

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				
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Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Time 1 hour 45 minutes **Paper reference** **1DT0/1D**

Design and Technology
COMPONENT 1: Systems

You must have:
 Calculator, ruler, HB pencil, protractor, compass

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
 – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
 – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Q:1/1/1

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.

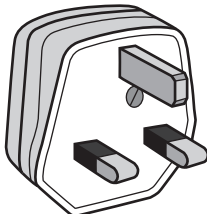
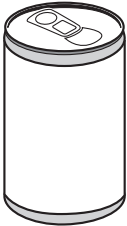
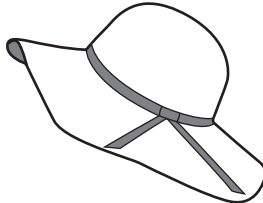

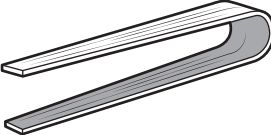
Picture of product	Material and product	Property
	Urea formaldehyde 3-pin plug	Insulator of electricity
	Aluminium drinks can	(1) (i)
	Felted wool fabric hat	(1) (ii)
	Tracing paper	(1) (iii)
	Laminated plywood salad servers	(1) (iv)

Figure 1

(b) Explain **one** disadvantage of using urea formaldehyde for the 3-pin plug.

(2)

The pins of the 3-pin plug are made from brass.

Brass is an alloy of copper and zinc in the ratio of 13:7
(13 parts copper to 7 parts zinc).

(c) Calculate how much copper is required to make 50 kg of brass.

(2)

Answer

kg

(Total for Question 1 = 8 marks)

- 2 Figure 2 shows a wall mounted book holder manufactured from mahogany.

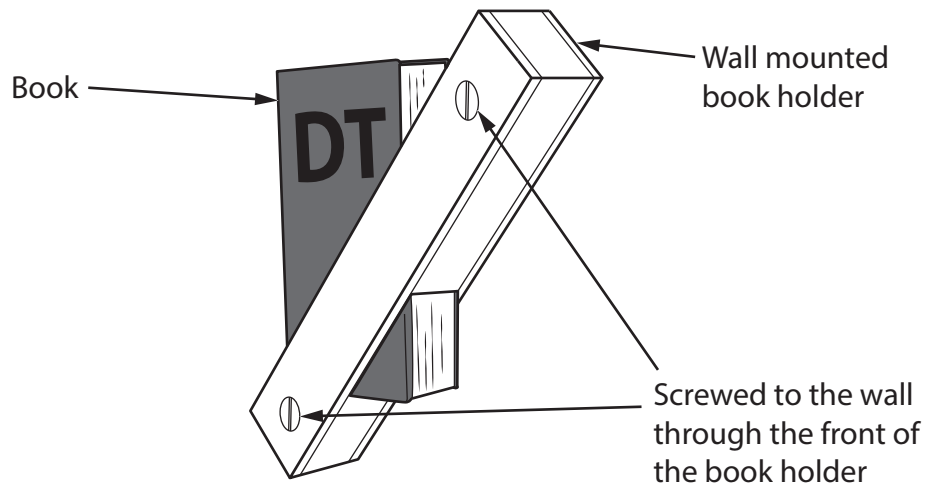


Figure 2

- (a) Name **one** other appropriate hardwood that could be used to make the wall mounted book holder. (1)

- (b) Explain **one** working property of mahogany that makes it an appropriate choice of material for the wall mounted book holder. (2)

Each wall mounted book holder is made as a one-off.

- (c) Explain **one** advantage for the manufacturer of making each wall mounted book holder as a one-off. (2)

Figure 3 shows the sizes of two pieces of mahogany used to make the wall mounted book holder.

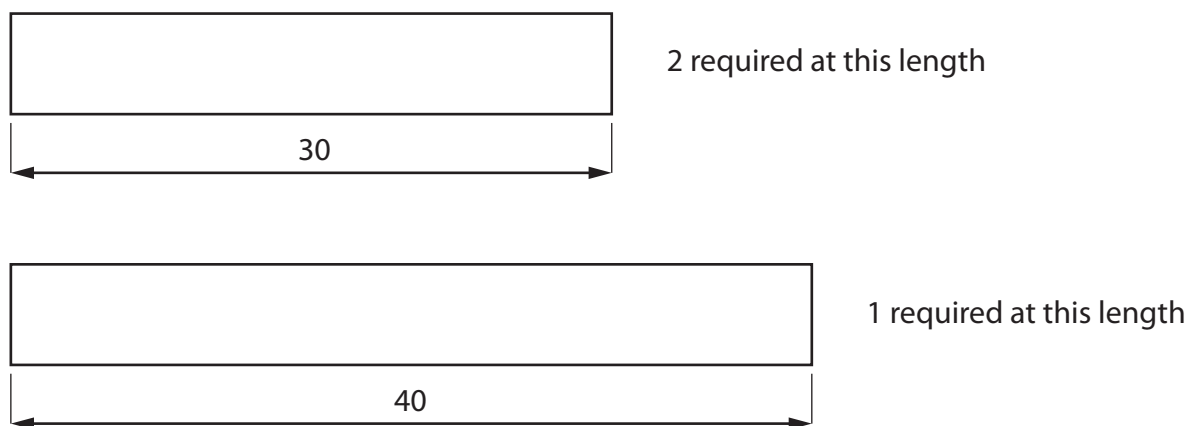


Figure 3

The mahogany has a cross sectional area of 5 cm^2

All dimensions in cm

Diagram not to scale

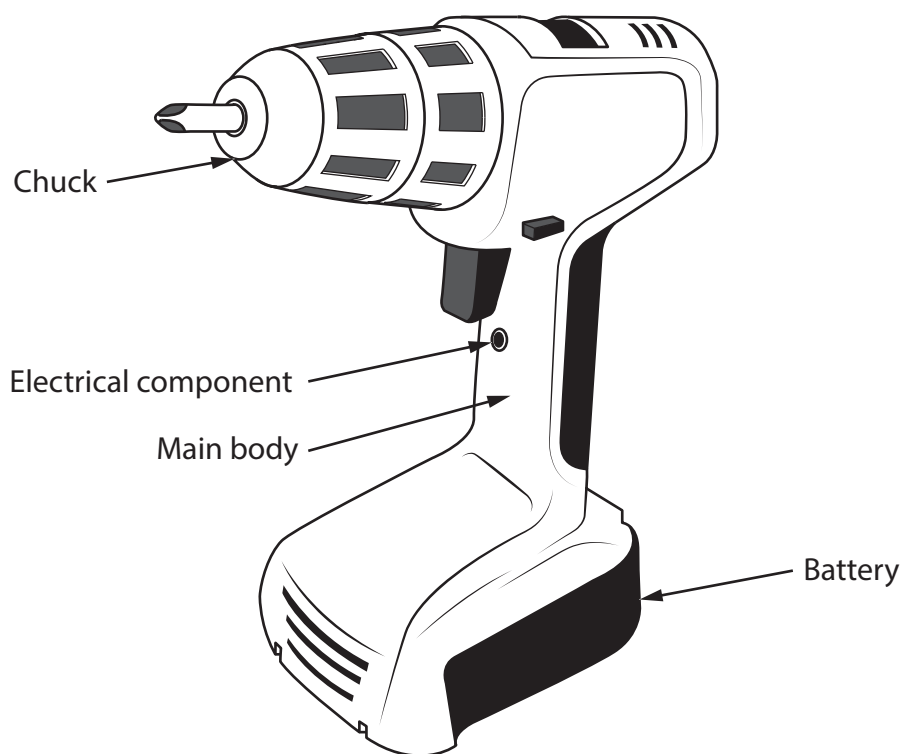
- (d) Calculate the cost of the mahogany required to make one wall mounted book holder if the mahogany costs $\text{£}1,200 \text{ m}^3$.

(4)

Cost £

(Total for Question 2 = 9 marks)

- 3 Figure 4 shows an electrically powered hand drill and the circuit symbol for an electrical component.



Circuit symbol for the electrical component

Figure 4

- (a) Name the type of electrical component from the circuit symbol shown in Figure 4.

(1)

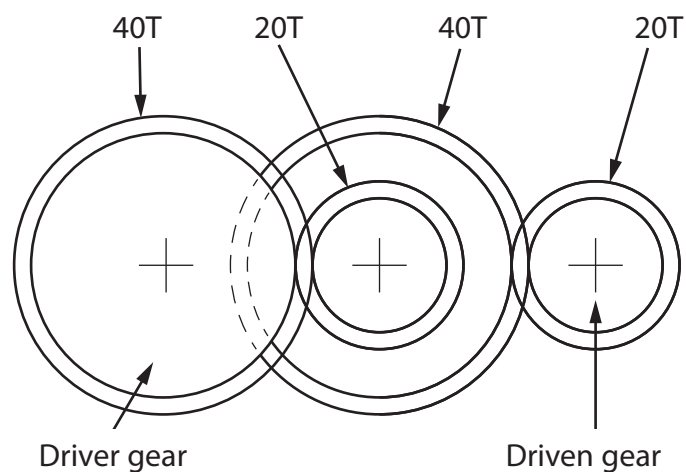
The electrically powered hand drill is being redesigned. The manufacturer is considering using a bevel gear inside.

- (b) Explain **one** reason for using a bevel gear inside the electrically powered hand drill.

(2)

- (c) The electrically powered hand drill also has a compound gear train inside.

Figure 5 shows a schematic diagram of the compound gear train.



T = Teeth

Figure 5

Calculate the revolutions per minute (RPM) of the driven gear if the driver gear rotates at 400 RPM.

(2)

Driven gear

RPM

(d) Explain **one** benefit of using a battery for the electrically powered hand drill.

(2)

The manufacturer of the electrically powered hand drill is considering using carbon fibre for the main body.

(e) Explain **two** benefits of using carbon fibre for the main body of the electrically powered hand drill.

(4)

1

2

(Total for Question 3 = 11 marks)

- 4 A not-for-profit organisation has developed some agro-textiles that can be used by farmers.

(a) Explain **two** ways that agro-textiles can be used by farmers.

(4)

1

2

(b) A farmer requires 420 m^2 of agro-textile to cover their field.

The agro-textile is available in rolls 50 m long measuring 1.2 m wide.

Calculate the number of rolls of agro-textile the farmer needs to cover their field.

(2)

Number of rolls

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(c) Discuss how fair trade products have been used to support farmers and societies in developing countries.

(6)



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(Total for Question 4 = 12 marks)

TOTAL FOR SECTION A = 40 MARKS

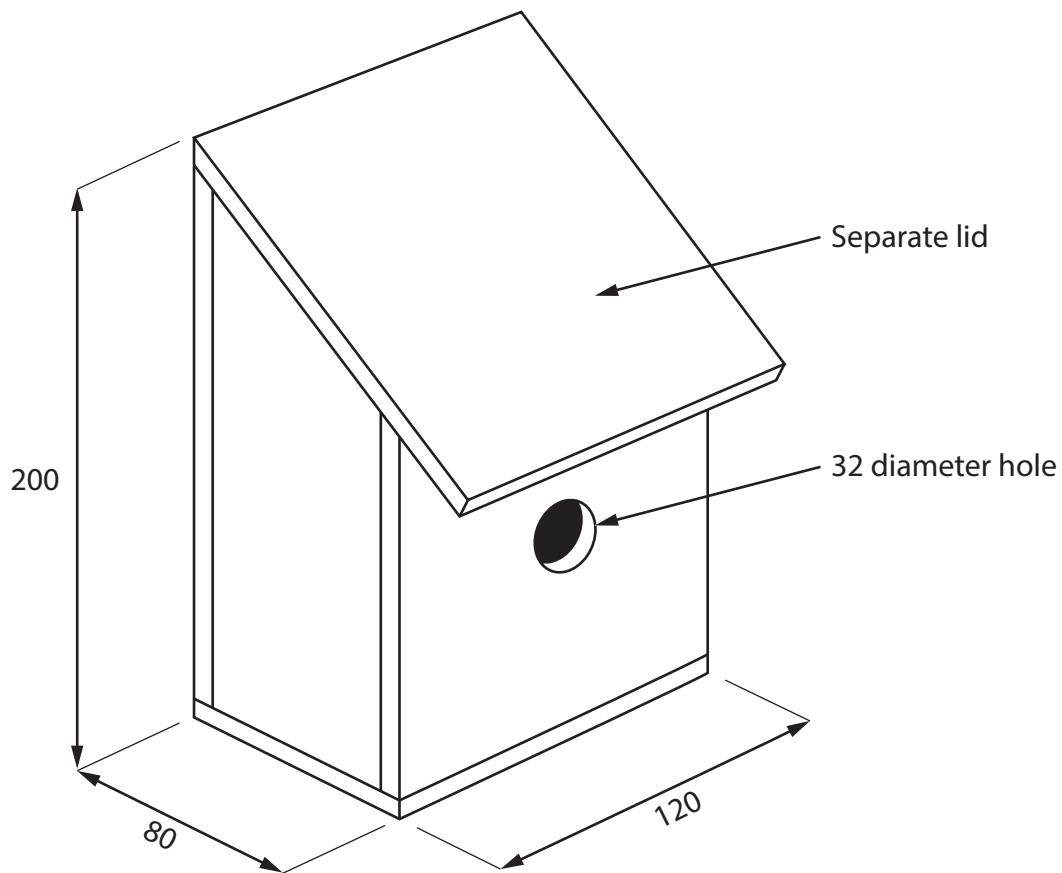


SECTION B

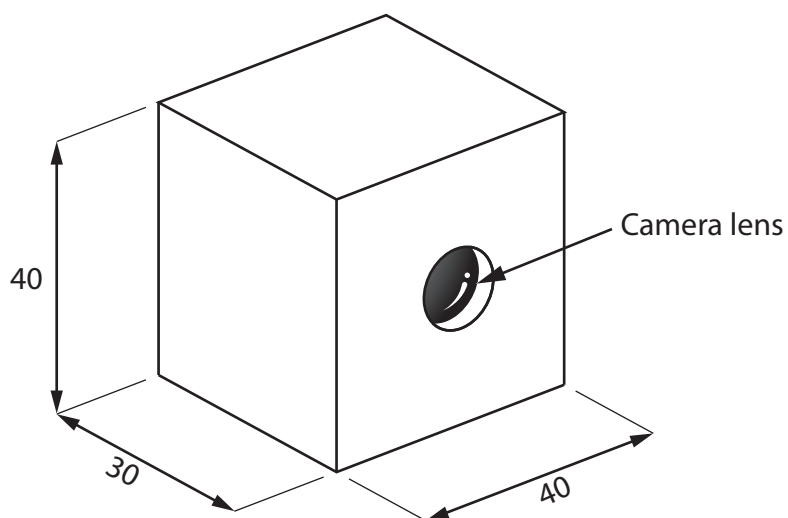
Systems

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

- 5 Figure 6 shows a design solution for a bird box together with some additional information.



Additional information – camera with batteries inside



All dimensions in mm

Diagram not to scale

Figure 6

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- (a) The bird box provides a nesting place for birds and needs to be improved to include the following specification points.

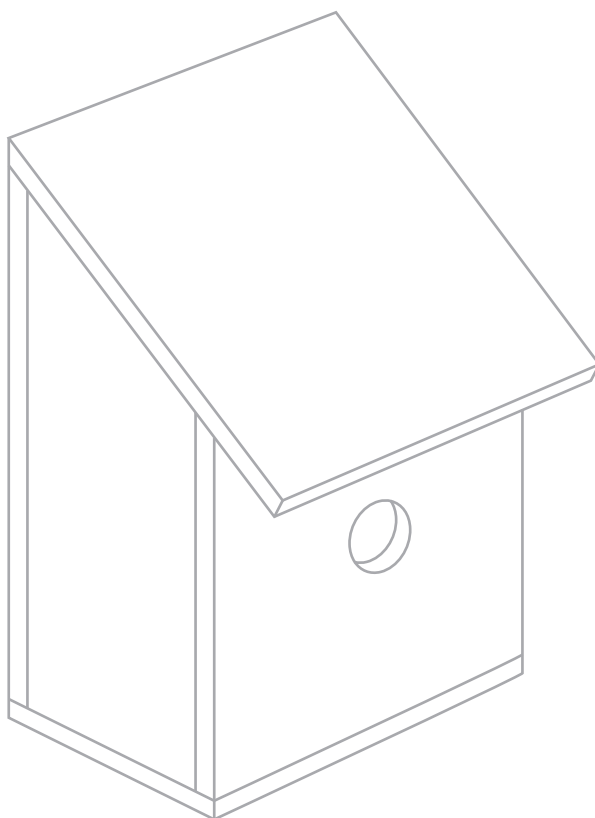
The bird box must:

- hold the camera inside so it can be easily removed to replace the batteries and allows access to a digital photographic storage system
- take a photograph of the bird with the camera when entry is detected through the hole
- be able to be hung up in a tree and easily moved to another tree.

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

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

(6)



- (b) Figure 7 shows a money box in the shape of a tea cup that plays a tune every time a coin is dropped in the slot.

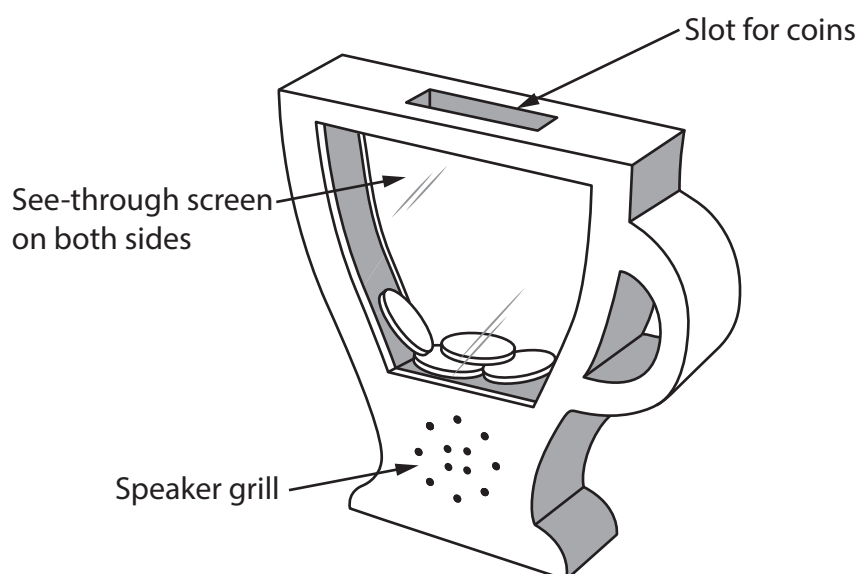


Figure 7

Explain **two** ways that the money box meets, or fails to meet, the criteria of providing a method to encourage young children to save money.

(4)

1

2

(Total for Question 5 = 10 marks)

6 Figure 8 shows an exploded view of an alarm system for a building.

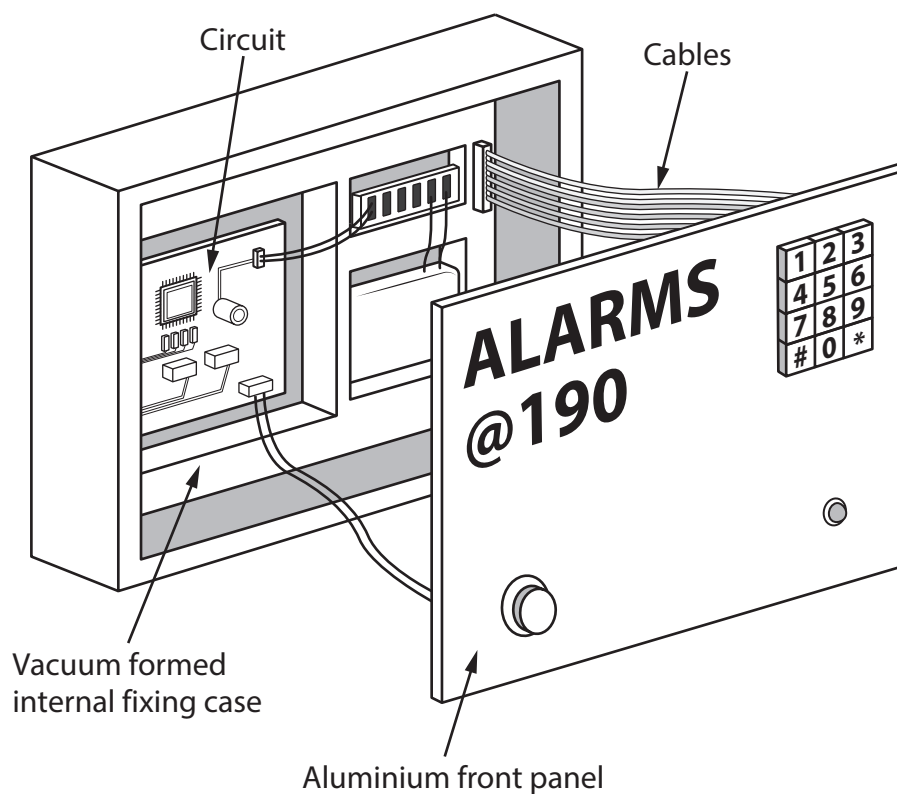


Figure 8

The circuit for the alarm system contains some standard components, including resistors and a light-emitting diode (LED).

- (a) Explain **two** reasons why the manufacturer would use Ohm's law when designing the circuit for the alarm system.

(4)

1

2

- (b) Figure 9 shows the internal fixing case for the alarm system that has been vacuum formed from high impact polystyrene (HIPS).

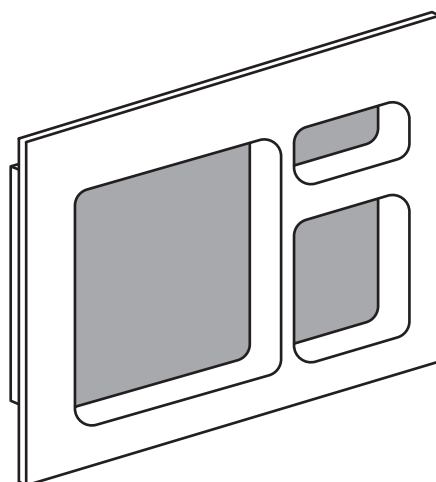


Figure 9

Use notes and sketches, in the space below, to show how the internal fixing case would be manufactured using the vacuum forming process.

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

(4)

- (c) The front panel of the alarm system has been anodised.

Explain **one** reason why an anodised finish has been applied to the front panel.

(2)

- (d) Give **two** different methods of cable management that can be used inside the alarm system.

For each method, explain **one** advantage of using the method of cable management inside the alarm system.

(6)

Method 1

Explanation

Method 2

Explanation

(Total for Question 6 = 16 marks)

7 Figure 10 shows a desk lamp powered by a USB lead connected to a laptop.

The USB lead has copper wires inside.

The main body is cut out from a single piece of white acrylic and the two side pieces are bent outwards by placing in the top part to form the curves.

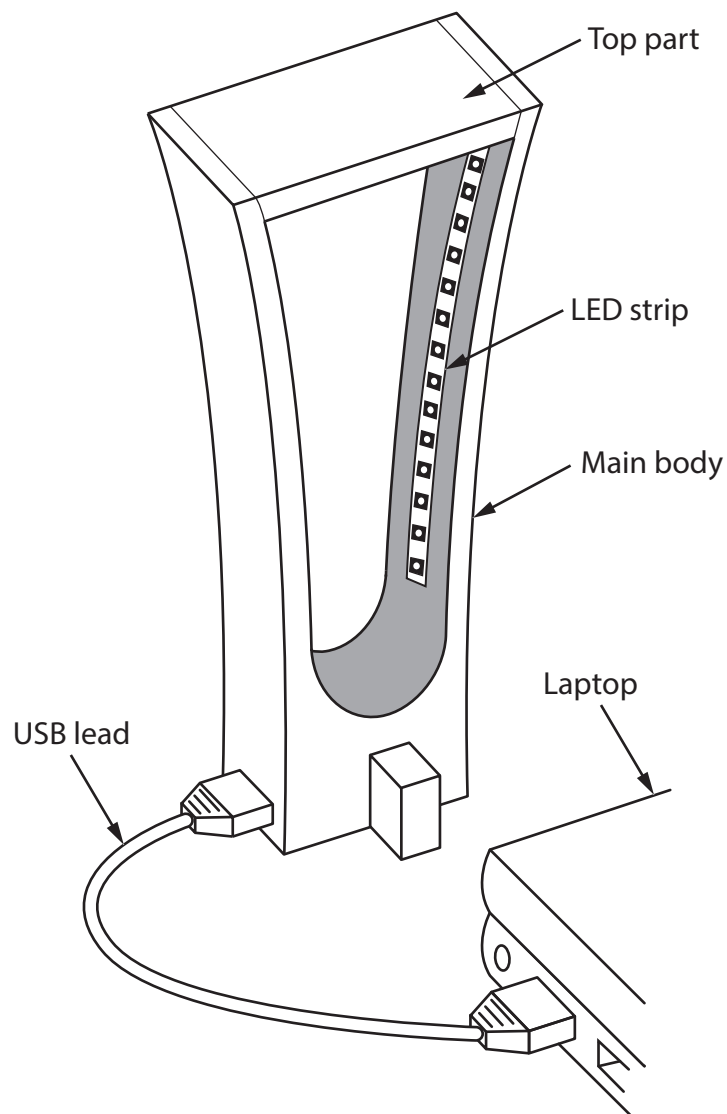


Figure 10

- (a) State the type of force the top part is subjected to from the two side pieces of the main body.

(1)

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(b) Explain **two** working properties of copper that make it an ideal material for the wires inside the USB lead.

(4)

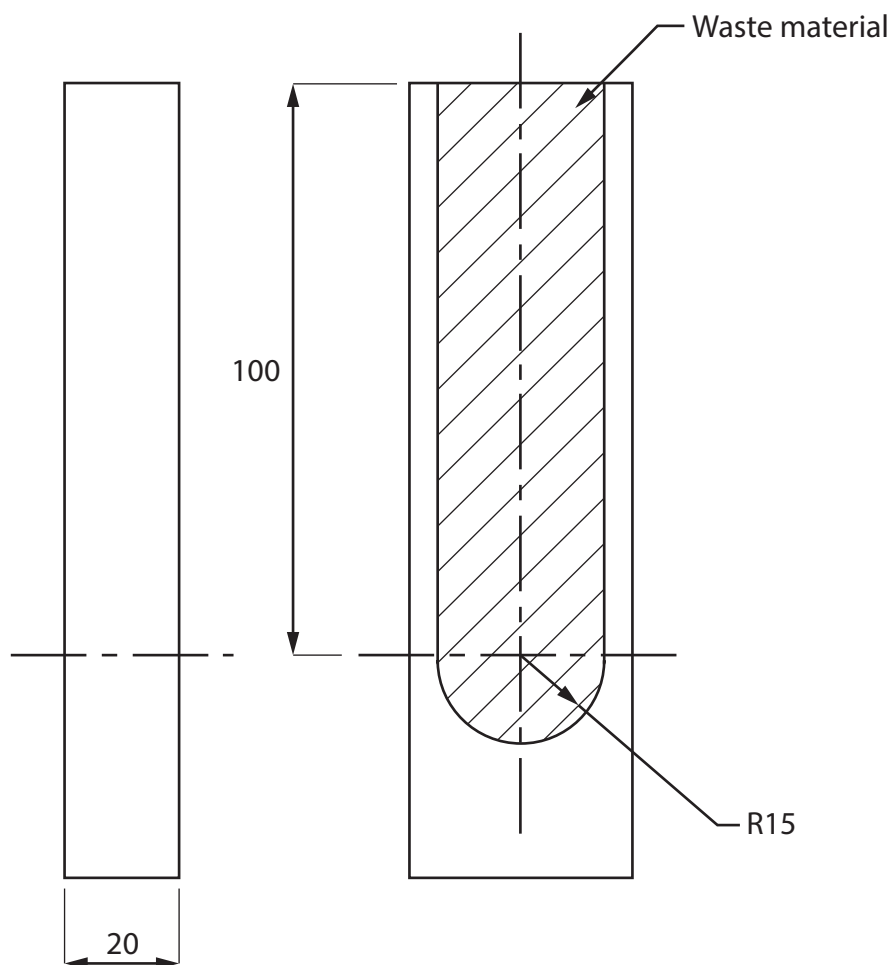
1

2



Figure 11 shows a dimensioned drawing of the main body of the desk lamp before the sides are bent.

The main body is manufactured from a single piece of white acrylic.



All dimensions are in mm

Diagram not to scale

Figure 11

(c) Calculate the volume of waste material produced when making the main body.

Give your answer to the nearest whole cm^3 .

Use $\pi = 3.142$

(5)

Answer

cm^3

The main body of the desk lamp could be fabricated from separate pieces of white acrylic rather than from a single piece.

- (d) Explain **two** reasons for fabricating the main body of the desk lamp from separate pieces of white acrylic rather than manufacturing it from a single piece.

(6)

1

2

(Total for Question 7 = 16 marks)

8 Figure 12 shows a speed sensing road sign manufactured from aluminium.

The sign displays the speed limit for the area and the speed of a car as it approaches the sign.

The speed of a vehicle is displayed on the road sign using light-emitting diodes (LEDs).

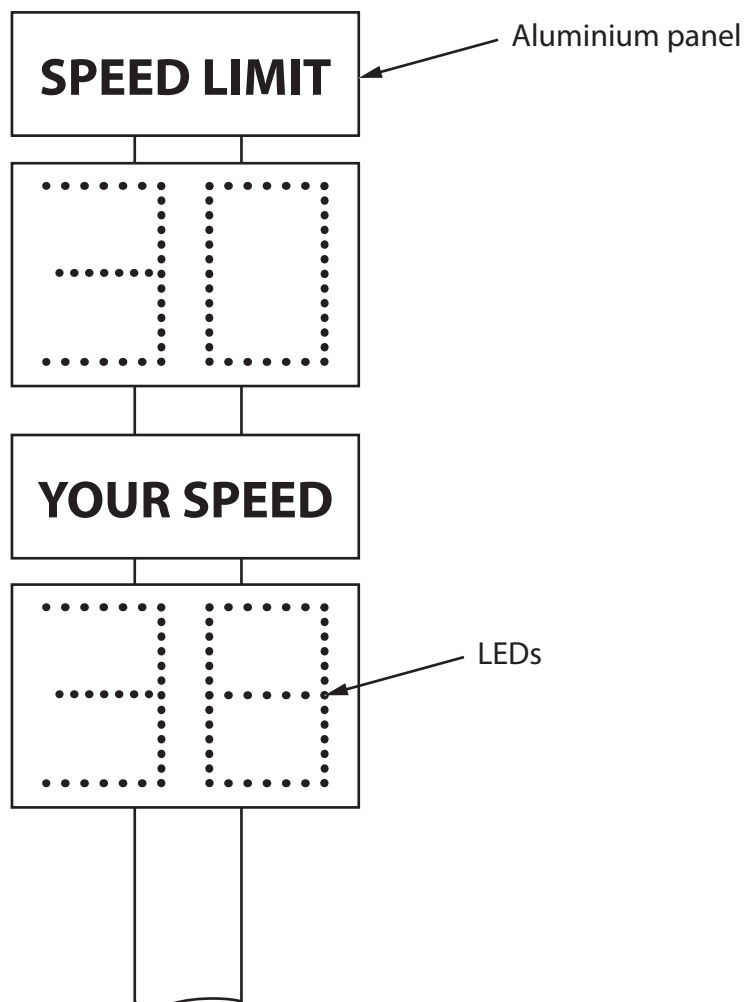


Figure 12

- (a) Explain **one** benefit of using LEDs to display the number under the words 'YOUR SPEED'.

(2)

The LEDs are subjected to quality control checks during their manufacture.

- (b) Explain **one** advantage of carrying out a quality control check on the LEDs during manufacture.

(3)

The speed sensing road signs use photo etched circuit boards for the electronic circuitry.

- (c) Explain **two** reasons for etching the circuit boards for the road signs.

(4)

1

2

- (d) The speed sensing road sign is manufactured from aluminium and the words 'SPEED LIMIT' and 'YOUR SPEED' are screen printed.

Figure 13 shows some additional information about the speed sensing road sign.

Source of aluminium	Canada
Road sign material	Stock sized 6 mm aluminium sheet
Potential market	Local councils, schools and holiday camps
Scale of production	Batch

Figure 13

Analyse the information in Figure 13.

Evaluate the speed sensing road sign with reference to social and availability factors including:

- use for different social groups
- use of stock materials
- use of specialist materials.

(9)

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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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