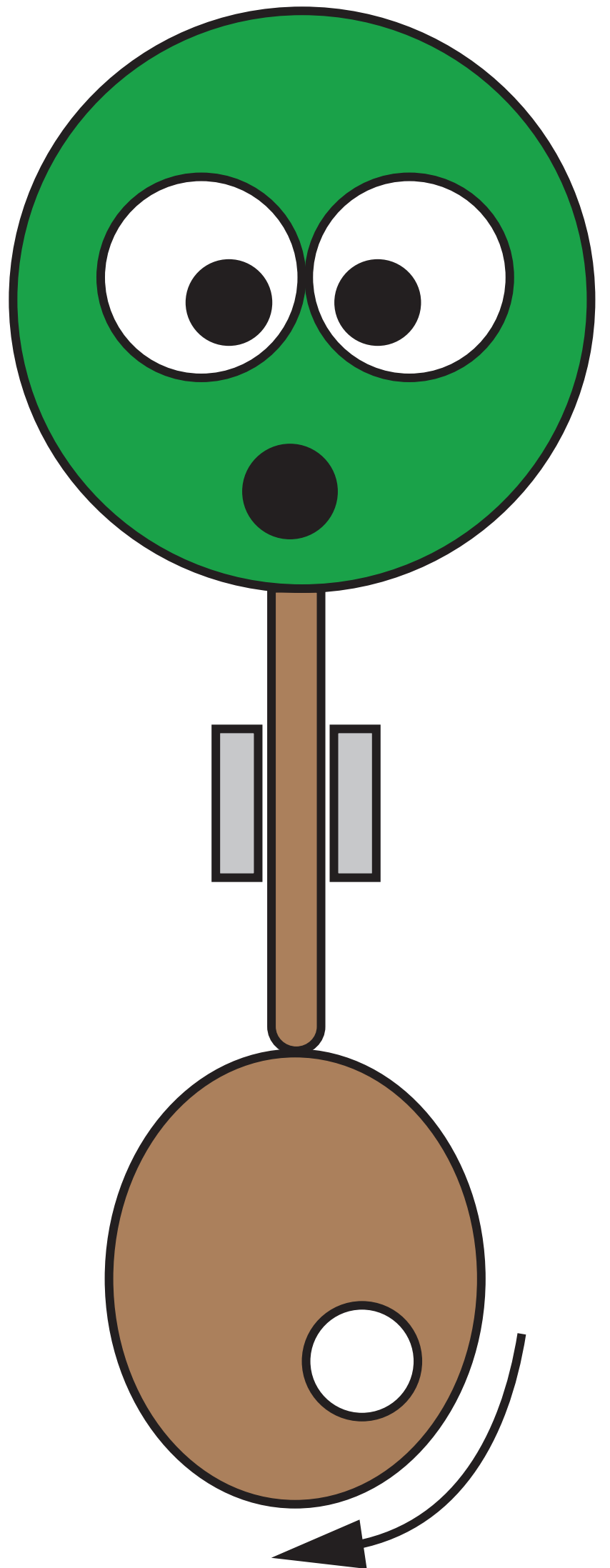
[2 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(Turn over)



Automata Toy



Cam Mechanism

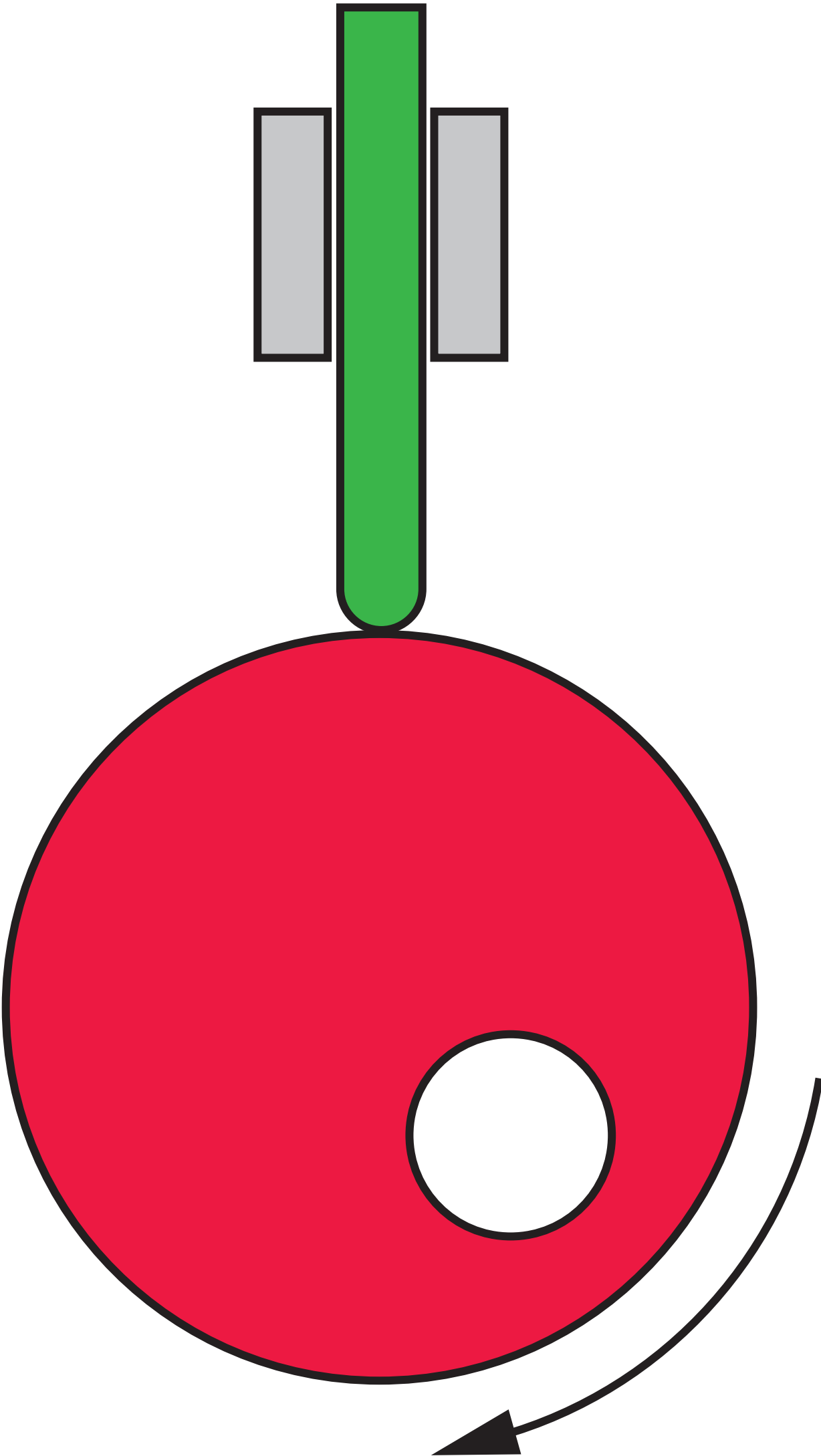
This question is about mechanical devices.

2 (a) The images opposite show an Automata Toy and its Cam Mechanism.

(i) State the function of the Cams on the Automata Toy. [1 mark]

Follower

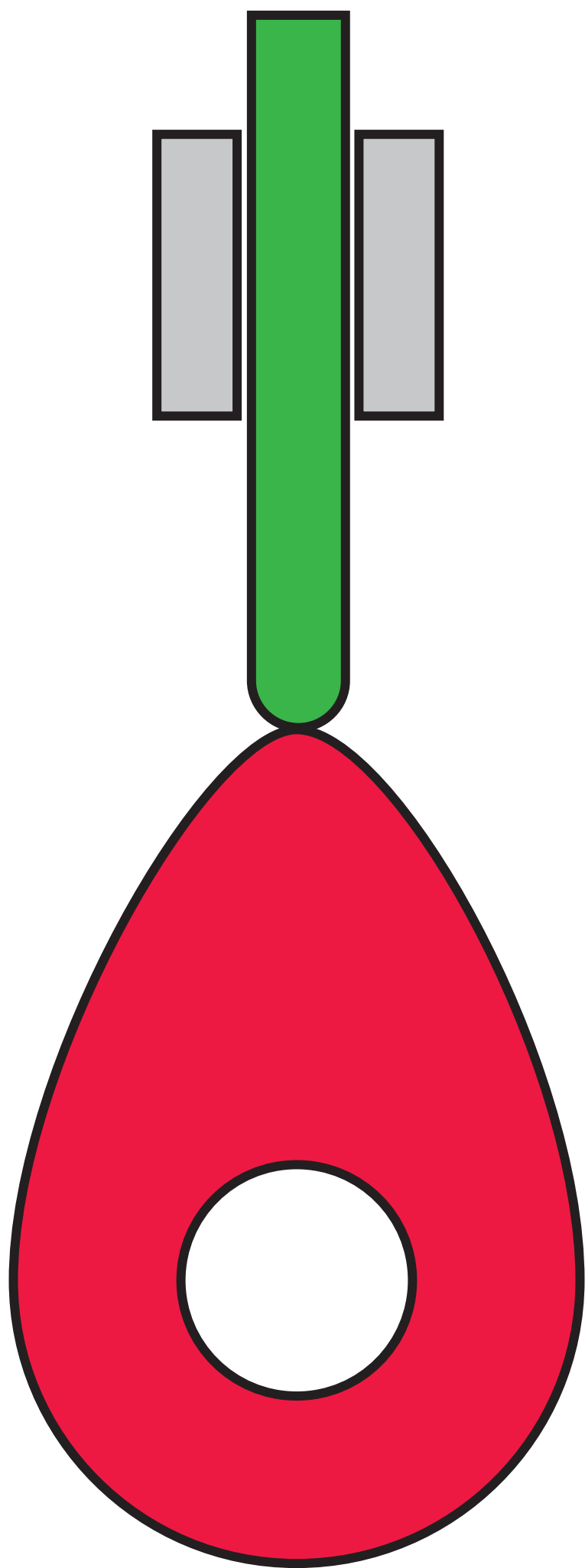
Cam



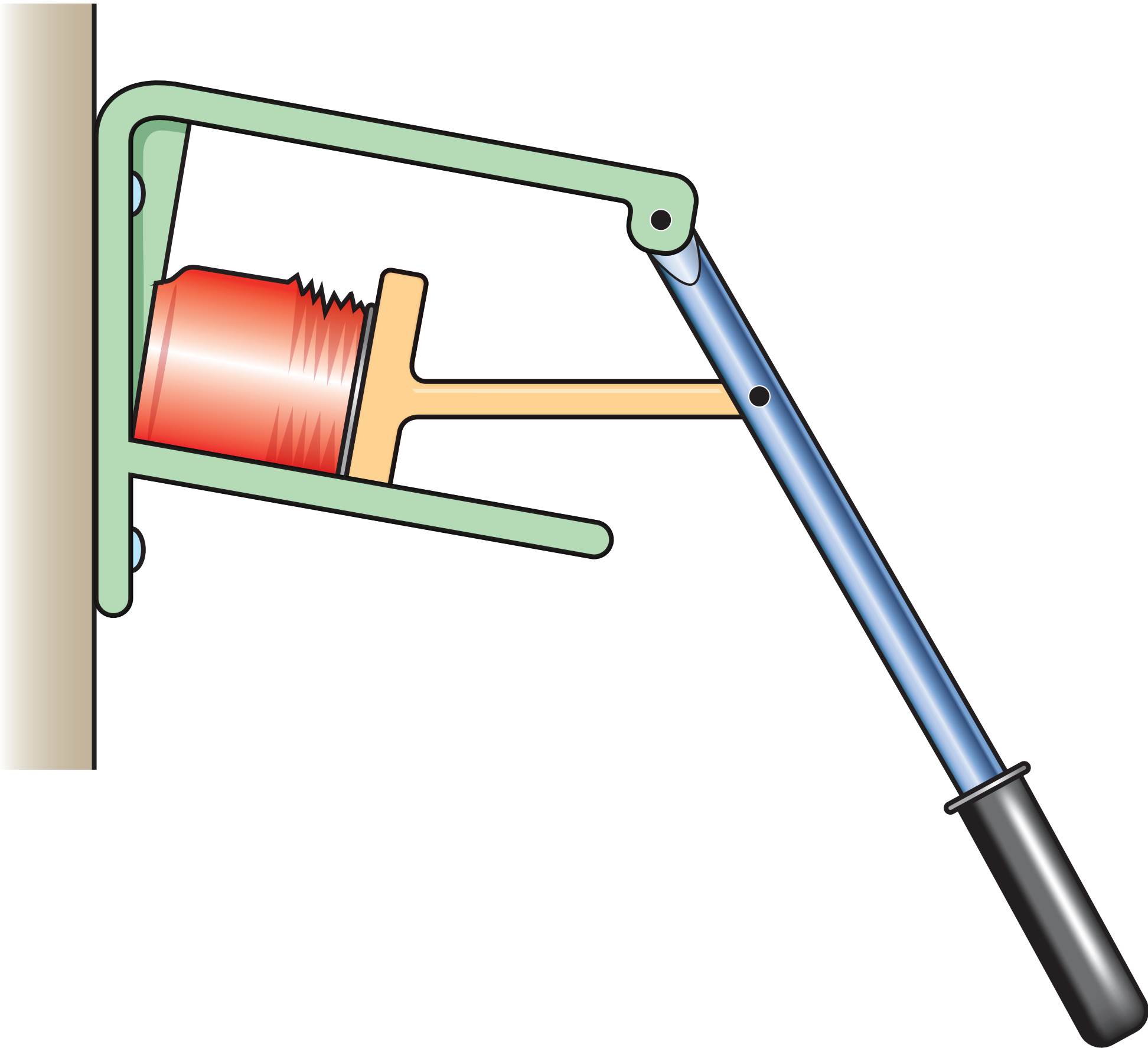
2 (a) (ii)

Draw arrows to correctly identify the Cam and the Follower on the image opposite. [2 marks]

(Turn over)



2 (b) The image opposite shows a pear-shaped Cam. Describe the motion produced by this mechanism.
[2 marks]



- 2 (c) The image opposite shows a lever system used to crush aluminium cans ready for recycling.**

Draw arrows to correctly label the effort and load. [2 marks]

2 (d) Analyse the environmental benefits of consumers crushing and recycling aluminium cans. [3 marks]



This question is about smart, composite and technical materials.

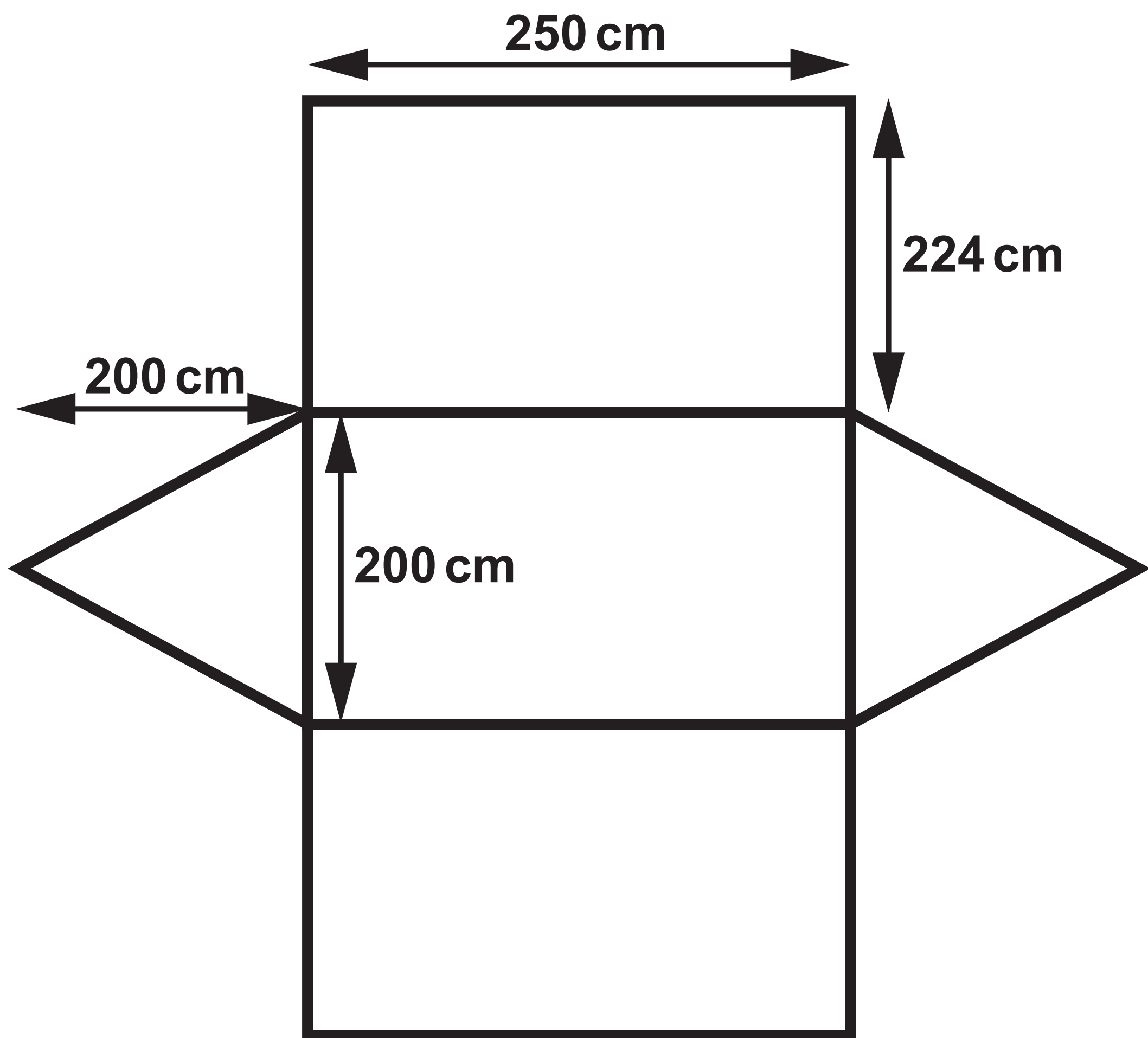
3 (a) The tent (opposite) is made from a range of modern materials.

(i) State the name of an appropriate composite material used to make the tent poles. [1 mark]

3 (a) (ii)

Describe the properties of the composite material you have stated that make it suitable for its use as a tent pole. [3 marks]

(Turn over)



3 (b) (i)

The net of the tent is shown opposite. Calculate the surface area of the tent.

Show all workings. [4 marks]



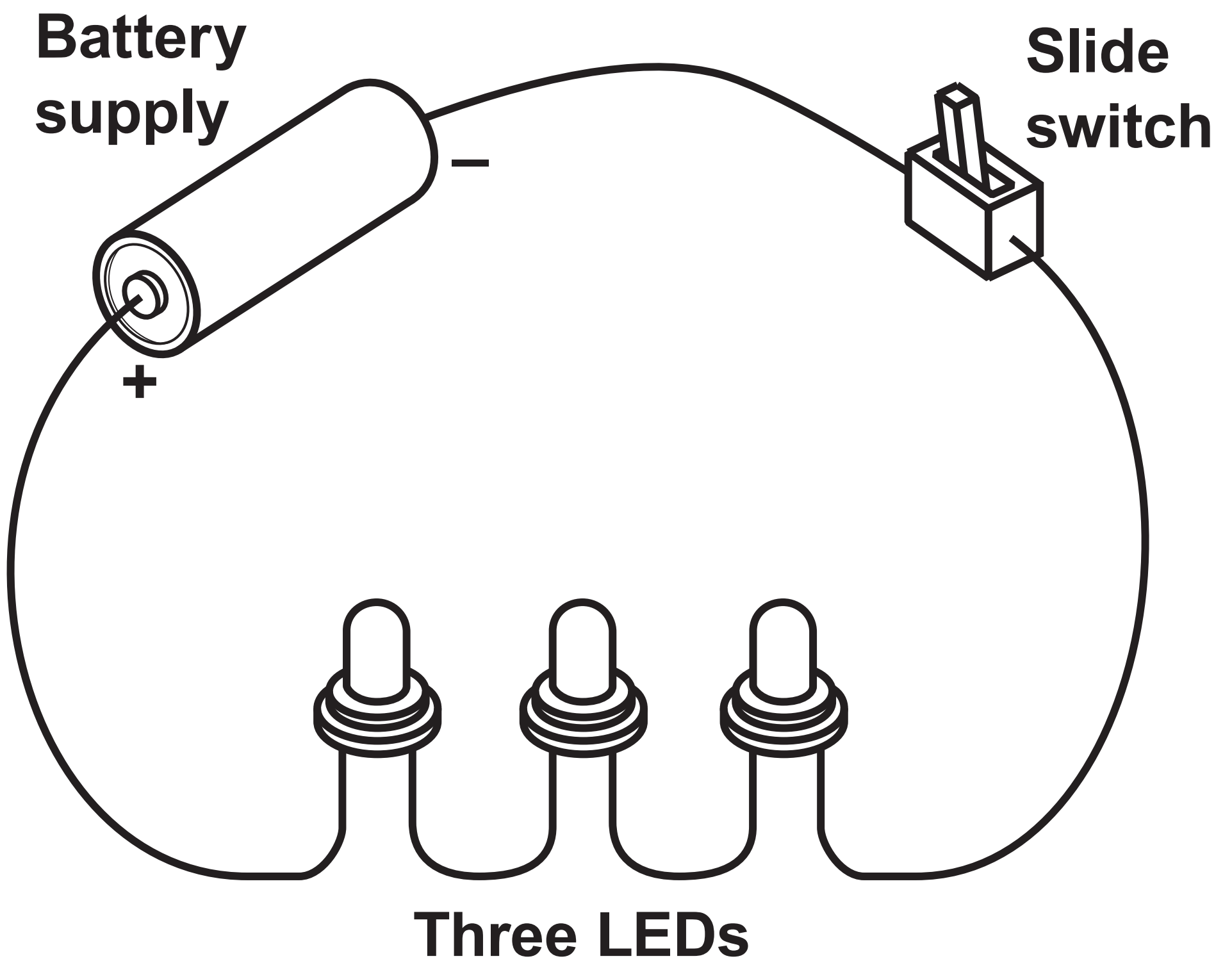
3 (b) (ii)

The product shown opposite is a storage bag for the tent. It is made from microfibres.

Put a tick (✓) in the grid below to indicate whether the following statements are TRUE or FALSE. [2 marks]

STATEMENT	TRUE	FALSE
Microfibres can be manufactured from natural and synthetic materials.		
Microfibres have an excellent strength-to-weight ratio.		

(Turn over)



3 (c) The image opposite shows a head torch used for camping.

Review the sketched diagram opposite, which is a simplified sketched version of the electrics used to power the light.

Using standard circuit symbols for each component, produce a circuit diagram in the space below. [5 marks]

This question is about materials.

- 4 (a) Describe the structure of EACH of the manufactured boards shown in the table on page 21. 3 × [2 marks]**

MANUFACTURED BOARD	NAME	DESCRIPTION
	Plywood	
	Chipboard	
	Medium Density Fibreboard	

(Turn over)



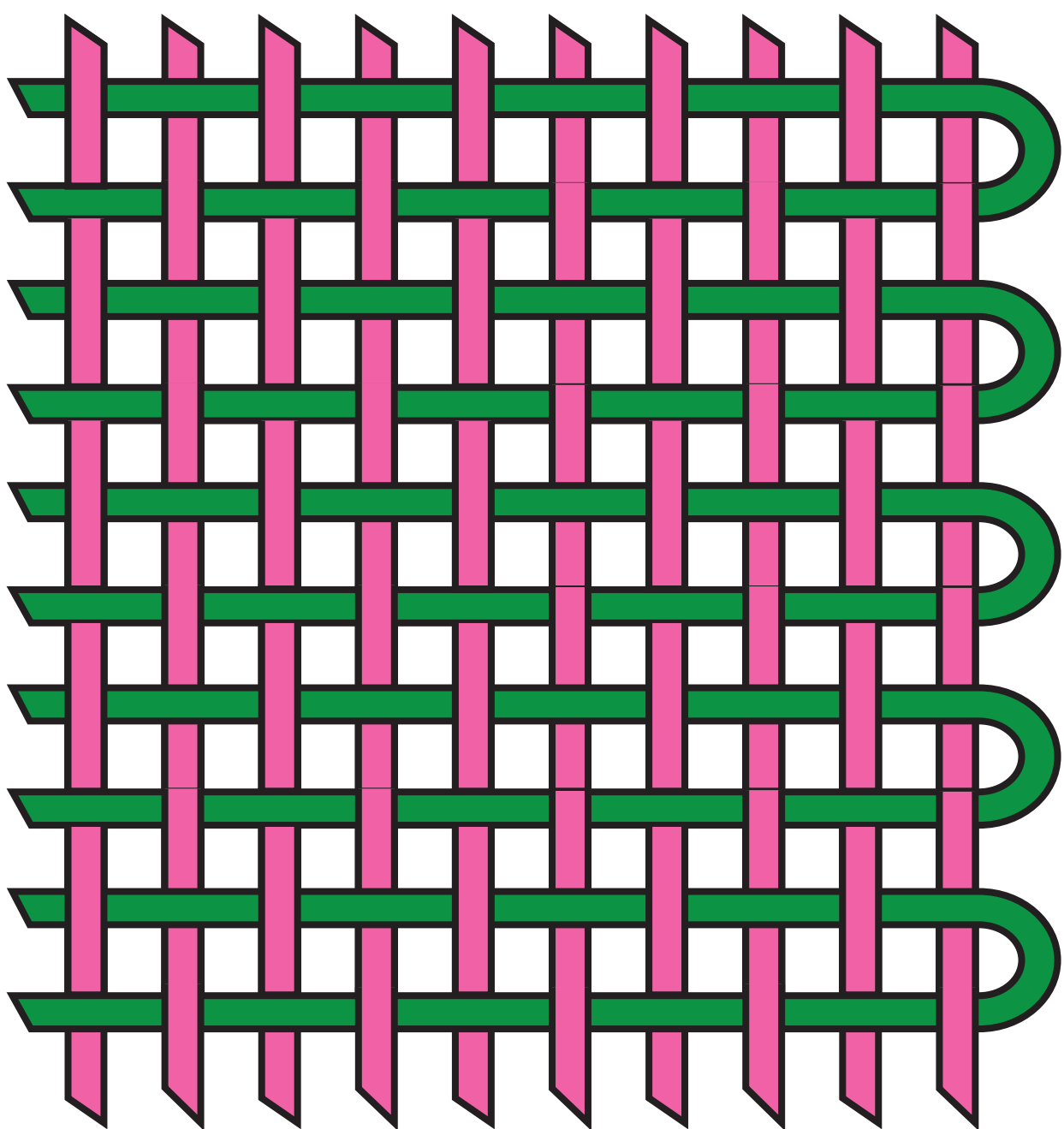
4 (b) The image opposite shows a selection of detergent bottles made from a thermoforming plastic.

(i) State the name of the most appropriate thermoforming plastic used to manufacture the bottles.

[1 mark]

4 (b) (ii)

Explain why a thermoforming plastic is suitable for the manufacture of detergent bottles. [3 marks]



4 (c) The diagram opposite is of a fabric construction.

- (i) Study the diagram opposite.
Complete the following sentences by
inserting the correct words from the
list provided. 3 × [1 mark]**

KNITTED WOVEN LOOPED

WEFT WARP

_____ fabrics are
constructed using interlocking yarns.

The yarns that run horizontally are called
_____ yarns.

The yarns that run vertically down the
length of the fabric are called
_____ yarns.

(Turn over)



Silk tie



Polyester tie

4 (c) (ii)

The ties shown in the images opposite are identical in design but differ in fibre content.

Discuss the properties of silk and polyester that make them suitable fabrics for the ties. [3 marks]

(Turn over)



4 (d) Opposite are pictures of a robot building kit made from recycled paper.

(i) The size of the paper used to make the envelope is 297 mm × 420 mm.

Circle the correct standard size below, used to make the envelope.

[1 mark]

A3

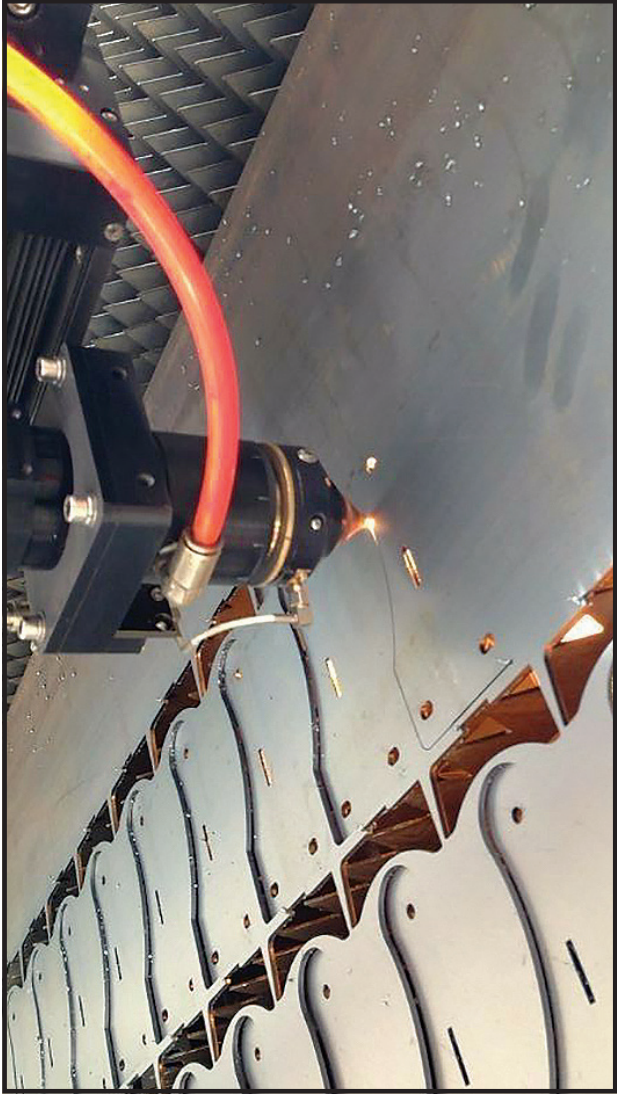
A4

A5

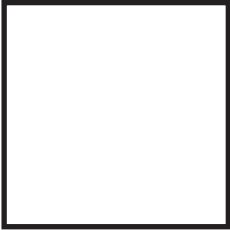
(Turn over)

4 (d) (ii)

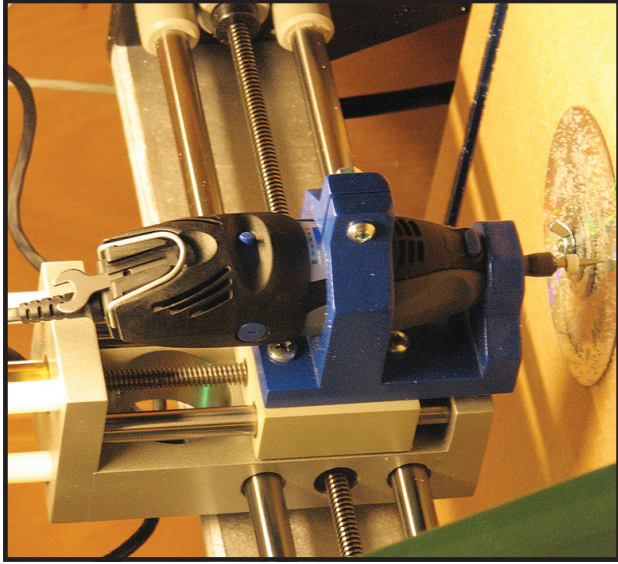
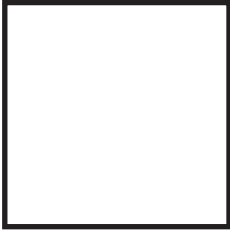
60% of the card is made from recycled paper. Describe ONE disadvantage of using recycled paper for this product. [3 marks]



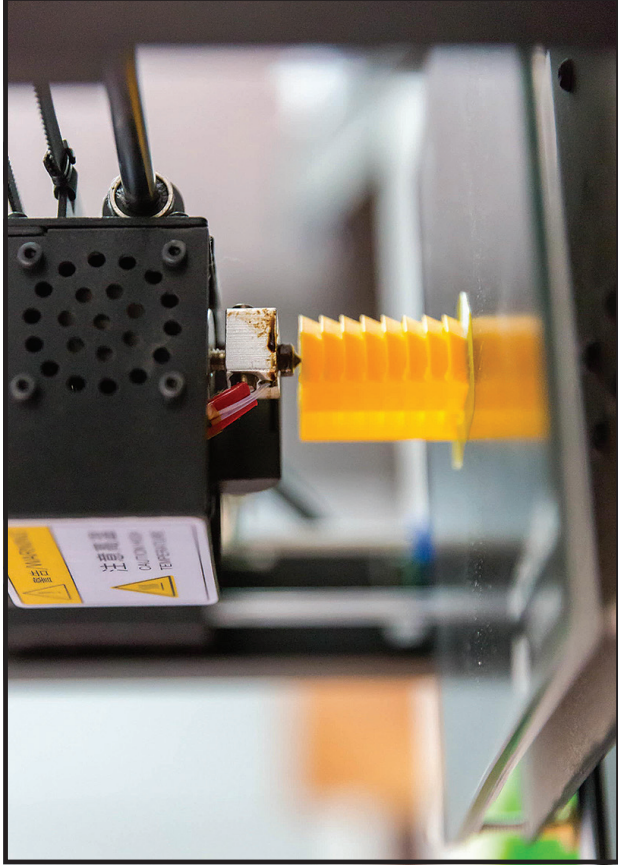
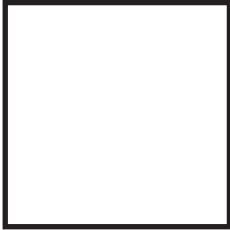
Laser Cutter



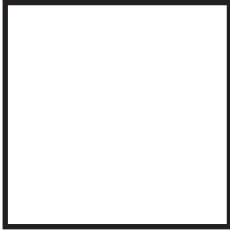
**CNC Embroidery
Machine**



CNC Router Machine



3D Printer



- 5. Review the images opposite and select ONE CAM DEVICE when answering the questions (a) to (c). Place a tick (✓) in the box of your selected device.**

- (a) (i) All the images opposite are examples of CAM devices.
State the meaning of CAM. [1 mark]**

C _____

A _____

M _____

5 (a) (ii)

Explain the benefits of using your chosen CAM device when making products in school. [3 marks]

5 (b) The CAM devices require input from a CAD software package.

(i) Give ONE example of a CAD software package that could be used with your chosen device. [1 mark]

5 (b) (ii)

**Describe TWO disadvantages of
using CAD in a school environment.
[4 marks]**

5 (c) (i)

Explain a safety consideration when using your chosen CAM device.

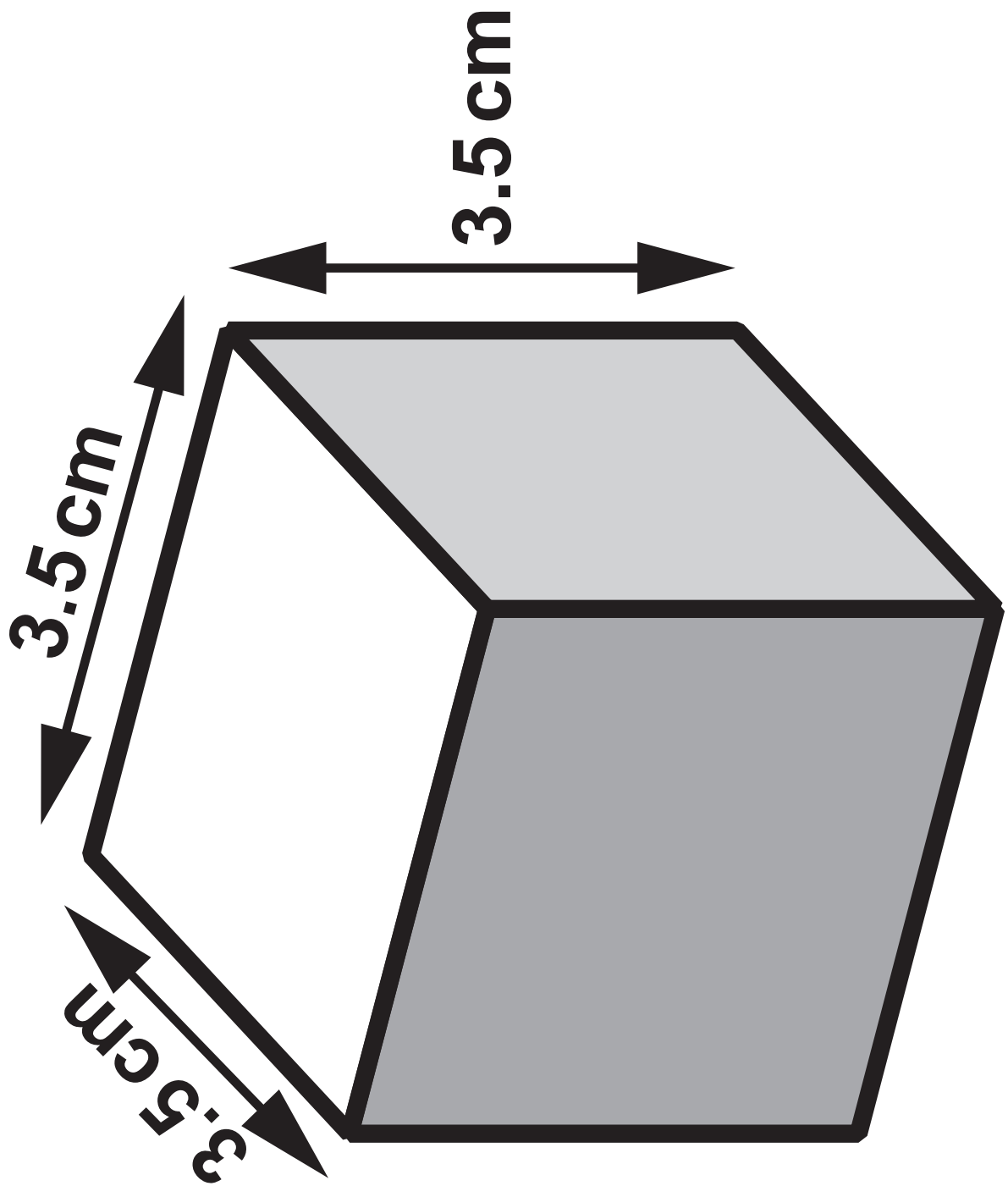
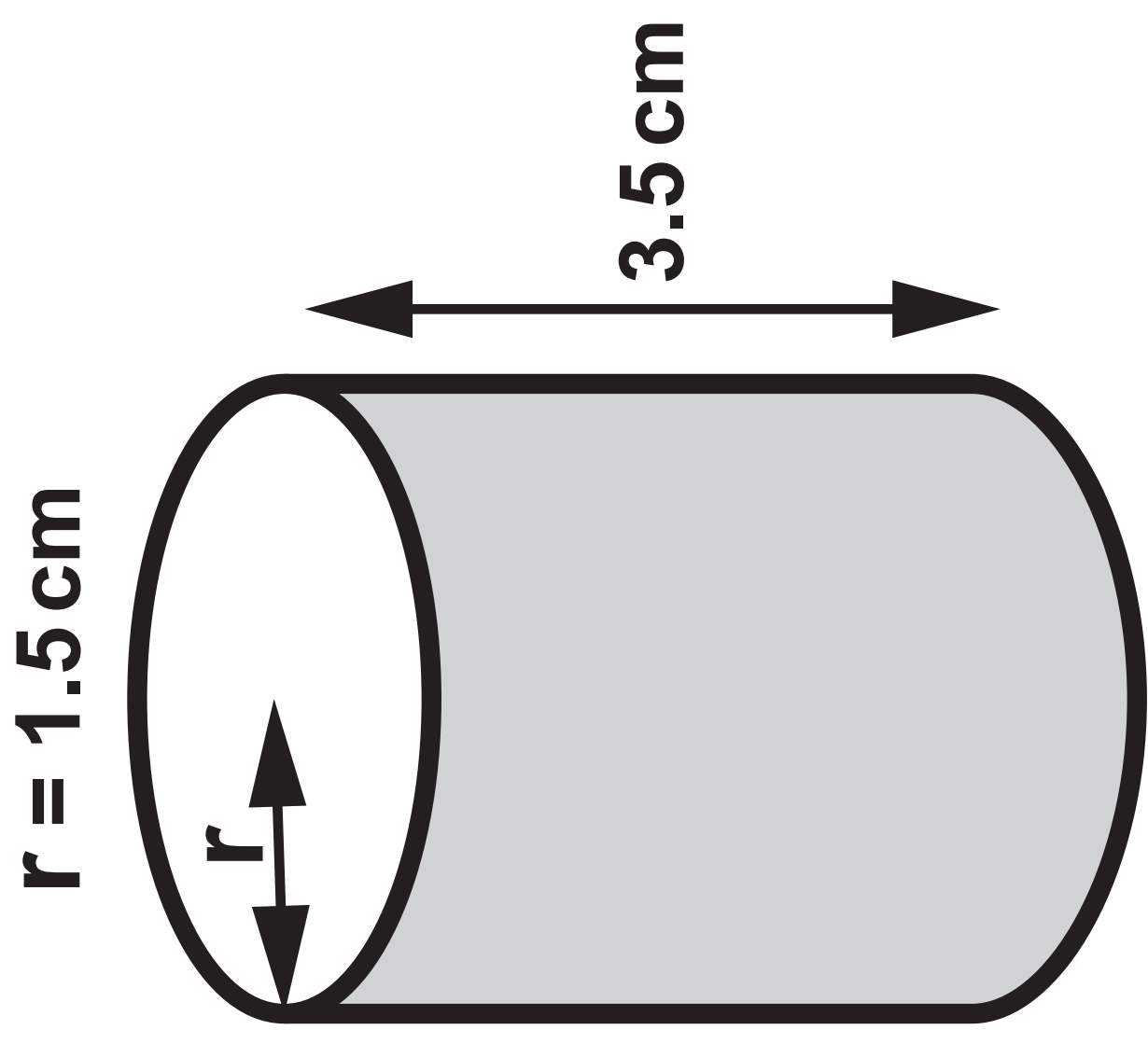
[2 marks]

(Turn over)

5 (c) (ii)

**Evaluate the use of your chosen
CAM device when used in the
development of a design. [4 marks]**

(Turn over)



5 (d) The CAD drawings opposite show two solid shapes that are to be 3D printed to form part of a child's toy puzzle.

Calculate the volume of the cube and the cylinder shapes.

Round your answer to 2 decimal points. Show all workings.

Volume of cube: [2 marks]

Answer _____ **cm³**

(Turn over)

5 (d)

Volume of cylinder: [3 marks]

Answer _____ cm^3

(Turn over)

SECTION B: OPTIONAL QUESTIONS

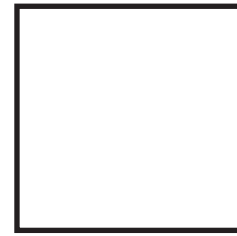
Choose ONE topic area only.

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

		Pages
Electronic systems, programmable components and mechanical devices	☐	38–48
Papers and boards	☐	49–58
Natural and manufactured timber	☐	59–68
Ferrous and non-ferrous metals	☐	69–78

(Turn over)

**Thermosetting and
thermoforming plastics**



79–89

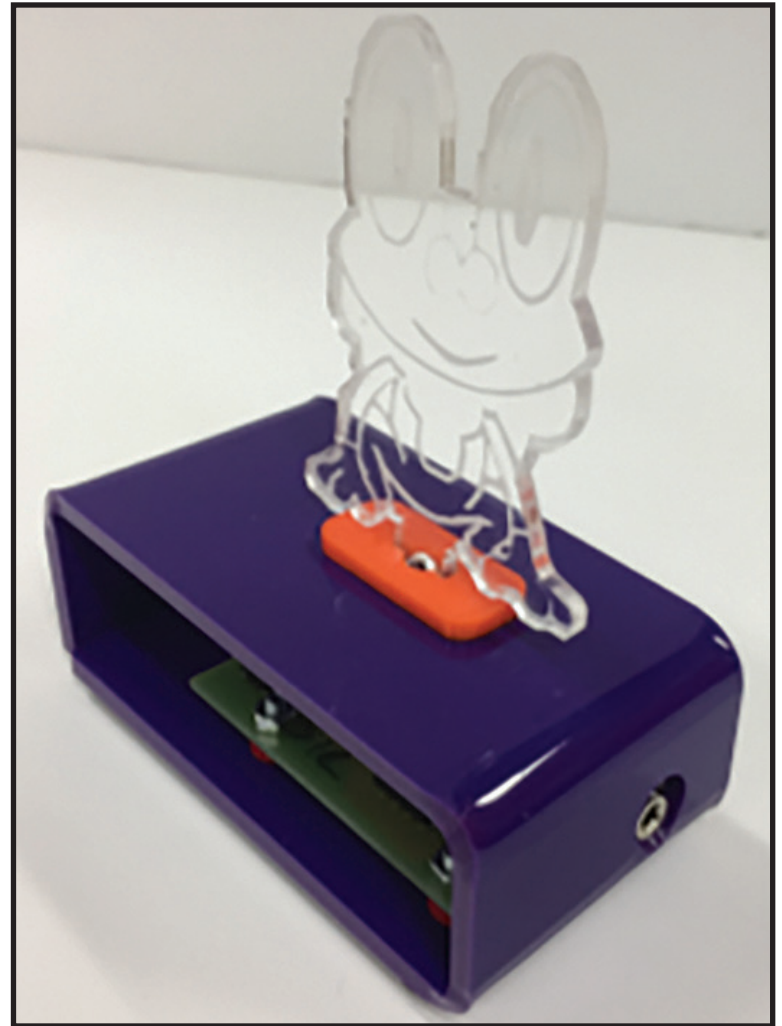
Fibres and textiles



90–99

**Now answer all parts of your chosen
topic.**

(Turn over)



SECTION B

- 6. Electronic systems,
programmable components and
mechanical devices**
- (a) The pictures opposite show a child's
colour changing mood light.**
- (i) State the name of a component that
could be used to turn on the child's
mood light. [1 mark]**

6 (a) (ii)

**The circuit board in the child's mood light is designed with a PIC chip.
State a function of the PIC chip.**

[1 mark]

(Turn over)

6 (a) (iii)

Explain why a double-sided circuit board is used in the child's mood light. [2 marks]



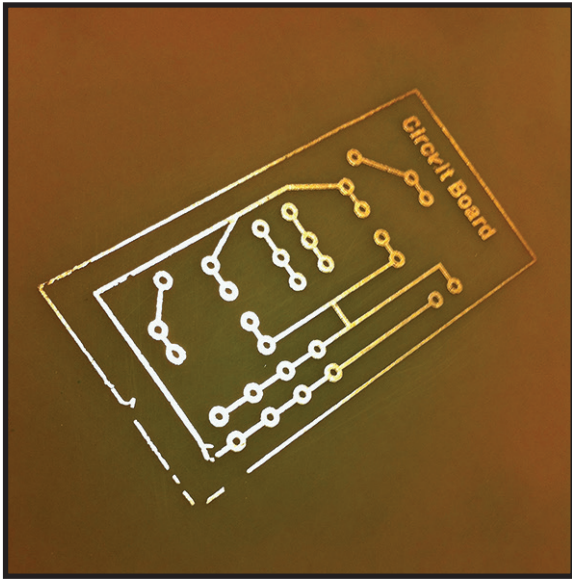
6 (a) (iv)

The image opposite shows a piece of equipment used to attach the components to the circuit board in the child's mood light.

State the name of this piece of equipment. [1 mark]

(v) The picture on page 42 shows a circuit board. Describe the process of joining the LED onto the circuit board. [4 marks]

6 (a) (v)

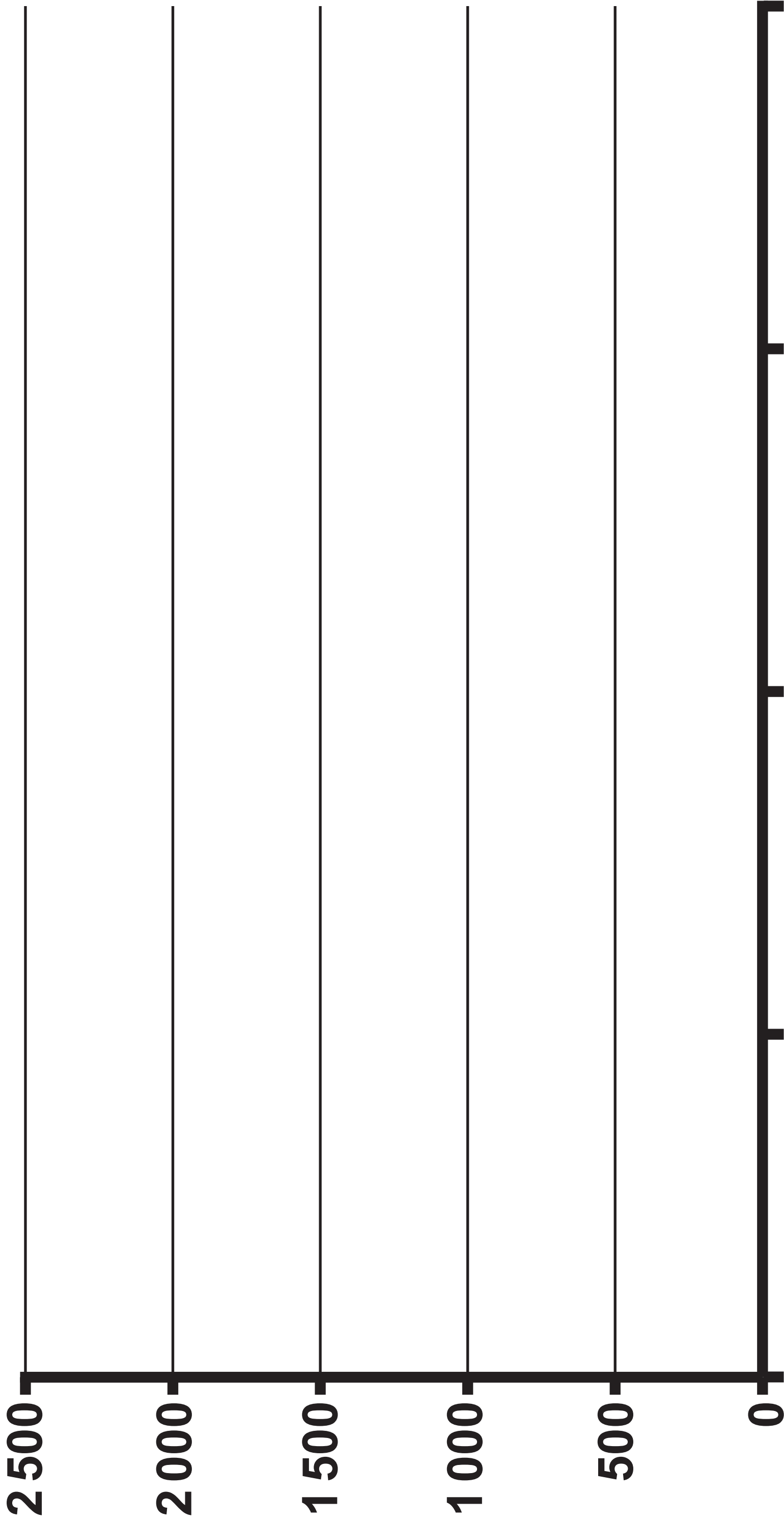


DESCRIPTION OF SOLDERING THE LED

[illegible]

(Turn over)

BAR CHART OF SALES



- 6 (b) A retailer tracked the sales of the child's mood light over a 4-month period. The table below displays the data collected.**

SALES (£)	MONTH
1 500	DECEMBER
2 500	JANUARY
750	FEBRUARY
500	MARCH

- (i) In the space opposite, draw and label a bar chart showing the data found in the table above. [3 marks]**

6 (b) (ii)

**The retailer pays 20% Value Added Tax (VAT) on all sales over a period of four months. Calculate how much VAT will need to be paid for the child's mood lights over the 4-month period. [2 marks]
Show all workings.**

(Turn over)

6 (c) Different electronic components use a wide range of materials, for example, silver, cadmium, ferric chloride and mercury.

Analyse the impact recycling electronic components has on our ecological footprint. [5 marks]

6 (d) Evaluate why prototyping and modelling design ideas benefit both the designer and manufacturer when designing a child's mood light.

[6 marks]

(Turn over)



6. Papers and boards

(a) The pictures opposite are of greetings cards manufactured from 180 gsm card.

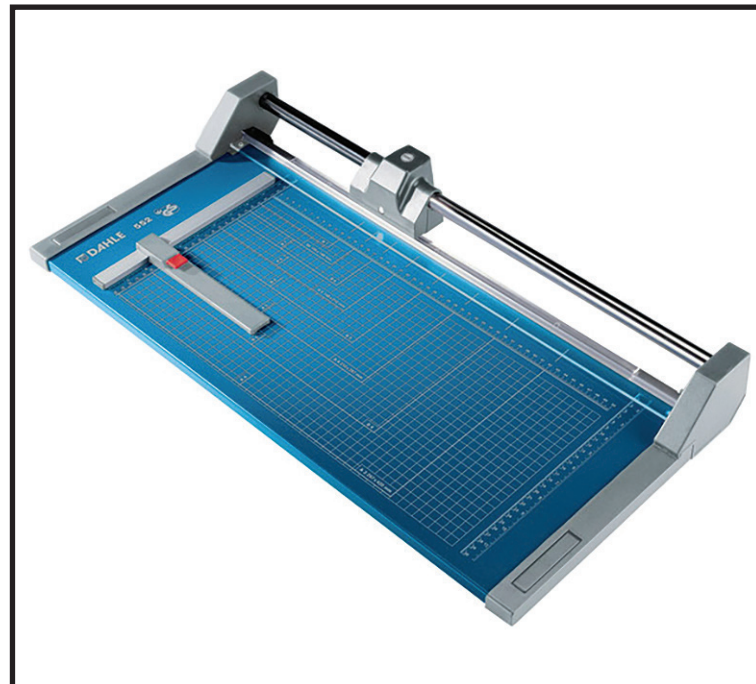
(i) State ONE reason why 180 gsm is the most suitable weight for the greetings cards. [1 mark]

(ii) State ONE reason why a 'duplex' printer is used to manufacture the greetings cards. [1 mark]

(Turn over)

6 (a) (iii)

Explain why registration marks are used when manufacturing greetings cards. [2 marks]



6 (a) (iv)

The picture opposite shows a piece of equipment used to manufacture the greetings cards.

State the name of this piece of equipment. [1 mark]

(v) The greetings card has been constructed using a die cutting machine. Describe the process of die cutting the greetings card shown on page 52. [4 marks]

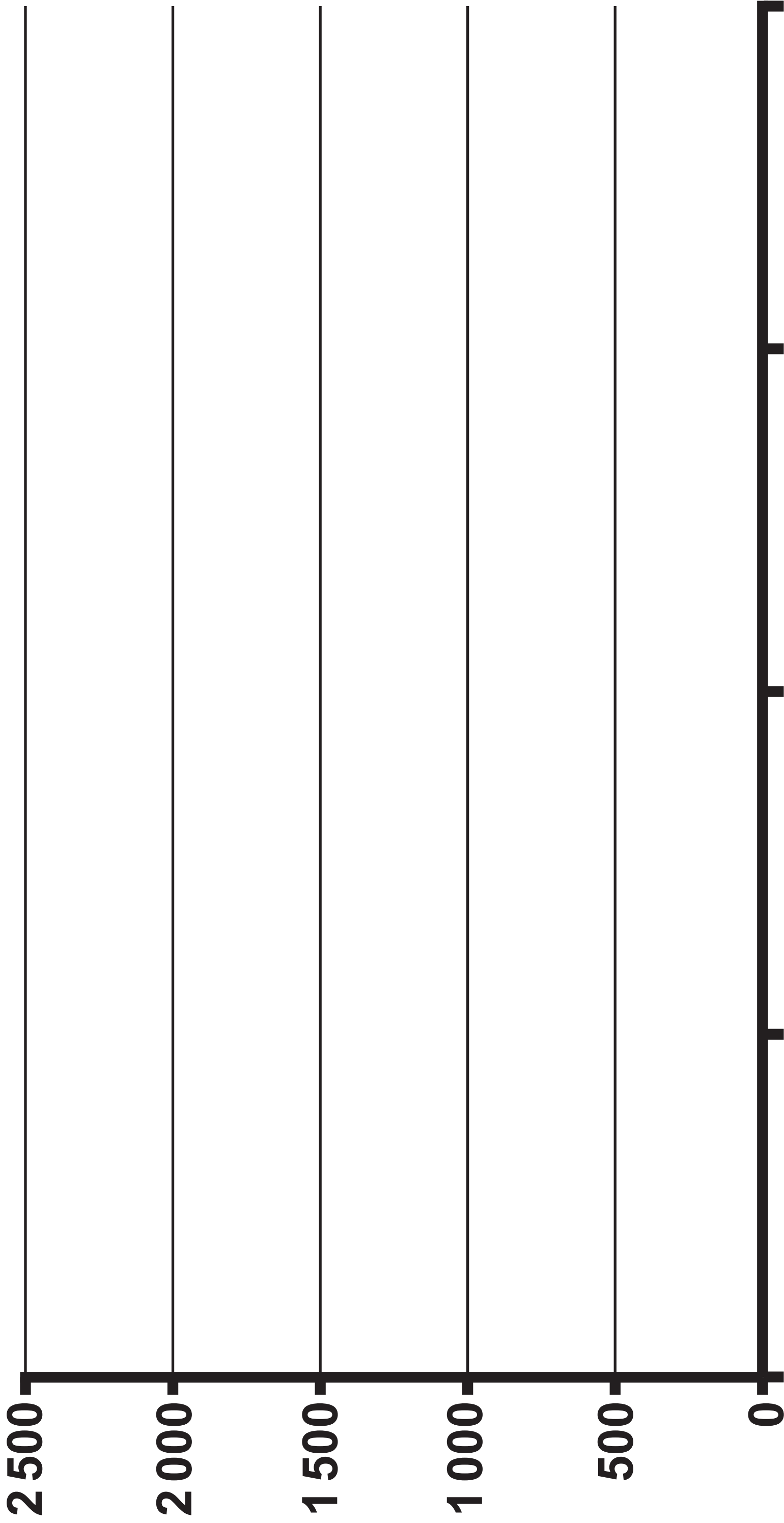
(Turn over)

6 (a) (v)

	DESCRIPTION OF DIE CUTTING PROCESS

(Turn over)

BAR CHART OF SALES



- 6 (b) A retailer tracked the sales of the greetings cards over a 4-month period. The table below displays the data collected.**

SALES (£)	MONTH
1 500	DECEMBER
2 500	JANUARY
750	FEBRUARY
500	MARCH

- (i) In the space opposite, draw and label a bar chart showing the data found in the table above. [3 marks]**

6 (b) (ii)

**The retailer pays 20% Value Added Tax (VAT) on all sales. Calculate how much VAT will need to be paid for the greetings cards sales over the 4-month period. [2 marks]
Show all workings.**

(Turn over)

6 (c) Wood and wood pulp are materials used to manufacture the greetings cards.

Analyse the impact harvesting these materials has on our ecological footprint. [5 marks]

[illegible]

(Turn over)

- 6 (d) Evaluate why prototyping and modelling design ideas benefit both the designer and the manufacturer when designing a greetings card.**
- [6 marks]**



6. Natural and manufactured timber

(a) The picture opposite is of a child's toy made from natural timber.

(i) State the name of the component used to join the wheels to the toy.

[1 mark]

(ii) State the name of the machine used to create the animal's eye in the child's toy. [1 mark]

(Turn over)

6 (a) (iii)

The child's toys have different finishes applied. Explain why a finish is used. [2 marks]



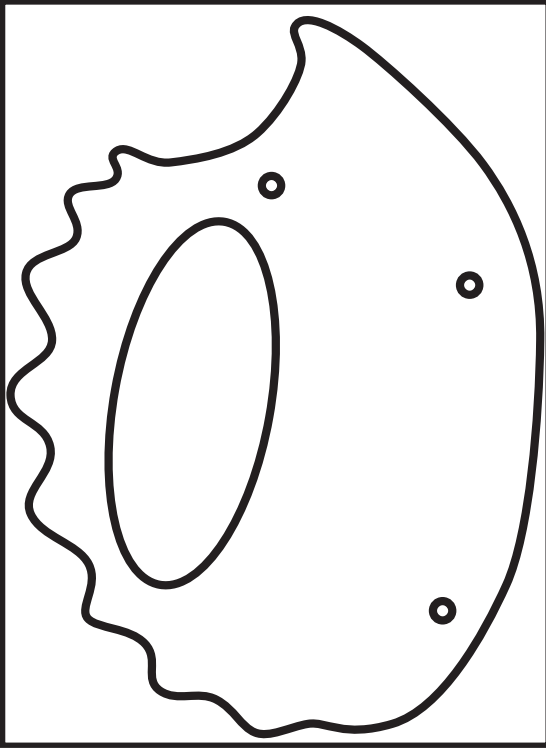
6 (a) (iv)

The image opposite shows a piece of equipment used to finish parts of the child's toy.

State the name of this piece of equipment. [1 mark]

(v) The wooden toy has been constructed using a rectangular timber block. Describe, on page 62, how to manufacture the body of the child's toy. [4 marks]

6 (a) (v)

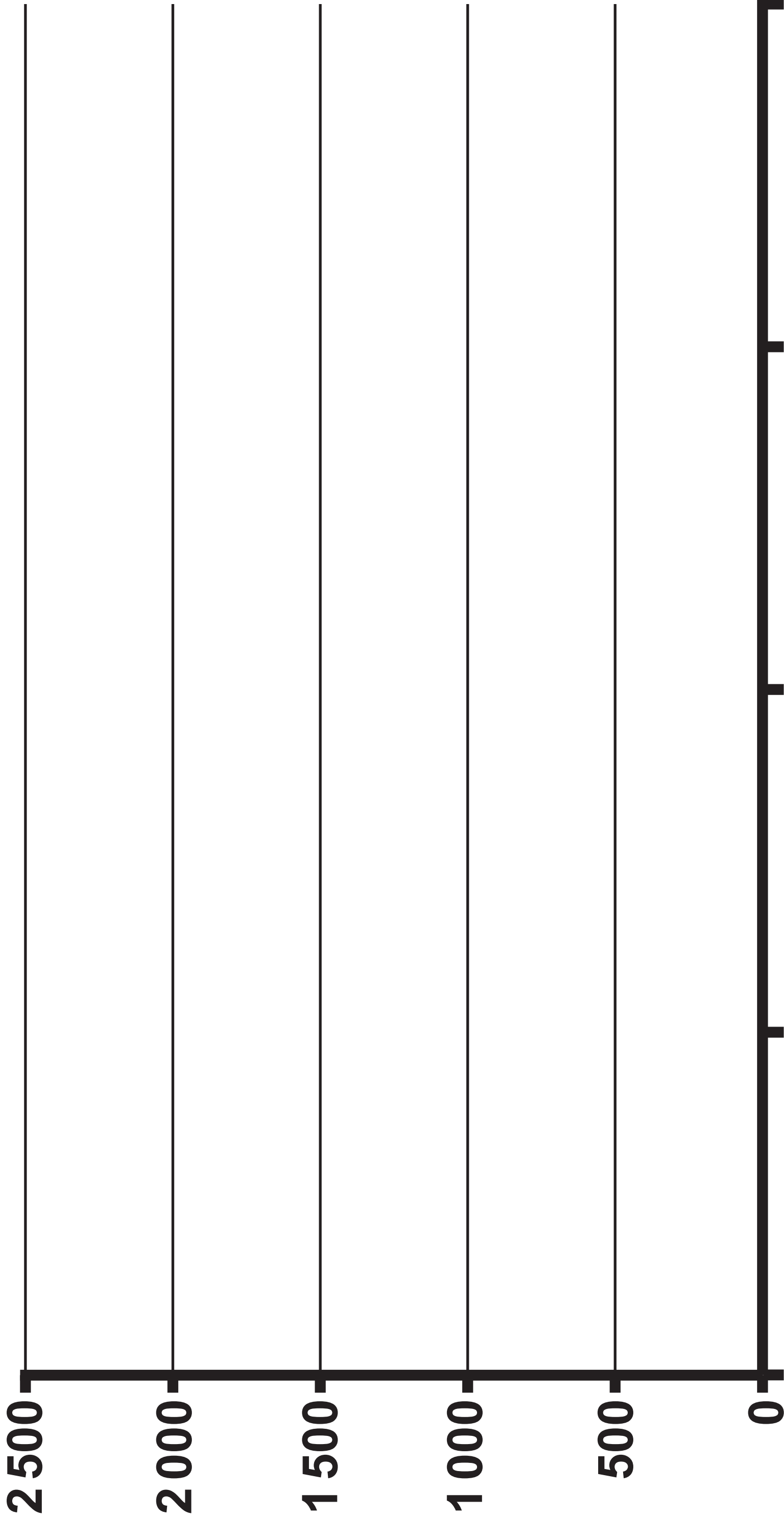


DESCRIPTION OF MANUFACTURING THE BODY OF THE TOY

[illegible]

(Turn over)

BAR CHART OF SALES



- 6 (b) A retailer tracked the sales of the child's toy over a 4-month period. The table below displays the data collected.**

SALES (£)	MONTH
1 500	DECEMBER
2 500	JANUARY
750	FEBRUARY
500	MARCH

- (i) In the space opposite, draw and label a bar chart showing the sales data found in the table above. [3 marks]**

6 (b) (ii)

The retailer pays 20% Value Added Tax (VAT) on all sales. Calculate how much VAT will need to be paid for the child's toy sales over the 4-month period. Show all workings. [2 marks]

(Turn over)

6 (c) Pine and oak are natural timbers used to manufacture the child's toy.

Analyse the impact deforestation and converting natural timbers has on our ecological footprint.

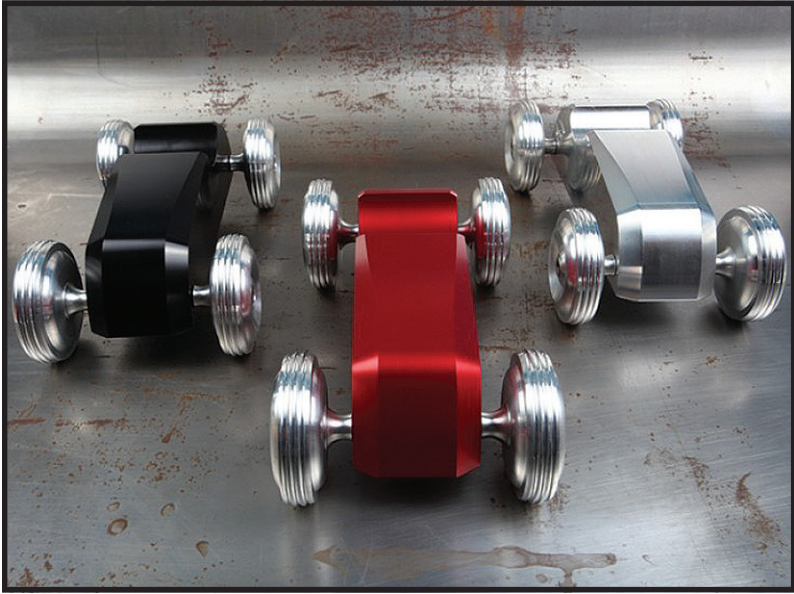
[5 marks]

(Turn over)

6 (d) Evaluate why prototyping and modelling design ideas benefit both the designer and the manufacturer when designing a child's toy.

[6 marks]

(Turn over)



6. Ferrous and non-ferrous metals

(a) The pictures opposite are of a child's toy made from machined aluminium.

(i) State the name of the component used to attach the wheels of the child's toy. [1 mark]

(ii) State the name of the machine used to create the axle holes in the wheels of the child's toy. [1 mark]

(Turn over)

6 (a) (iii)

The child's toys have different finishes applied. Explain why a finish is used. [2 marks]



6 (a) (iv)

The image opposite shows a piece of equipment used to finish some parts of the child's toy.

State the name of this piece of equipment. [1 mark]

- (v) The child's toy car wheels have been machined from an aluminium round bar. Describe, on page 72, how to manufacture the wheels of the toy. [4 marks]**

6 (a) (v)

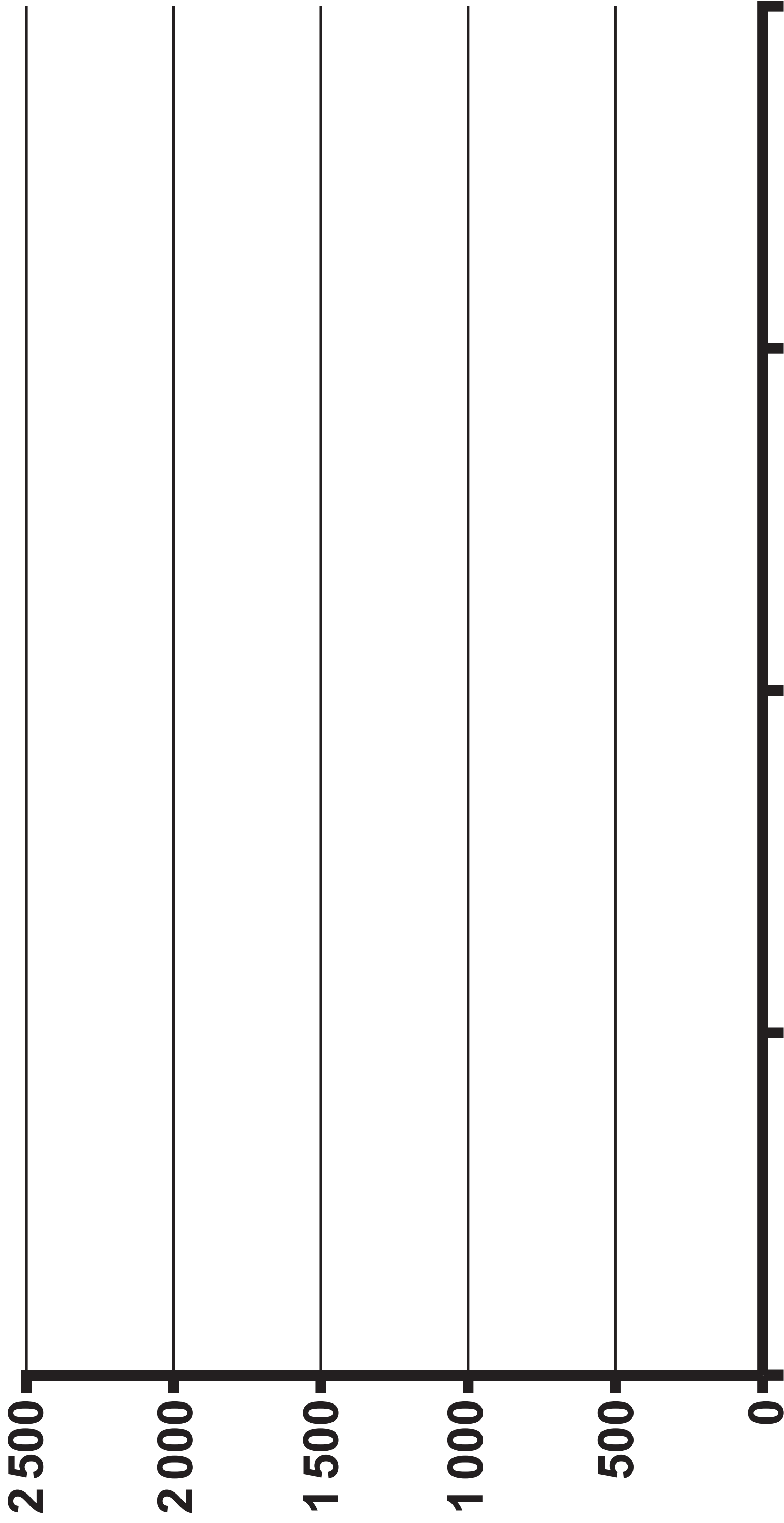


DESCRIPTION OF MANUFACTURING THE WHEELS

[illegible]

(Turn over)

BAR CHART OF SALES



- 6 (b) A retailer tracked the sales of the child's toy over a 4-month period. The table below displays the data collected.**

SALES (£)	MONTH
1 500	DECEMBER
2 500	JANUARY
750	FEBRUARY
500	MARCH

- (i) In the space opposite, draw and label a bar chart showing the sales data found in the table above.**

[3 marks]

(Turn over)

6 (b) (ii)

The retailer pays 20% Value Added Tax (VAT) on all sales. Calculate how much VAT will need to be paid for the child's toy sales over the 4-month period.

Show all workings. [2 marks]

(Turn over)

6 (c) Raw aluminium comes from mining an ore which is then processed into the material used to manufacture the child's toy.

Analyse the impact mining aluminium has on our ecological footprint. [5 marks]

6 (d) Evaluate why prototyping and modelling design ideas benefit both the designer and the manufacturer when designing the child's toy.

[6 marks]

(Turn over)



6. Thermosetting and thermoforming plastics

(a) The pictures opposite show a public bench manufactured from recycled plastic products.

(i) State the name of a fixture used to assemble the public bench.

[1 mark]

6 (a) (ii)

The public bench has been manufactured from recycled HDPE (High-density polyethylene) plastic.

State the name of a product that could have been recycled to make the public bench. [1 mark]

6 (a) (iii)

Explain why HDPE is an appropriate plastic to use in the manufacture of the public bench. [2 marks]

(Turn over)



6 (a) (iv)

The image opposite shows a machine used to create holes in the public bench.

State the name of the machine.

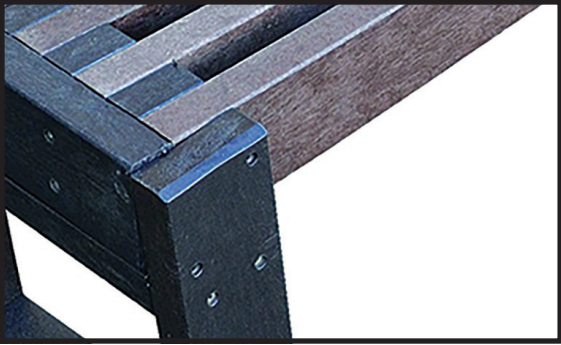
[1 mark]

(v) The picture on page 83 shows the leg of the public bench assembled. Describe the joining process.

[4 marks]

(Turn over)

6 (a) (v)

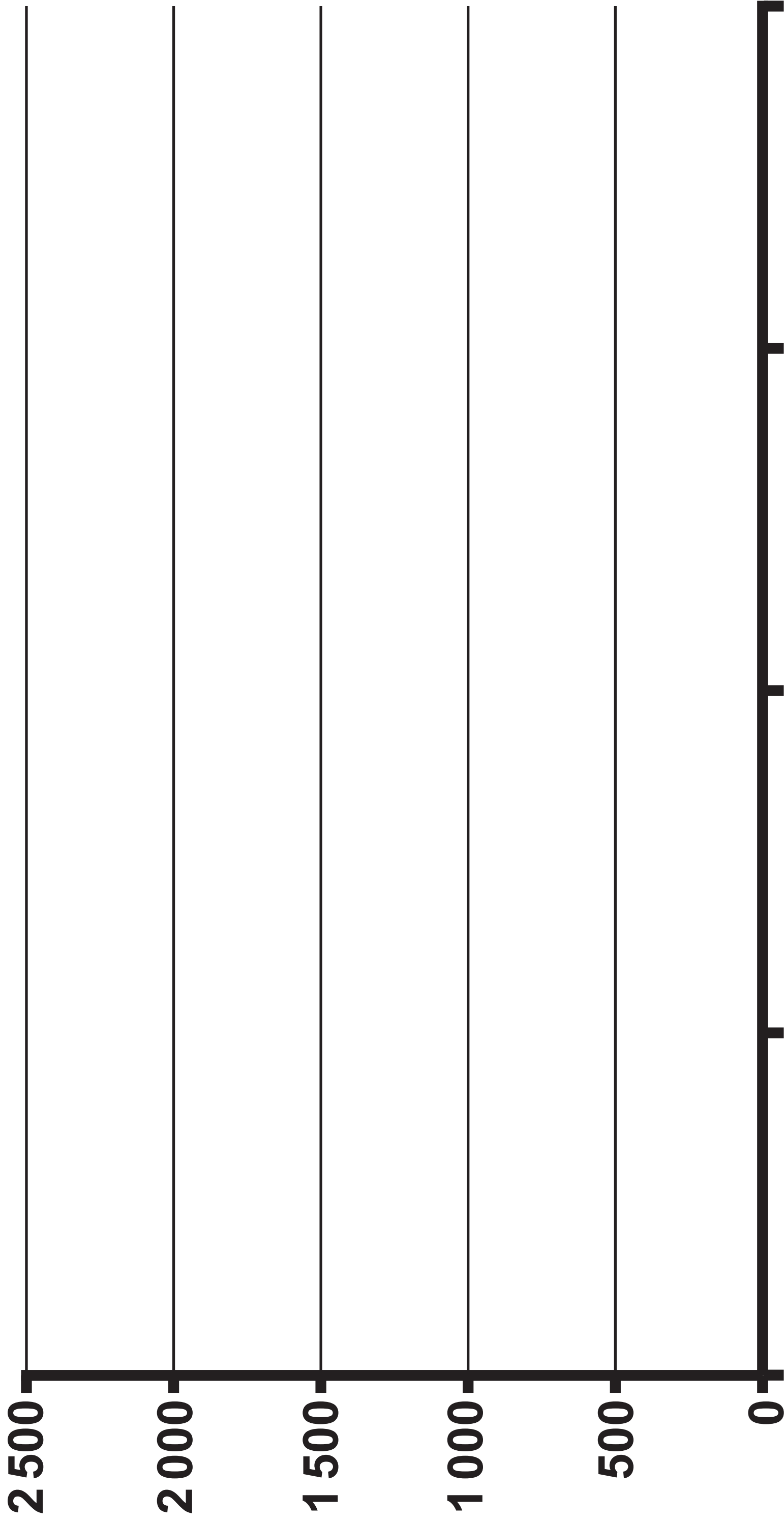


DESCRIPTION OF JOINING PROCESS

[illegible]

(Turn over)

BAR CHART OF SALES



- 6 (b) A retailer tracked the sales of the public bench over a 4-month period. The table below displays the data collected.**

SALES (£)	MONTH
1 500	DECEMBER
2 500	JANUARY
750	FEBRUARY
500	MARCH

- (i) In the space opposite, draw and label a bar chart showing the sales data found in the table above.**

[3 marks]

(Turn over)

6 (b) (ii)

**The retailer pays 20% Value Added Tax (VAT) on all sales. Calculate how much VAT will need to be paid for the public bench sales over the 4-month period. [2 marks]
Show all workings.**

(Turn over)

6 (c) The plastic used to make the public bench comes from recycled plastics. This has an impact on our environment.

Analyse the impact recycled plastics have on our ecological footprint.

[5 marks]

(Turn over)

6 (d) Evaluate why prototyping and modelling design ideas benefit both the designer and the manufacturer when designing a public bench.

[6 marks]

(Turn over)

FRONT

BACK



6. Fibres and textiles

(a) The picture opposite is of a skirt made from a blend of wool and silk.

(i) State the name of the component used to fasten the skirt. [1 mark]

(ii) The skirt is constructed using darts. State the function of a dart. [1 mark]

6 (a) (iii)

**The skirt's waistband is interfaced.
Explain why interfacing is used in
clothing construction.**

[2 marks]

(Turn over)



6 (a) (iv)

The image opposite shows a piece of equipment used to edge finish the skirt's seams.

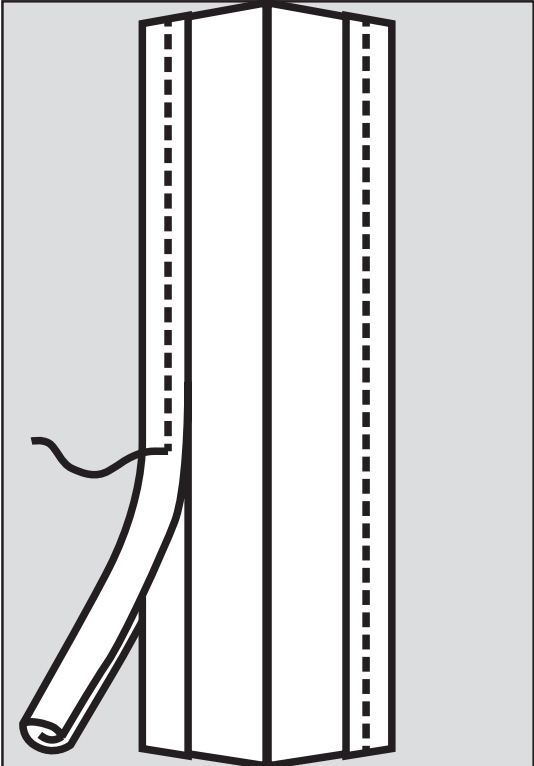
State the name of the piece of equipment. [1 mark]

(v) The picture on page 93 shows how the skirt's plain seams could be edge finished with bias binding. Describe how to manufacture the seam.

[4 marks]

(Turn over)

6 (a) (v)

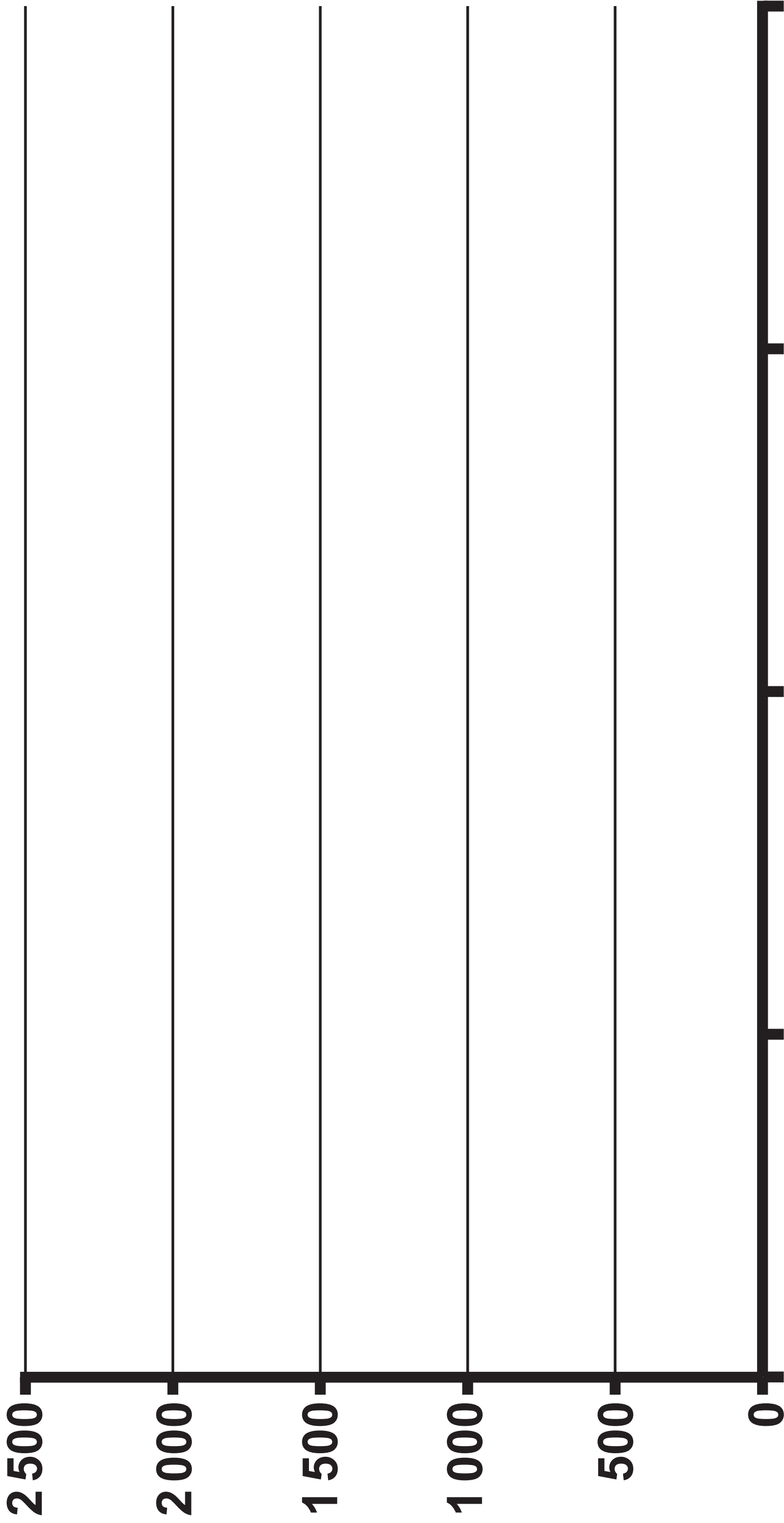


DESCRIPTION OF SEAM MANUFACTURE

[illegible]

(Turn over)

BAR CHART OF SALES



- 6 (b) A retailer tracked the sales of the skirt over a 4-month period. The table below displays the data collected.**

SALES (£)	MONTH
1 500	DECEMBER
2 500	JANUARY
750	FEBRUARY
500	MARCH

- (i) In the space opposite, draw and label a bar chart showing the sales data found in the table above.**

[3 marks]

(Turn over)

6 (b) (ii)

The retailer pays 20% Value Added Tax (VAT) on all sales. Calculate how much VAT will need to be paid for the skirt sales over the 4-month period. Show all workings. [2 marks]

(Turn over)

6 (c) Wool and silk are natural protein fibres and were used for the fabric of the skirt.

Analyse the impact farming these fibres has on our ecological footprint. [5 marks]

6 (d) Evaluate why prototyping and modelling design ideas benefit both the designer and the manufacturer when designing a skirt. [6 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(Turn over)

END OF PAPER

[illegible]

(Turn over)

