Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number	Candidate Number

Friday 24 May 2019

Afternoon (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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Pearson

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.

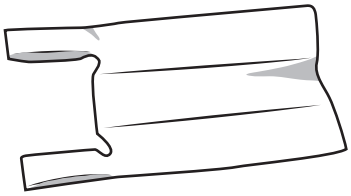
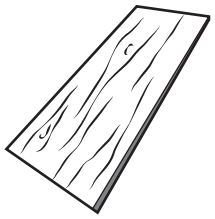
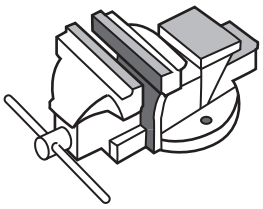
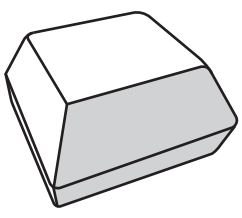
Product	Product material	Property
	Biodegradable plastic shopping bag	Will degrade in soil
	Cedar roof tile	(1) (i) .....
	Cast iron workshop vice	(1) (ii) .....
	Polyester raincoat	(1) (iii) .....
	Solid white board burger package	(1) (iv) .....

Figure 1

(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.

(2)

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(Total for Question 1 = 8 marks)

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.

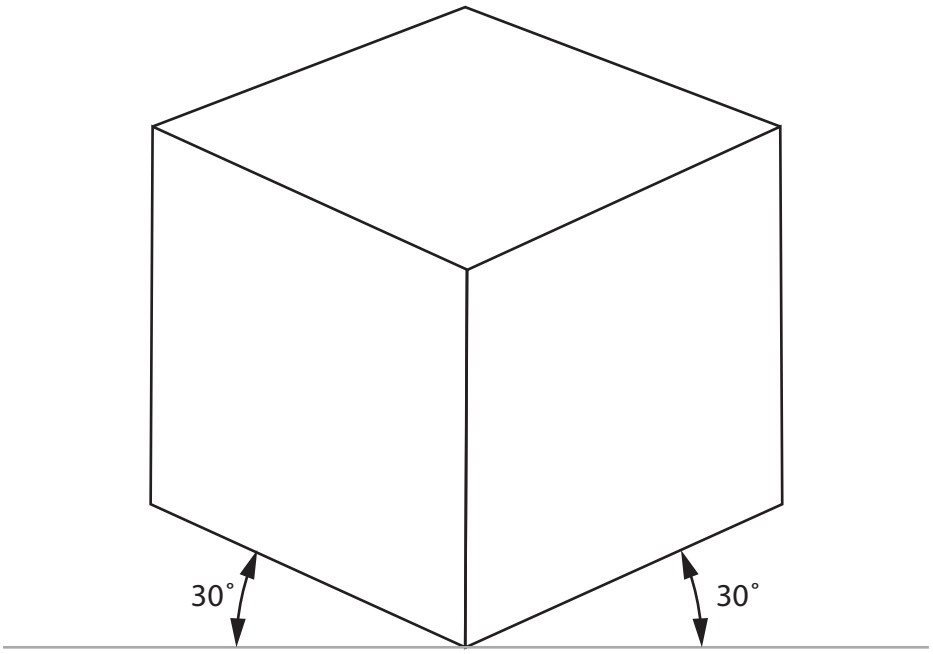

Figure 3

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

(1)

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(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

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(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.

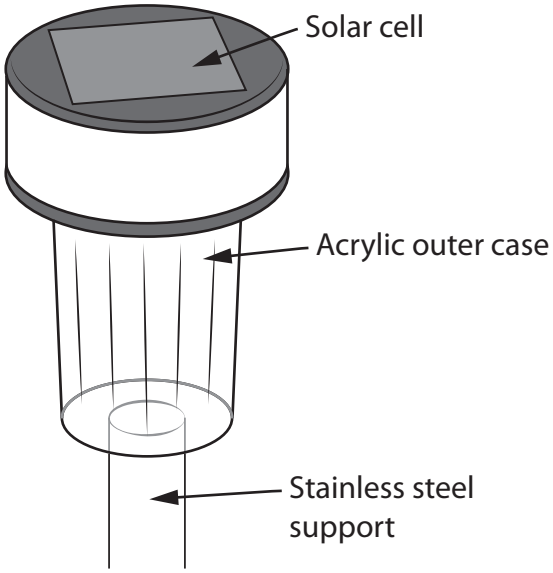

Figure 4

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

(1)

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(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)

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(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)

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(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)

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

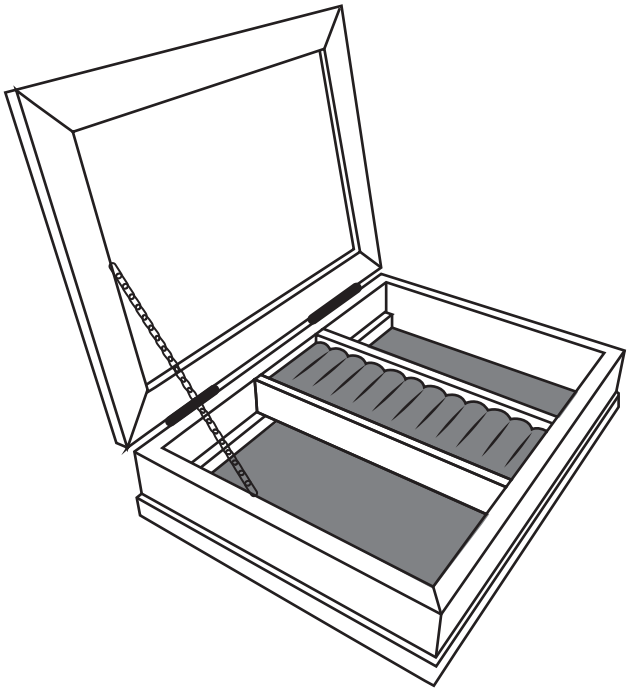

Figure 5

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

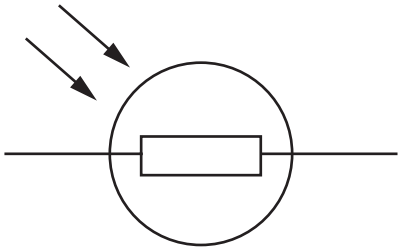

Figure 6

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

(1)

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(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)

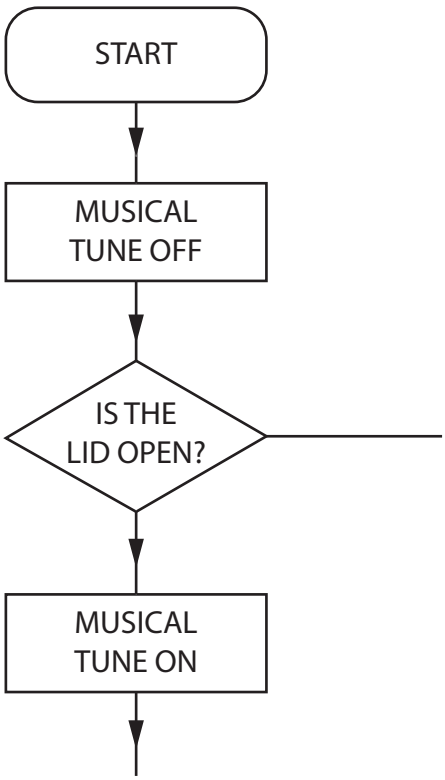


Figure 7

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

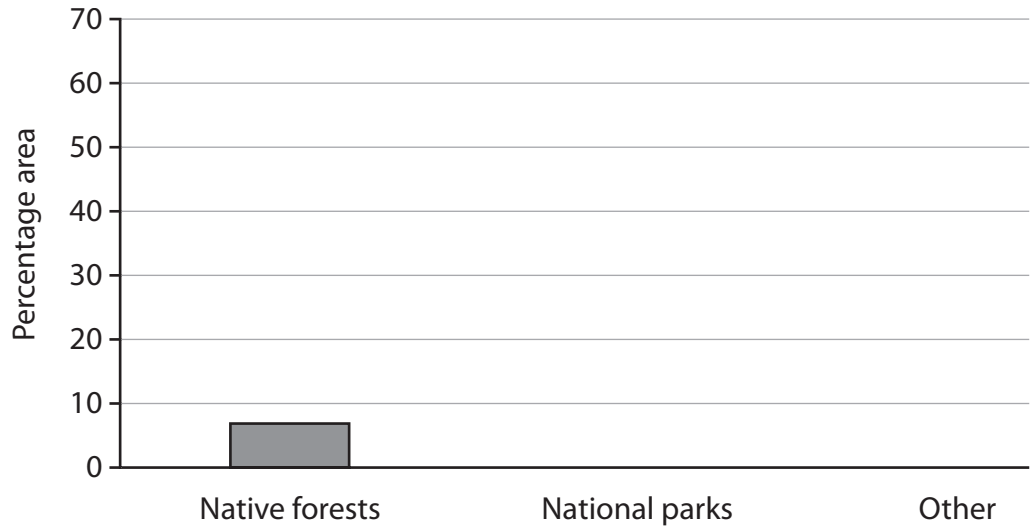
Sources of mahogany	Percentage grown in each area (%)
Native forests	7
National parks	30
Other	63

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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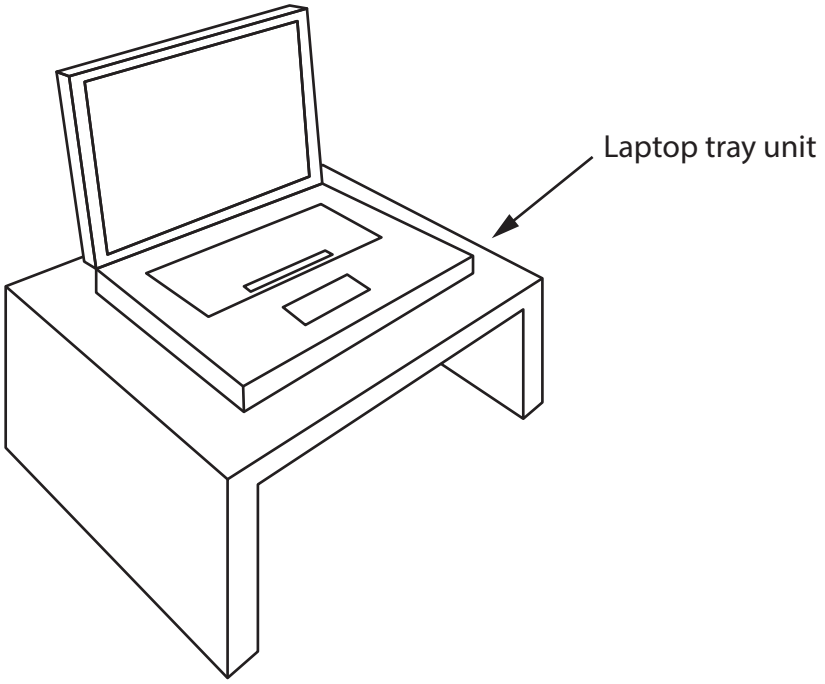
(Total for Question 4 = 12 marks)

TOTAL FOR SECTION A = 40 MARKS

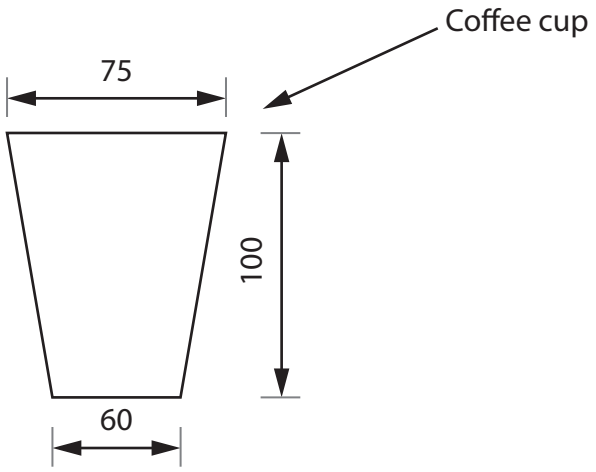
SECTION B – SYSTEMS

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

5 Figure 9 shows a design solution for a laptop tray unit together with some additional information.



Additional information



All dimensions in mm

Figure 9

(a) The laptop tray unit needs to be improved to include the following specification points.

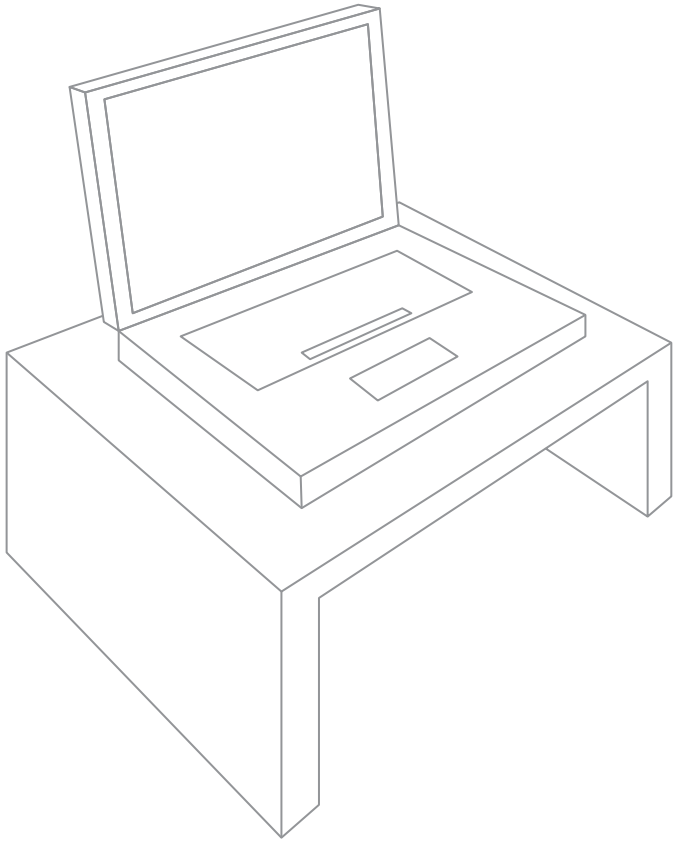
The laptop tray unit must:

- provide a means of sensing when the laptop is placed on the stand and a visual output to show that it has been recognised
- provide a method of holding a coffee cup without the risk of it falling over
- store a wireless mouse so that it is easily accessible.

Use notes and sketches, on the outline below, to show how the laptop tray unit 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 a shop display stand for a pair of glasses.

The shop display stand rotates on a turntable that is controlled by an electronic circuit.

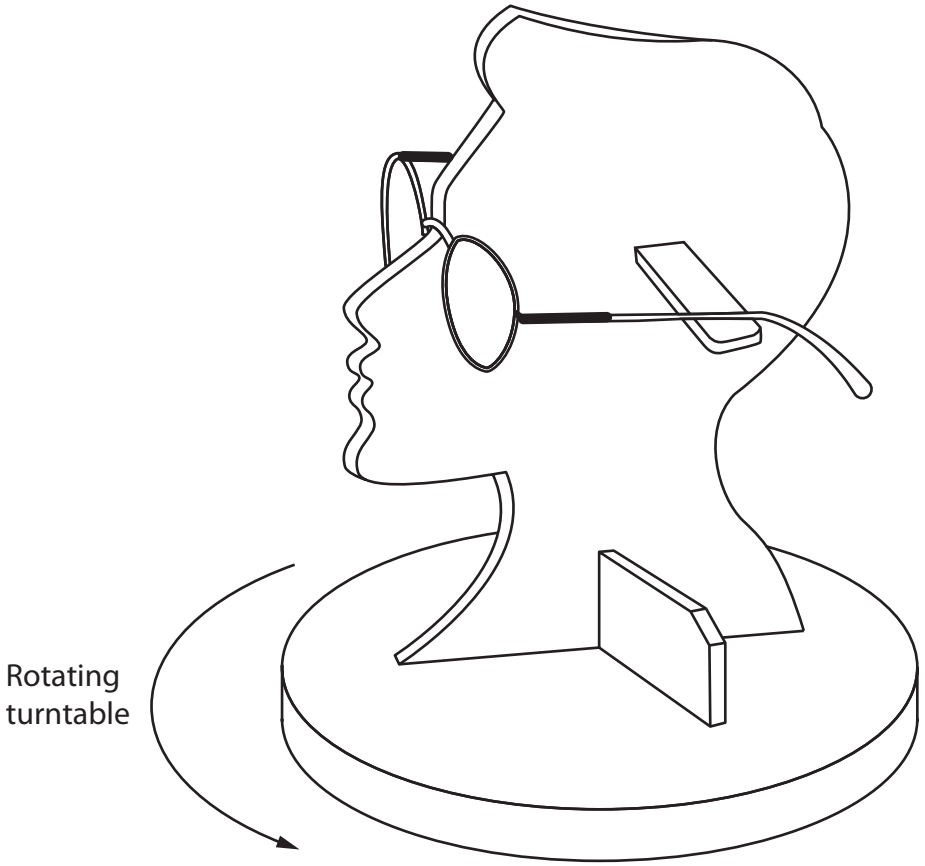


Figure 10

Explain **two** ways that the shop display stand 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 a bicycle light that can also be used as a torch. It meets the requirements of the Restriction of Hazardous Substances (RoHS) Directive.

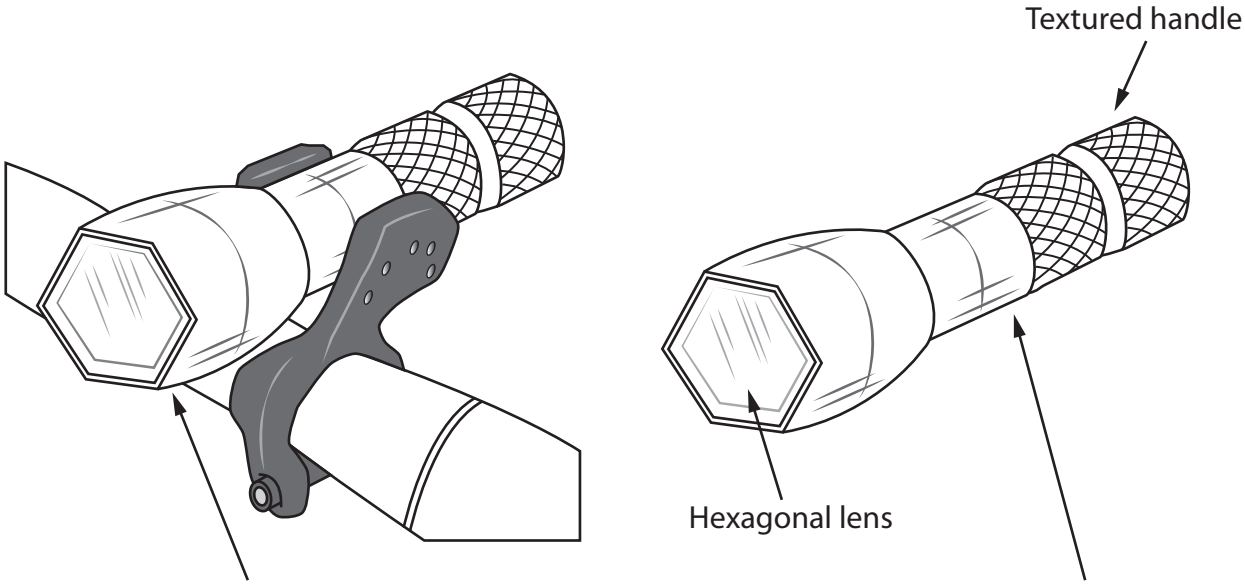

Figure 11

(a) Explain **two** advantages of manufacturing the bicycle light to meet the requirements of the RoHS Directive.

(4)

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(b) Figure 12 shows a prototype printed circuit board (PCB) for the bicycle light and a light-emitting diode (LED).

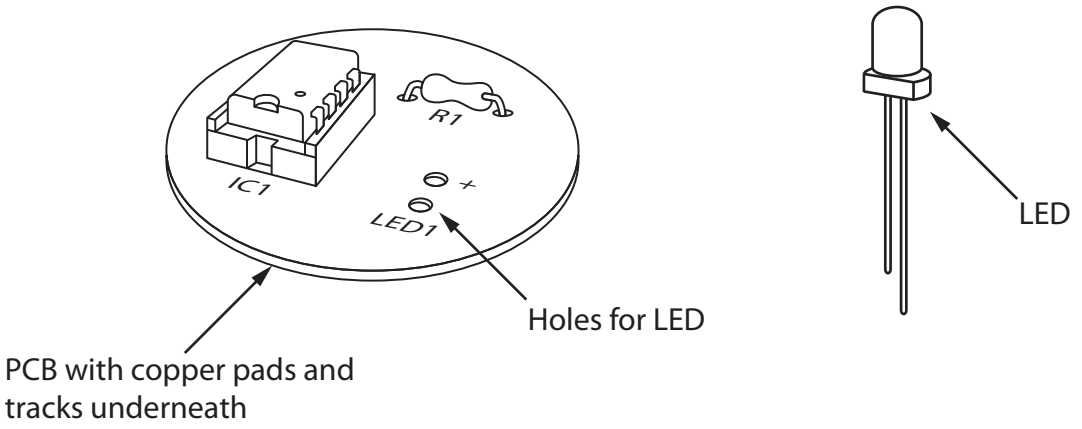

Figure 12

Use notes and sketches, in the space below, to show how the LED would be soldered to the PCB in a school workshop.

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

(4)

(c) Explain **one** reason for adding texture to the handle of the bicycle light.

(2)

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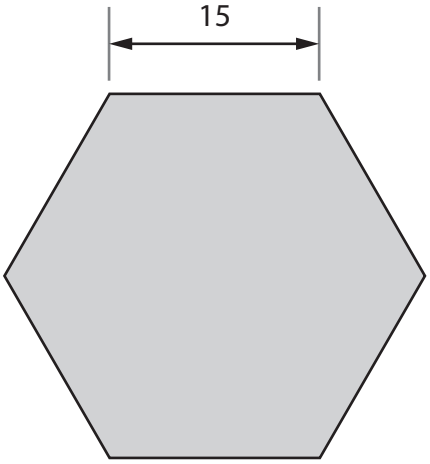
(d) Figure 13 shows a drawing of the hexagonal lens for the bicycle light made from 3 mm acrylic sheet.

The hexagonal lens is to be produced in a batch of 1000.



All dimensions in mm

Figure 13

Name **two** different techniques that could be used to batch produce the lens.

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

(6)

Technique 1

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Explanation

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Technique 2

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Explanation

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(Total for Question 6 = 16 marks)

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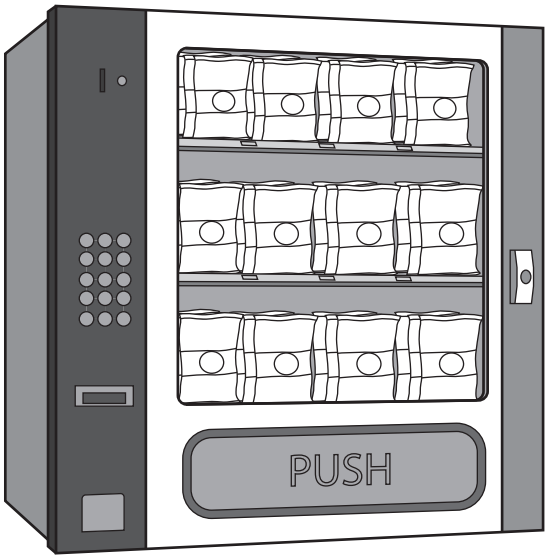
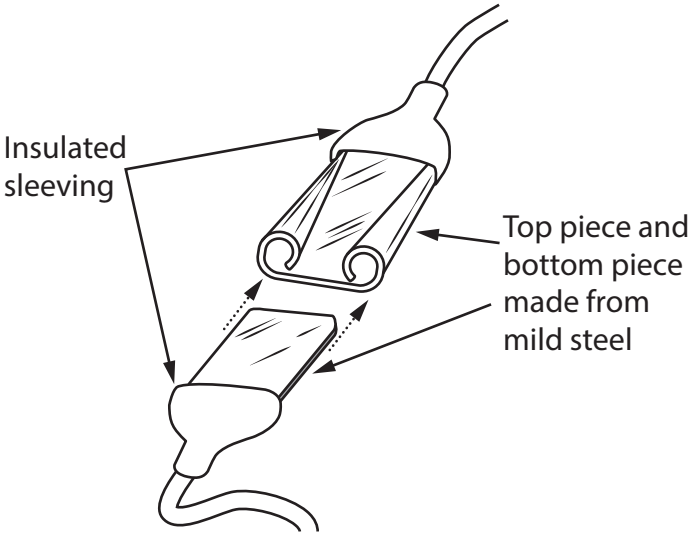
7 Figure 14 shows a vending machine and a close-up of a large connector.

The large connector is used to join some components to the main circuit board inside the vending machine.





Close-up of the large connector

Figure 14

(a) Name **one** surface finish or surface treatment that could be applied to the mild steel.

(1)

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(b) The two pieces of connector are partly covered with sleeving cut from 20 m lengths of stock material.

The stock material is 22 mm diameter insulated sleeving.

Explain **two** reasons for using stock-sized insulated sleeving.

(4)

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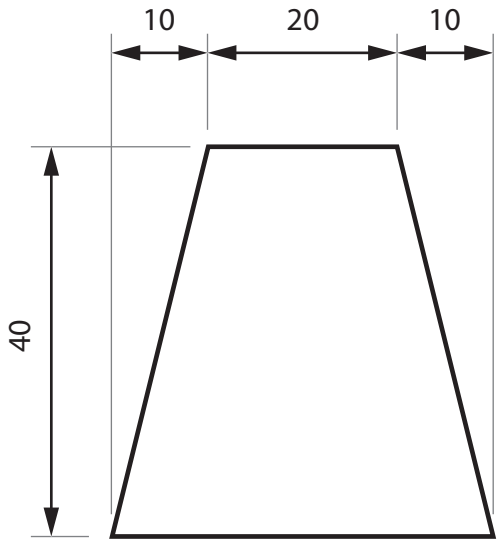
(c) Figure 15 shows the dimensions for the top piece of the connector before it is formed into the correct shape.



All dimensions in mm

Diagram not to scale

Figure 15

Calculate the maximum number of whole top pieces that could be cut from a length of mild steel measuring 181 cm long by 4 cm wide.

Ignore the width of any cuts.

(5)

Answer ..... whole pieces

(d) The vending machine has a control circuit that uses a microcontroller (PIC).

Explain **two** characteristics of a microcontroller that make it a suitable choice for use in a control circuit.

(6)

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(Total for Question 7 = 16 marks)

8 Figure 16 shows a mini fridge made from high impact polystyrene (HIPS).
A thermistor is used in the electronic circuit for the mini fridge.

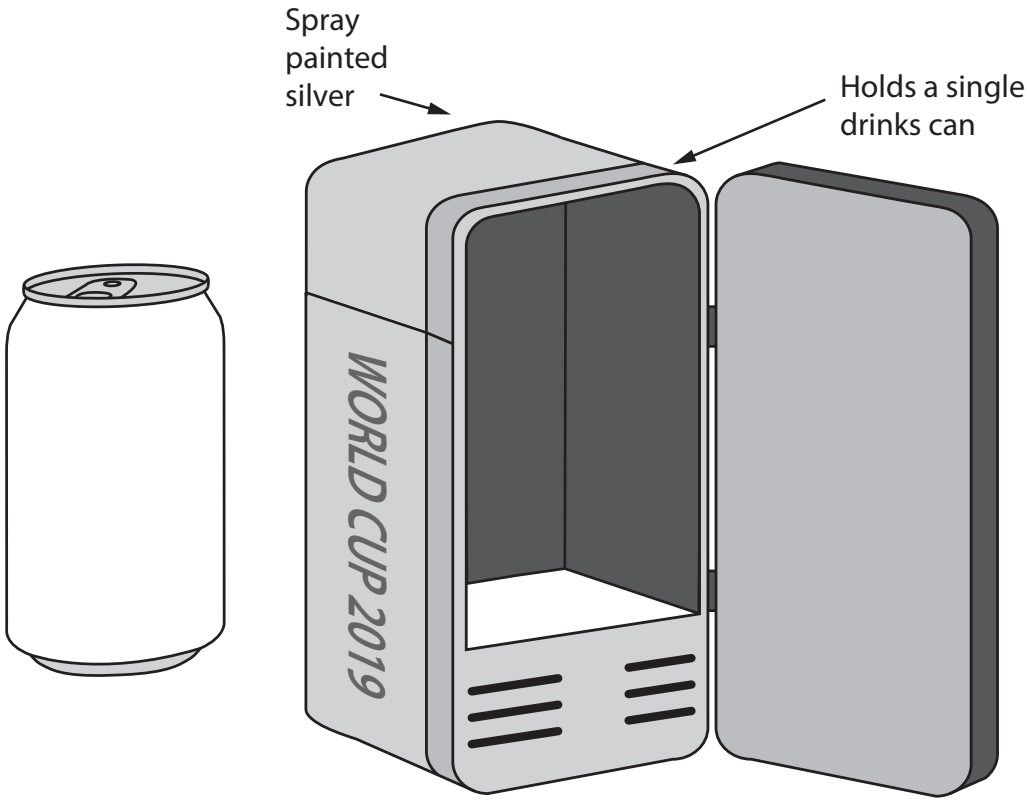

Figure 16

(a) (i) Explain **one** cost factor that will affect the choice of components for the mini fridge.

(2)

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(ii) Explain the function of the thermistor that makes it suitable for use in the mini fridge electronic circuit.

(3)

(b) Explain **two** positive effects of the Waste Electrical and Electronic Equipment (WEEE) Directive when disposing of the mini fridge.

(4)

1

2

(c) The mini fridges are manufactured in China and transported worldwide.

Figure 17 shows a table with information about the mini fridges.

Scale of production	Mass
Material/Components	HIPS, electronic circuit
Material source	Crude oil from Saudi Arabia
Size	220 mm x 100 mm x 100 mm
Surface Finish	Spray painted

Figure 17

Analyse the information in Figure 17.

Evaluate the mini fridges with reference to their social footprint including:

- trends / fashions
- effects of material extraction and processing
- effects of the disposal of components and systems.

(9)

(Total for Question 8 = 18 marks)

TOTAL FOR SECTION B = 60 MARKS
TOTAL FOR PAPER = 100 MARKS