



**SECTION A – CORE**


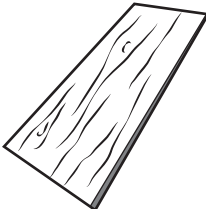
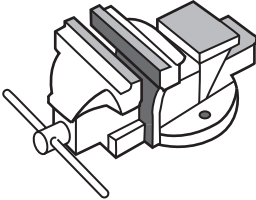

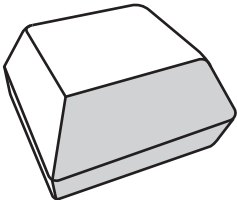
**Answer ALL questions. Write your answers in the spaces provided.**

- 1 (a) The materials that products are made from are chosen because of their properties.

Figure 1 shows a table of products.

For each of the products shown, give a property of the material it is made from that makes the material suitable for the product.

The first one has been done for you.

Product	Product material	Property
	Biodegradable plastic shopping bag	Will degrade in soil
	Cedar roof tile	(1) (i) .....
	Cast iron workshop vice	(1) (ii) .....
	Polyester raincoat	(1) (iii) .....
	Solid white board burger package	(1) (iv) .....

**Figure 1**

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(b) Figure 2 shows a table with the number of plastic bags given away in England.

Year	Number of bags given away (billions)
2014	7.6
2015	5.4

**Figure 2**

Calculate the percentage reduction in the number of plastic bags given away between 2014 and 2015.

Give your answer to the nearest whole number.

(2)

Percentage reduction .....

(c) In 2015 charging for carrier bags was introduced resulting in a reduction in the number of bags being manufactured.

Explain **one** negative effect of this reduction for the manufacturer.

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**(Total for Question 1 = 8 marks)**



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- 2 Figure 3 shows a drawing of a fabric play cube for young children.  
The fabric play cube has a side length of 60 mm.

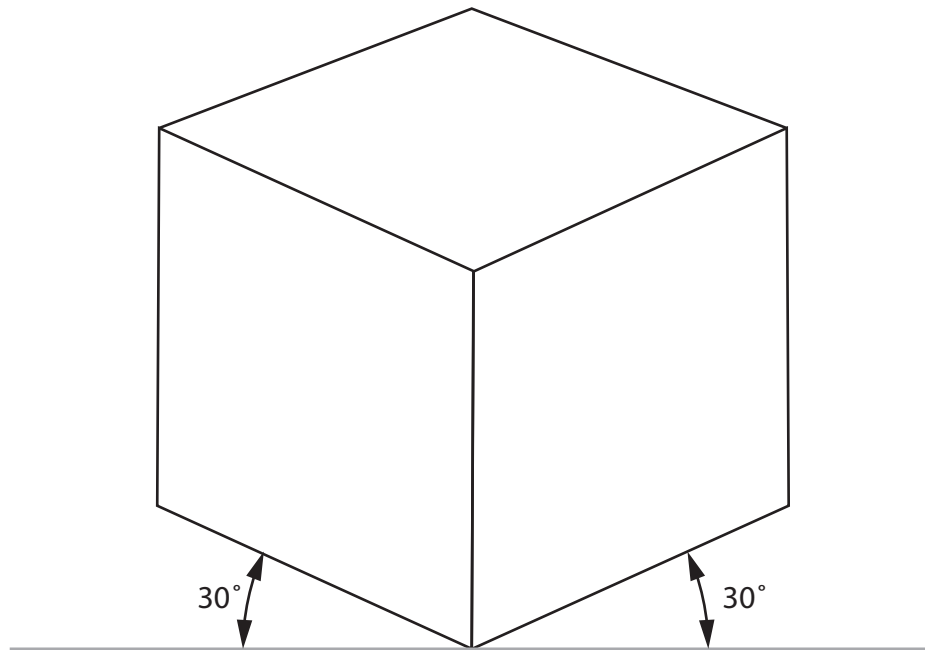


Figure 3

- (a) Name the communication technique that has been used to produce the drawing shown in Figure 3.

(1)

- (b) A prototype play cube was made from calico.

Explain **one** reason for using calico for the prototype play cube.

(2)

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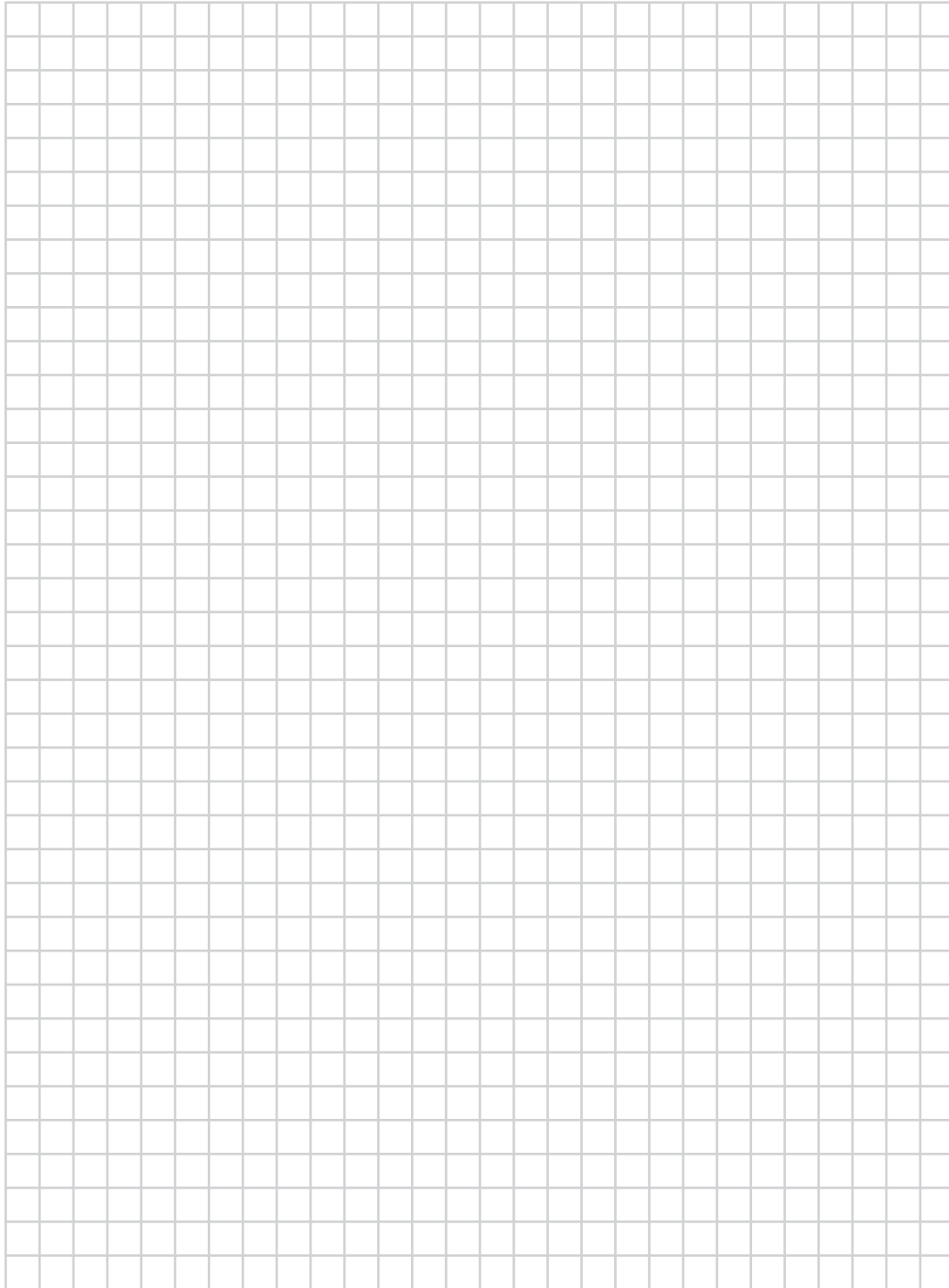
(c) The pattern for the prototype play cube was made from a single net.

Draw a net for the play cube on the grid provided below.

Do not include any seam allowance.

Use a dashed line — — — — to show where the net would be folded.

(4)



Each square represents 10 mm



(d) Tracing paper was used to design the prototype play cube.

Explain **one** reason why designers use tracing paper.

(2)

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**(Total for Question 2 = 9 marks)**

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3 Figure 4 shows part of a solar powered garden light.

The outer case is made from acrylic.

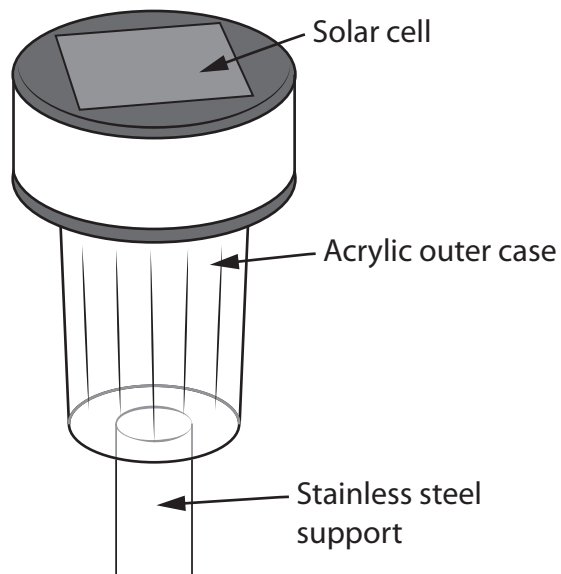


Figure 4

(a) Give **one** property of acrylic that makes it an appropriate material from which to make the outer case.

(1)

(b) The solar powered garden light is held off the ground by a stainless steel support. Explain **one** reason for using stainless steel for the support.

(2)

(c) The manufacturer of the solar powered garden light wants to reduce its carbon footprint.

Explain **one** way new and emerging technologies could be used to reduce the manufacturer's carbon footprint.

(2)



(d) The solar cell used in the solar powered garden light costs 1/12th of the total cost of the product.

Calculate the cost of the solar cell if each light costs £4.97 to make.

Give your answer to two significant figures.

(2)

£ .....

(e) The manufacturer of the solar powered garden light employs different groups of people including apprentices.

Explain **two** ways that the use of new and emerging technologies could affect the apprentices.

(4)

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**(Total for Question 3 = 11 marks)**

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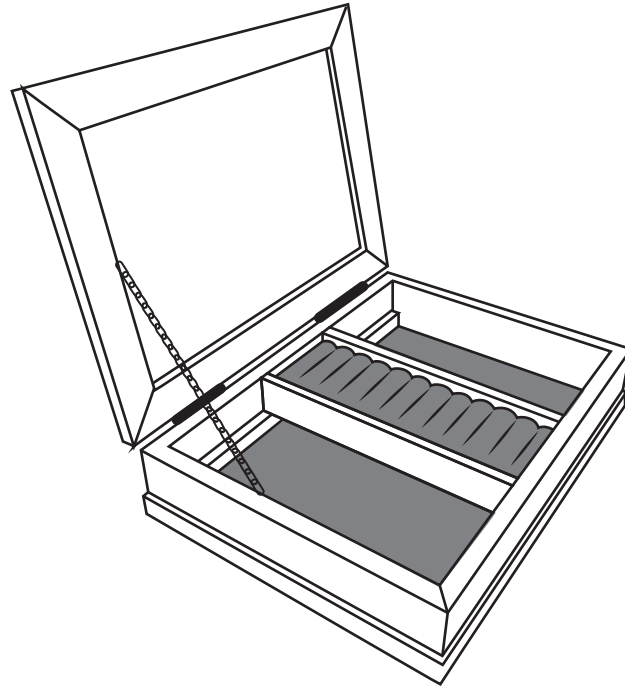
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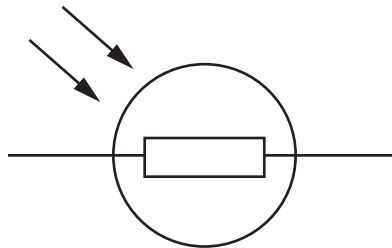


4 Figure 5 shows a drawing of a jewellery box made from mahogany.



**Figure 5**

The electronic component shown in Figure 6 is used in the jewellery box.



**Figure 6**

(a) (i) Name the electronic component shown in Figure 6.

(1)



- (ii) The jewellery box uses a programmable component to turn on a musical tune when the lid is opened, that stays on until the lid is closed.

Figure 7 shows a partly completed flowchart for the programmable component.

Correctly label the **decision outputs** and add the remaining **lines** and **arrows** on the flowchart to show how the programmable component:

- turns on the musical tune when the lid is opened
- turns off the musical tune when the lid is closed.

(3)

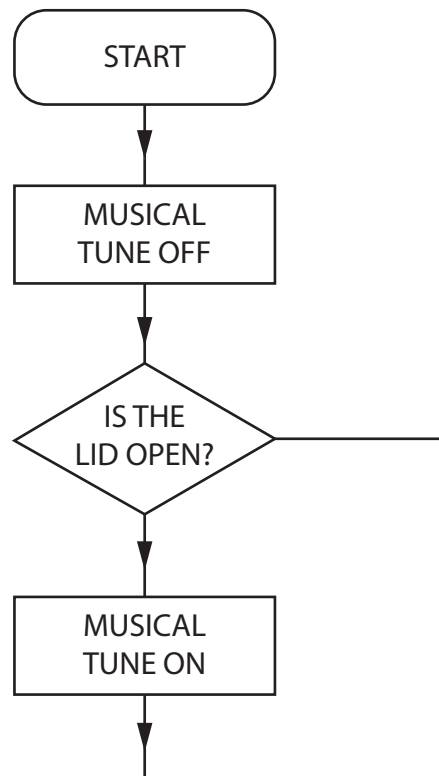


Figure 7



(b) Analyse the information in Figure 8 about the sources of mahogany.

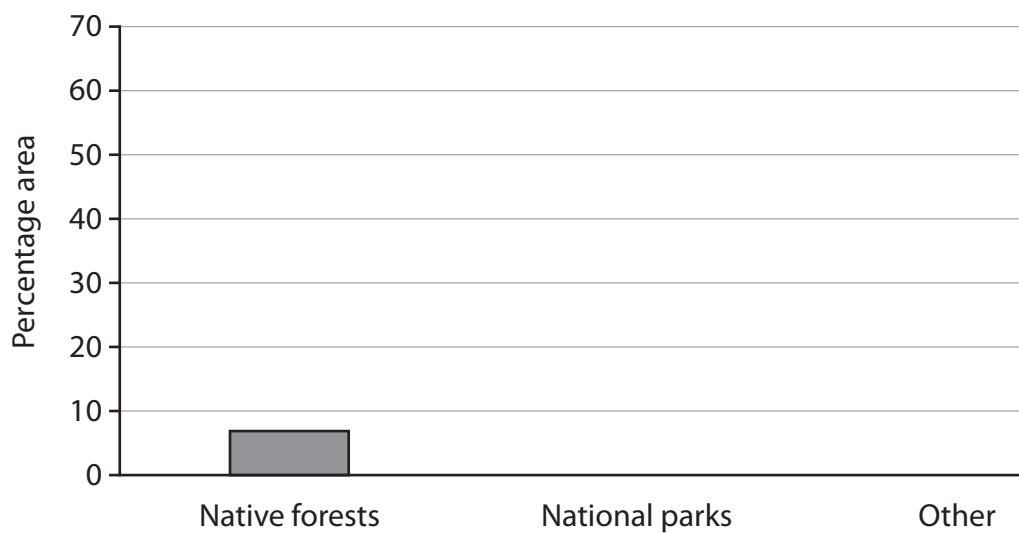
Sources of mahogany	Percentage grown in each area (%)
Native forests	7
National parks	30
Other	63

Figure 8

Complete the bar chart below to show the percentage grown in each area.

The first one has been done for you.

(2)



(c) A film company is considering launching a range of musical jewellery boxes based on its animated characters.

Discuss the different design strategies the company could use to generate initial ideas and to avoid design fixation.

(6)

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**(Total for Question 4 = 12 marks)**

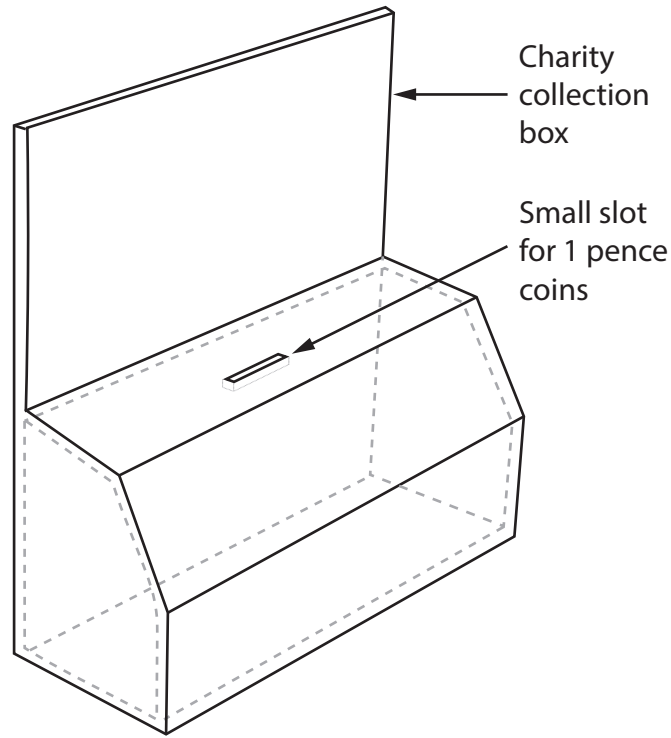
**TOTAL FOR SECTION A = 40 MARKS**



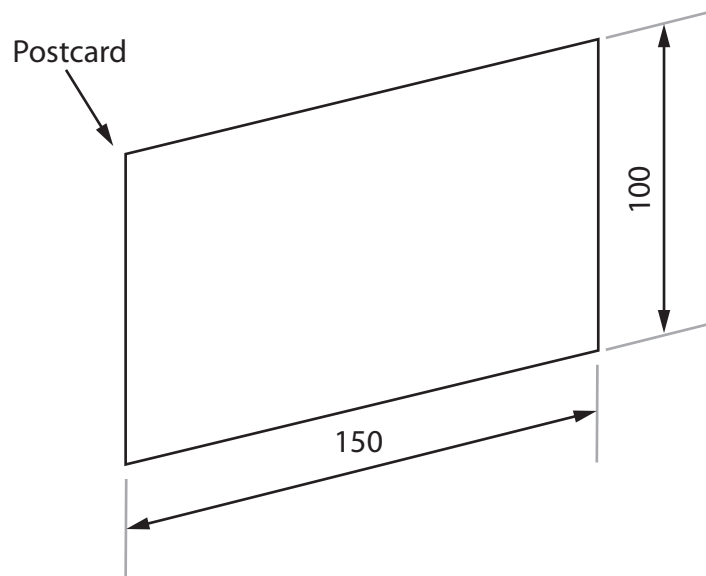
**SECTION B – POLYMERS**

**Answer ALL questions. Write your answers in the spaces provided.**

- 5 Figure 9 shows a design solution for a charity collection box together with some additional information.



Additional information



All dimensions in mm

**Figure 9**

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- (a) The charity collection box needs to be improved to include the following specification points.

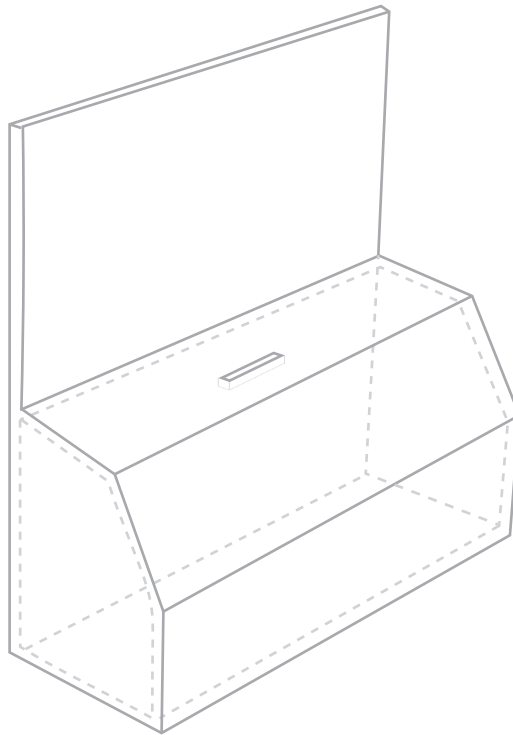
The charity collection box must:

- allow different charity postcards to be displayed and changed
- provide a method to allow bigger coins to be put in and kept inside without someone being able to shake them out
- provide a secure method that allows the coins inside the box to be removed without causing any damage to the box.

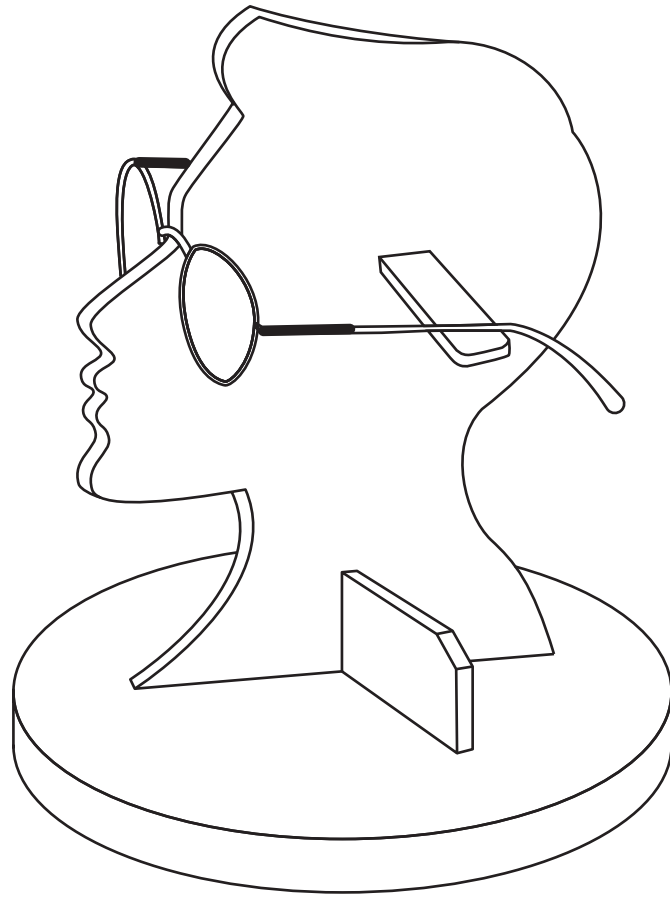
Use notes and sketches, on the outline below, to show how the charity collection box could be modified to include these specification points.

You will be marked on how you apply your understanding of design and technology, not your graphical skills.

(6)



(b) Figure 10 shows an expanded polystyrene retail display unit for a pair of glasses.



**Figure 10**

Explain **two** ways that the retail display unit meets, or fails to meet, the criteria of providing a secure way to display the glasses.

(4)

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**(Total for Question 5 = 10 marks)**





6 Figure 11 shows some kitchen knives. The handles are made from a sustainable polymer.

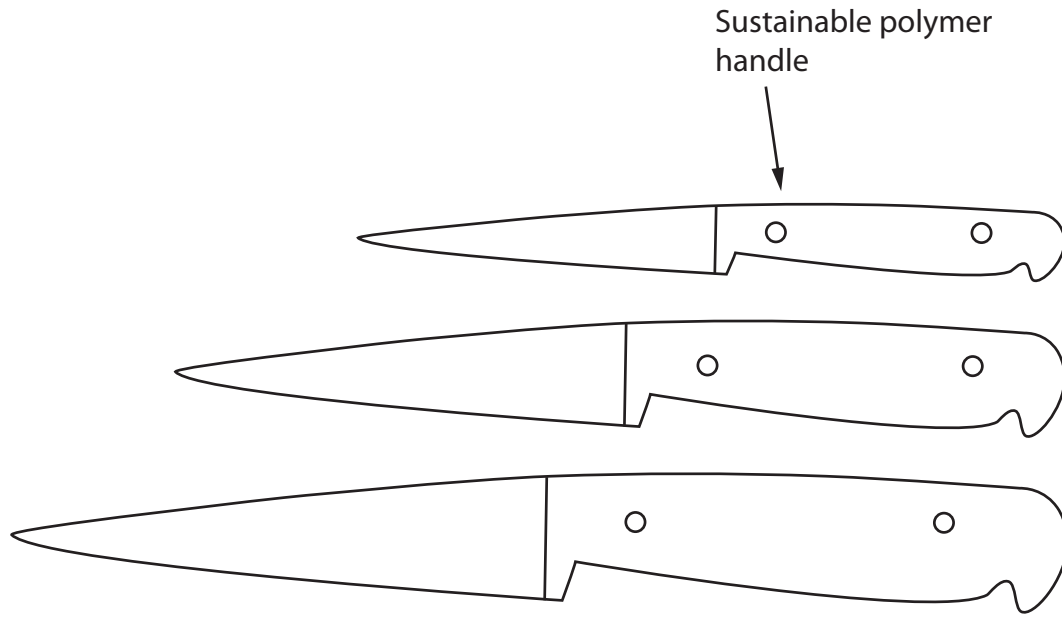


Figure 11

(a) Explain **two** advantages of manufacturing the kitchen knife handles from a sustainable polymer.

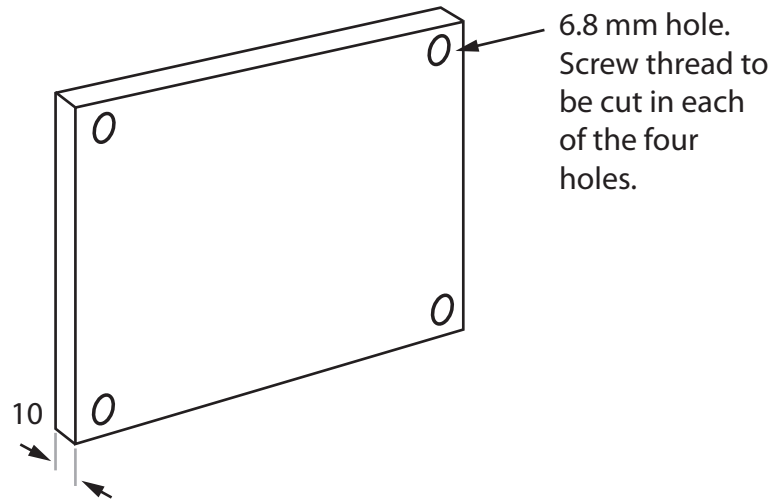
(4)

1 .....

2 .....



(b) Figure 12 shows part of a kitchen knife storage holder that will be joined to other parts using bolts.



All dimensions in mm

**Figure 12**

Use notes and sketches, in the space below, to show how to cut a screw thread through one of the holes in the 10 mm acrylic.

You will be marked on how you apply your understanding of design and technology, not your graphical skills.

(4)

Blank space for student response.

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(c) Explain **one** reason for using coloured polymers for the knife handles.

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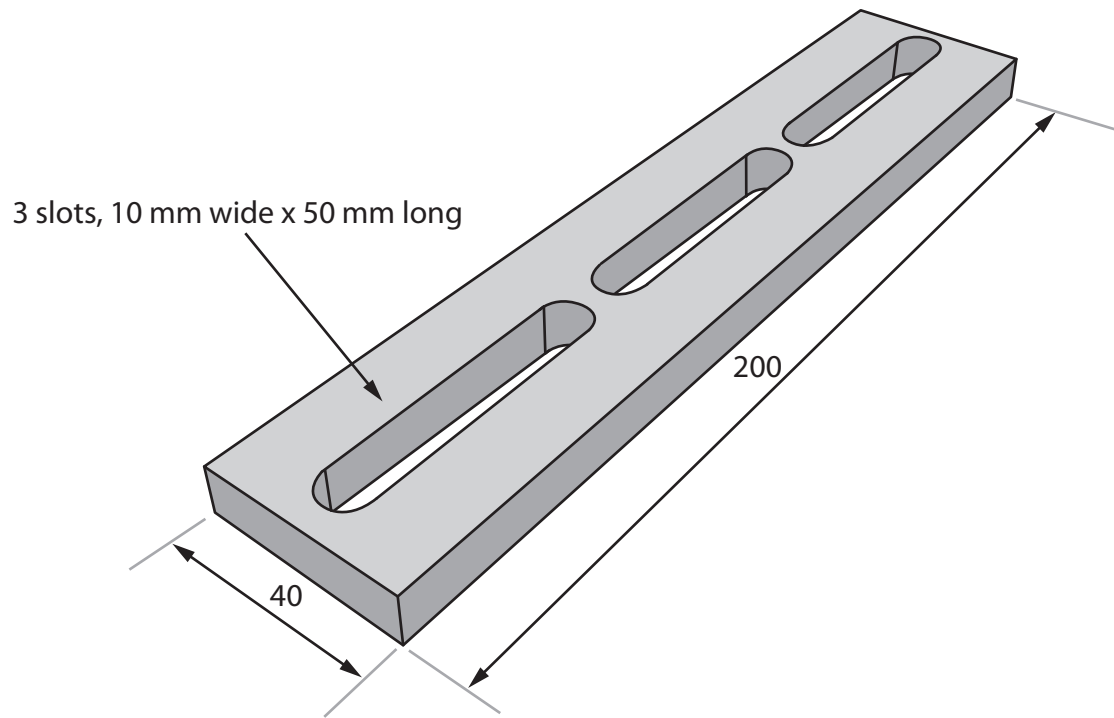
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(d) Figure 13 shows the top part of the kitchen knife storage holder.

The top part is to be manufactured from 6 mm thick acrylic in a batch of 1000.



All dimensions in mm

**Figure 13**

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Name **two** different techniques that could be used to batch produce the top part of the kitchen knife storage holder.

Explain **one** advantage of using each technique.

(6)

Technique 1

Explanation

Technique 2

Explanation

(Total for Question 6 = 16 marks)



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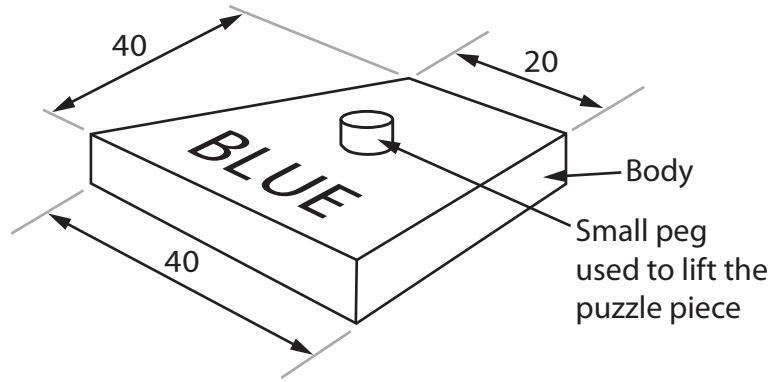
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7 Figure 14 shows a piece from a child's puzzle made from high impact polystyrene (HIPS).



All dimensions in mm

Figure 14

(a) Name **one** surface finish or surface treatment that could be used to create the word 'BLUE' on the puzzle piece.

(1)

(b) The peg has been cut from a 600 mm length of stock material.

The stock material is 6 mm diameter rod.

Explain **two** reasons for using a stock-sized rod.

(4)

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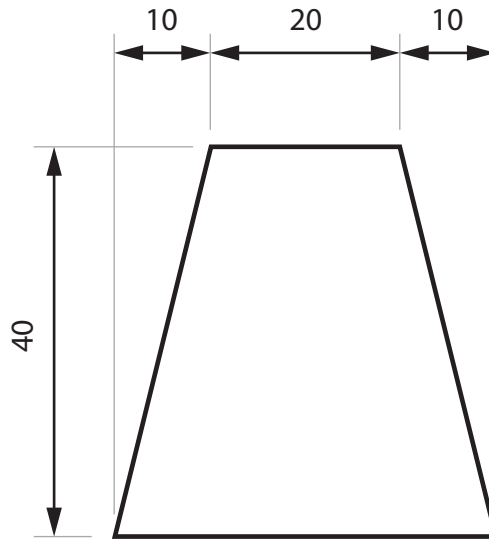
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(c) Figure 15 shows the dimensions for the body of the puzzle piece.



All dimensions in mm  
Diagram not to scale

**Figure 15**



Calculate the maximum number of whole puzzle piece bodies that can be cut from a length of polymer measuring 181 cm long by 4 cm wide.

Ignore the width of any cuts.

(5)

Answer ..... whole bodies

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(d) Explain **two** working properties of HIPS that make it an appropriate choice of material for the body of the puzzle piece.

(6)

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**(Total for Question 7 = 16 marks)**

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8 Figure 16 shows a window frame manufactured from polyvinyl chloride (PVC).

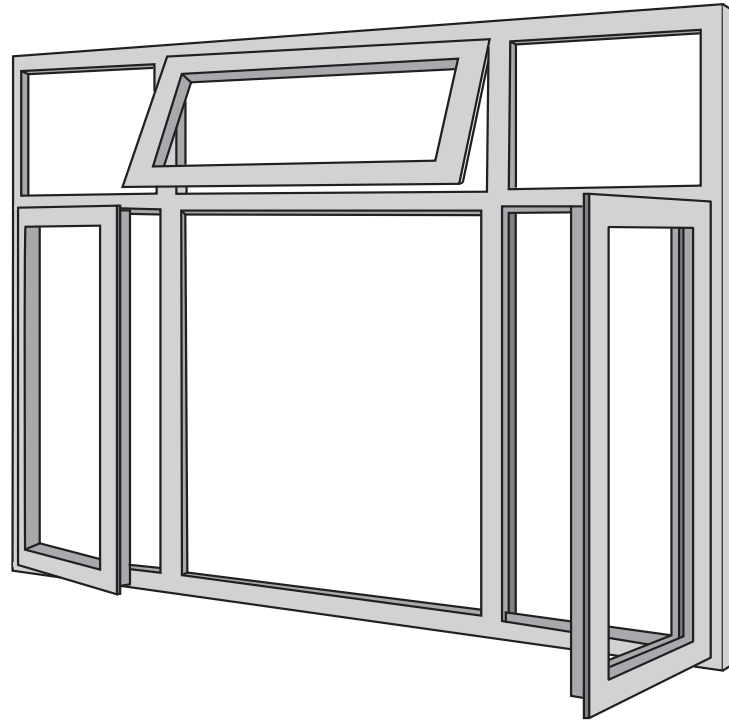


Figure 16

(a) (i) Explain **one** reason for introducing additives into the PVC.

(2)

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(ii) Explain **one** working property of PVC that makes it suitable for the window frame.

(3)

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(b) Explain **two** negative effects on the global environment of using PVC for the window frame.

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**(Total for Question 8 = 18 marks)**

**TOTAL FOR SECTION B = 60 MARKS**

**TOTAL FOR PAPER = 100 MARKS**



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