

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

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Candidate Number

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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.
- Good luck with your examination.

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.




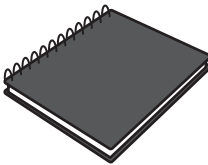
Picture of product	Material and product	Property
	Stainless steel spoon	Corrosion resistant
	Mahogany dining room chair	(1) (i)
	High Impact Polystyrene (HIPS) drinking cup	(1) (ii)
	Wool scarf	(1) (iii)
	Cartridge paper sketch book	(1) (iv)

Figure 1

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(b) Explain **one** advantage of using wind to generate energy.

(2)

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As wind turbines get bigger and taller they produce more power.

(c) Figure 2 shows a table of information about two different wind turbines.

	Wind Turbine A	Wind Turbine B
Power (kW)	500	800

Figure 2

Calculate how much more power wind turbine B produces in comparison to wind turbine A as a percentage.

(2)

Answer %

(Total for Question 1 = 8 marks)



2 Figure 3 shows a game.

The two sets of cubes are made from contrasting coloured non-ferrous metals.

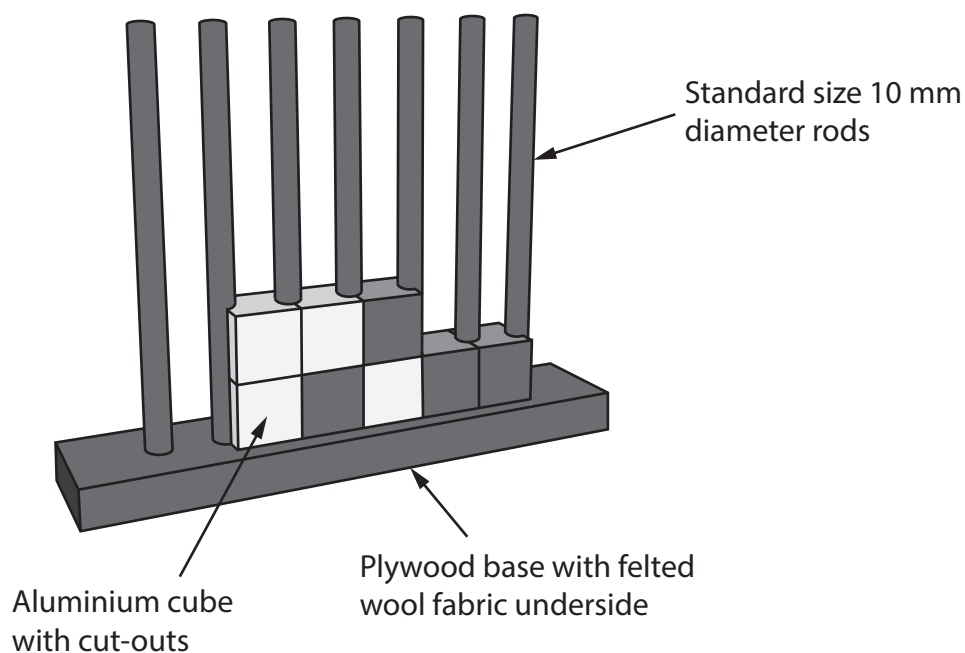


Figure 3

Aluminium is used to manufacture one set of the coloured cubes.

(a) Name **one** other appropriate non-ferrous metal that could be used to make the other set of coloured cubes.

(1)

(b) Explain **one** reason for using standard sized 10 mm diameter rods.

(2)



(c) Explain **one** property of felted wool fabric that makes it an appropriate choice of material for gluing to the underside of the plywood base.

(2)

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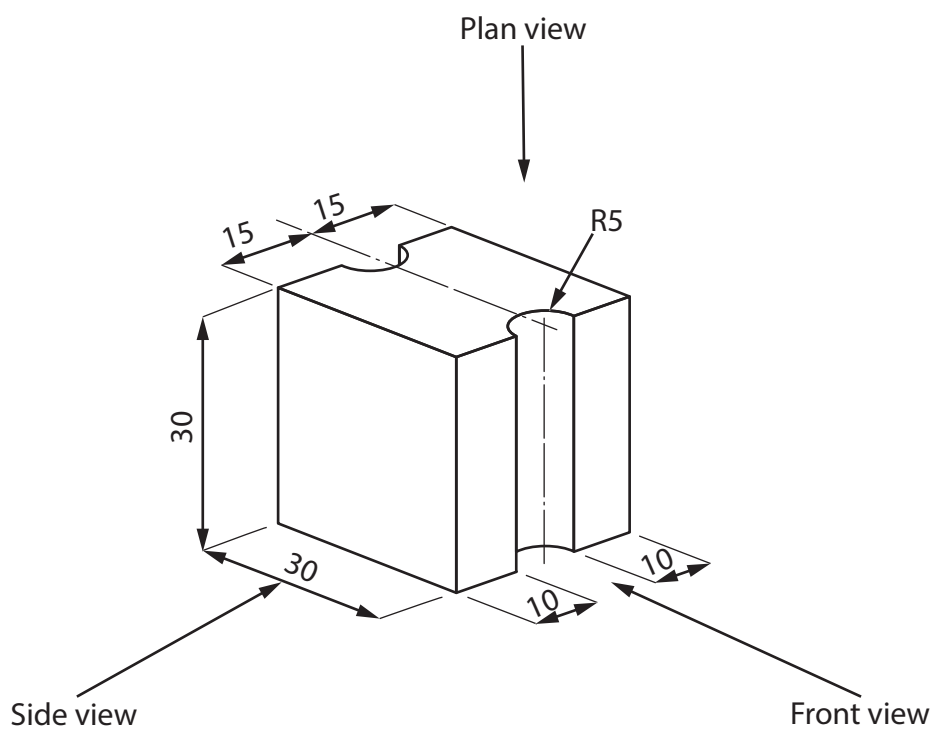
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Figure 4 shows a dimensioned isometric drawing of one of the metal cubes with cut-outs.



All dimensions in mm

Diagram not to scale

Figure 4

- (d) Complete a full-sized orthographic drawing of the metal cube shown in Figure 4 on the 5 mm orthographic grid on the opposite page.

The front view and part of the plan view have already been done for you.

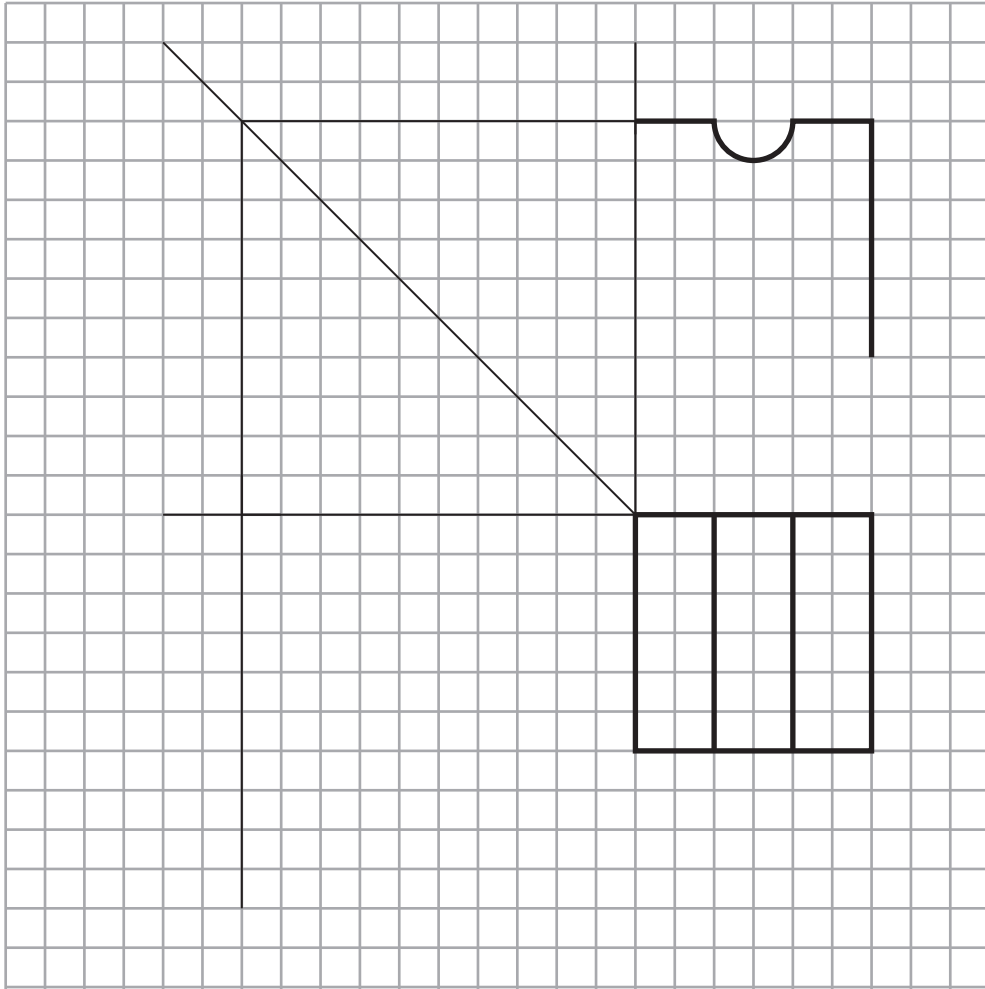
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5mm orthographic grid

(Total for Question 2 = 9 marks)



- 3 Figure 5 shows a sports rowing boat manufactured from fibreglass, which is a composite material.

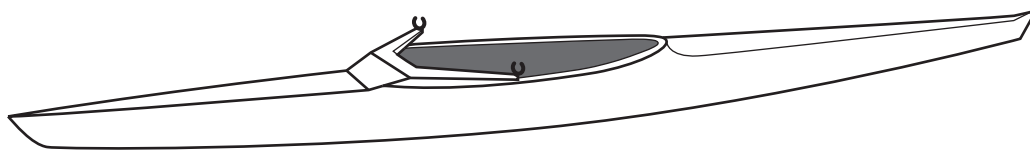


Figure 5

- (a) Name **one** composite material other than fibreglass.

(1)

- (b) Explain **one** reason for manufacturing the sports rowing boat from fibreglass.

(2)

- (c) When manufacturing fibreglass, the glass fibre matting is coated with a mixture of resin and a catalyst.

The resin and catalyst are mixed in the ratio of 100 g resin to 2 ml of catalyst.

Calculate how much catalyst would be added to 650 g of resin.

(2)

Answer ml



(d) The sports rowing boat oar shown in Figure 6 is a lever.

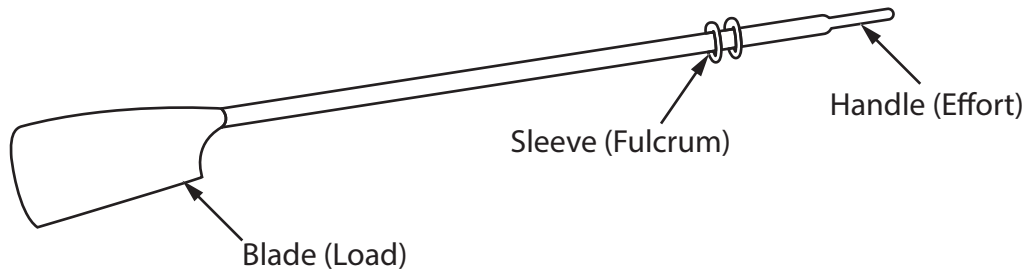


Figure 6

Analyse the boat oar.

(i) Name the lever classification for the sports rowing boat oar. (1)

(ii) State the type of movement shown by the sports rowing boat oar handle when in use. (1)

(e) Explain **two** benefits of sports textiles for athletes. (4)

1

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(Total for Question 3 = 11 marks)



4 Figure 7 shows a one piece corrugated board package for a smart lightbulb.

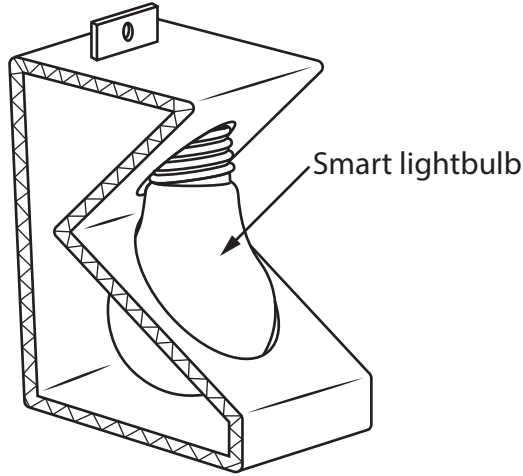


Figure 7

(a) Explain **one** working property of corrugated board that makes it an appropriate choice of material to make the lightbulb package.

(2)

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(b) Explain **one** way that the cost of materials has been kept to a minimum for the lightbulb package.

(2)

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(c) The net for the package measures 40 cm long by 8 cm wide.

The designer needs to increase the surface area of the package by $\frac{1}{8}$ th for greater protection of the lightbulb.

Calculate the new surface area of material required for the package.

(2)

Answer cm²

The smart lightbulb can be connected to the internet.

(d) Discuss how the Internet of Things (IoT) has led to greater independence for older people living on their own in their homes.

(6)

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TOTAL FOR SECTION A = 40 MARKS



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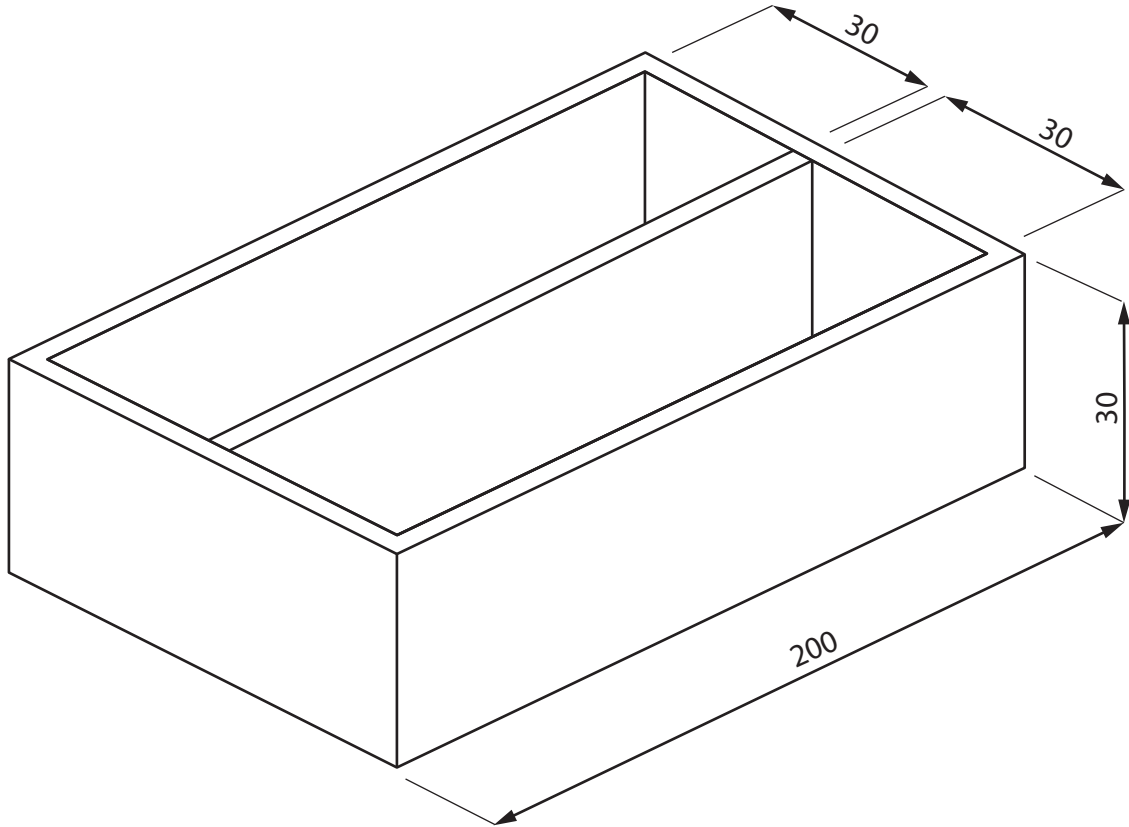
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SECTION B BEGINS ON THE NEXT PAGE.



SECTION B – SYSTEMS

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

- 5 Figure 8 shows a design solution for an electronic components tidy case together with some additional information.



Additional information

Maximum dimensions of the boxes of electronic components

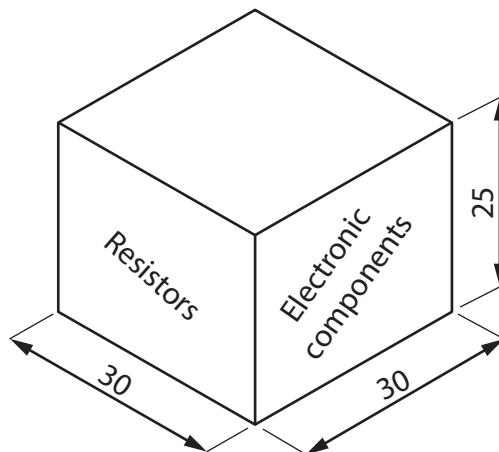


Figure 8

All dimensions in mm

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- (a) The electronic components tidy case needs to be improved to include the following specification points.

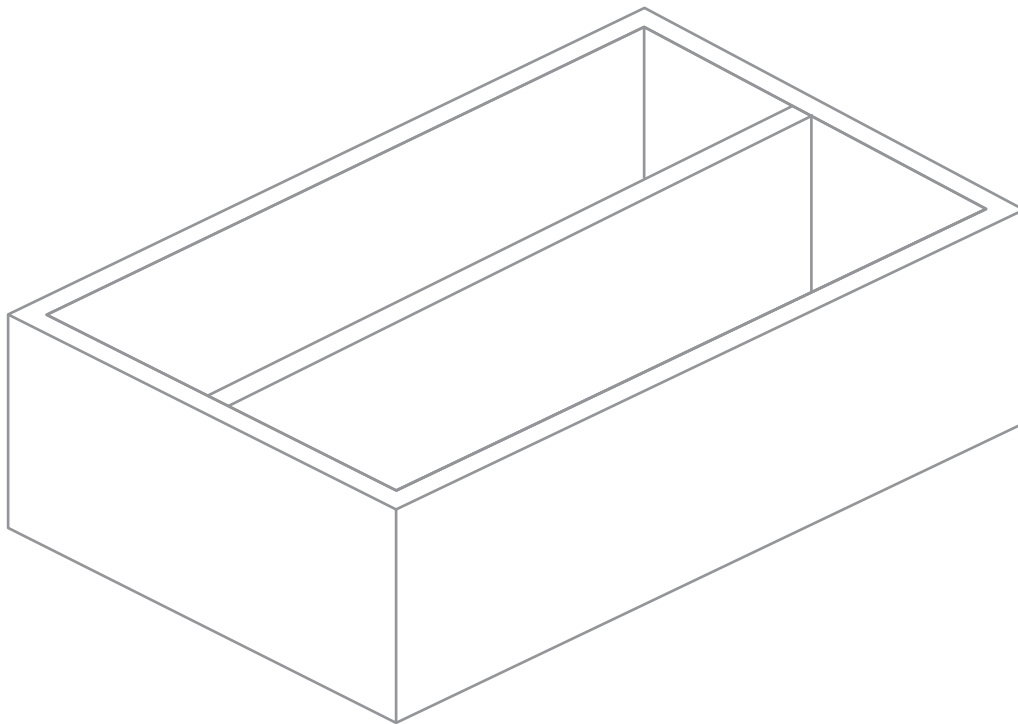
The electronic components tidy case must:

- provide separate storage spaces for different sized boxes of electronic components and allow the type of components to be seen
- include a lockable method to stop the boxes of electronic components from falling out when being moved
- provide an audible warning that will alert the user if someone tries to move the tidy case.

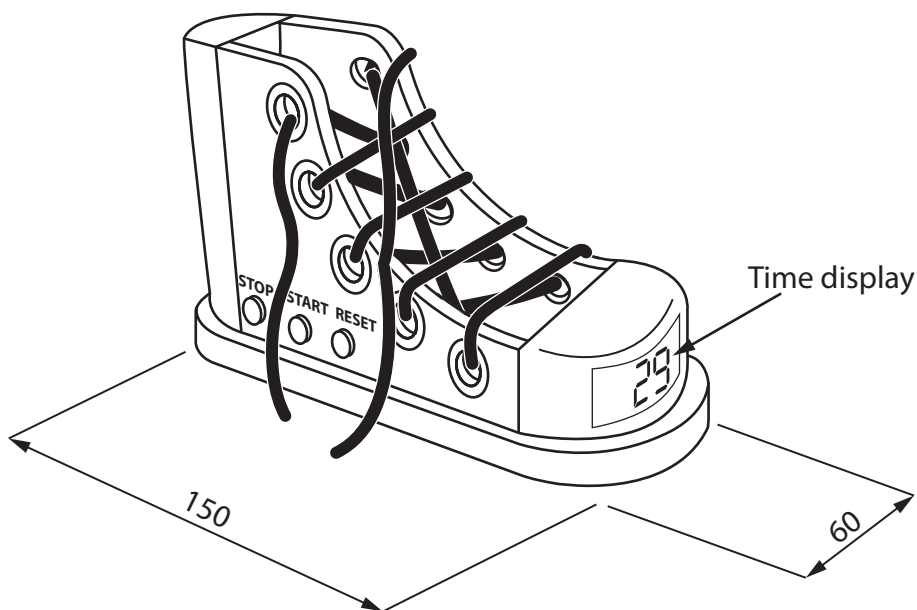
Use notes and sketches, on the outline below, to show how the electronic components tidy case could be modified to include these three specification points.

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

(6)



(b) Figure 9 shows a boot that is used to help young children learn how to tie their own shoelaces. It includes a device which measures the time taken to tie the laces.



All dimensions in mm

Figure 9

Explain **two** ways that the boot meets, or fails to meet, the criteria of providing a method to help young children learn how to tie their own shoelaces.

(4)

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(Total for Question 5 = 10 marks)



6 Figure 10 shows a teaching aid for use in schools.

The case of the teaching aid is manufactured from polymers.

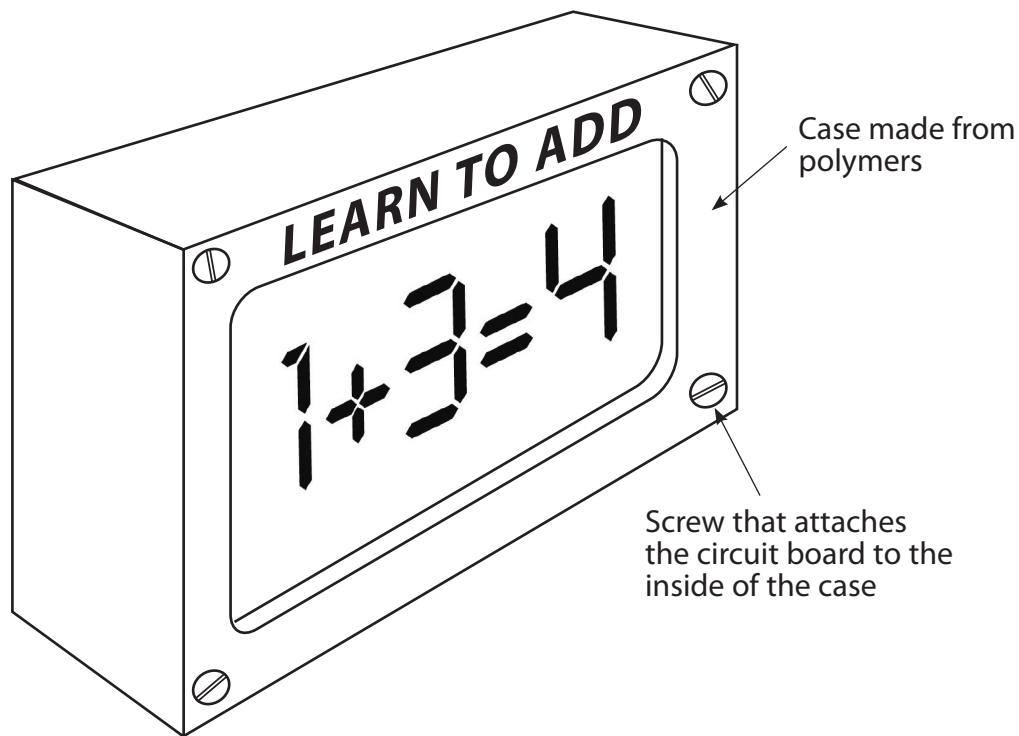


Figure 10

(a) Explain **two** physical characteristics of polymers that make them an ideal material from which to make the case of the teaching aid.

(4)

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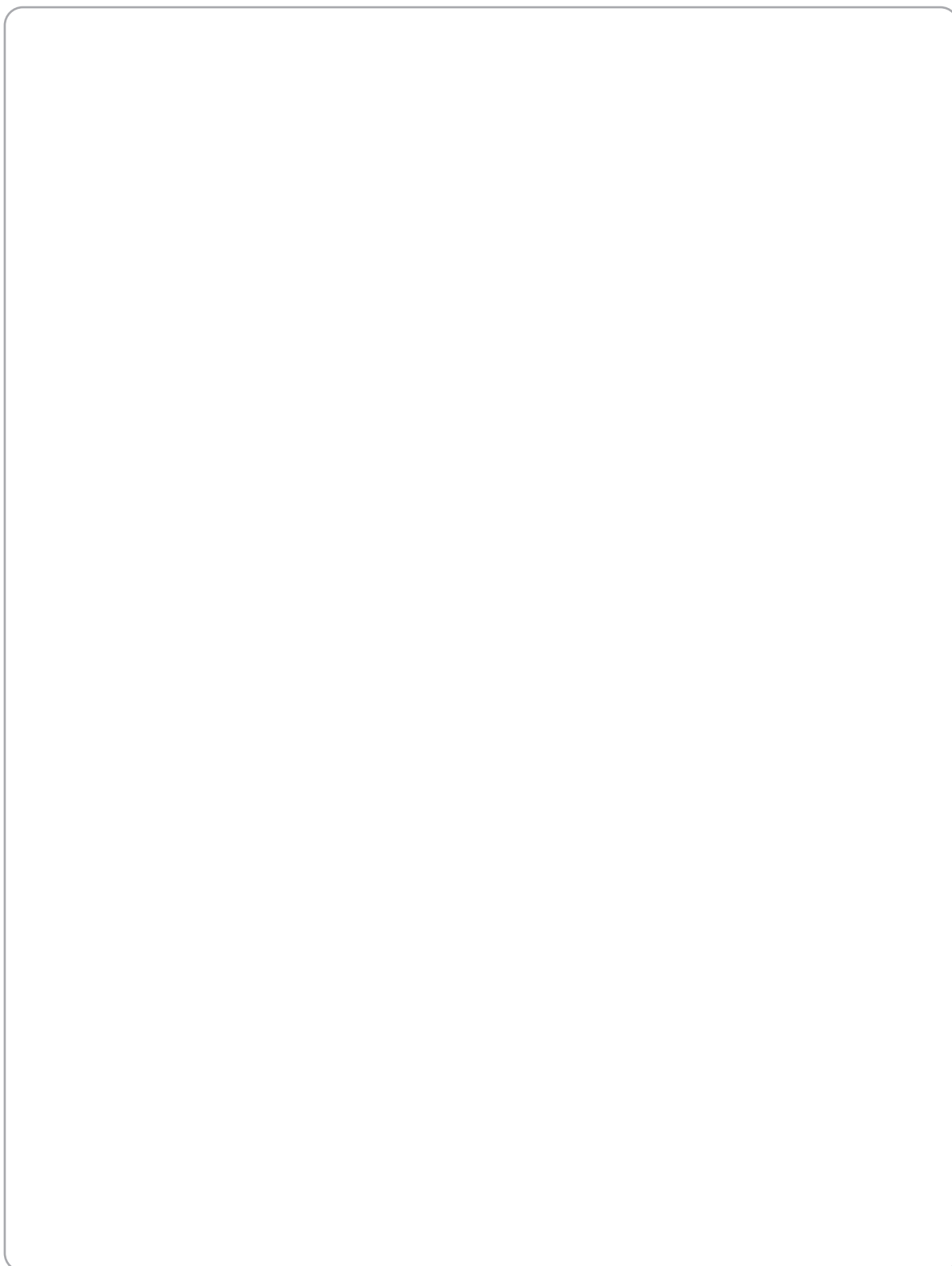


- (b) The circuit board has a 5 mm hole drilled in each of the four corners so that it can be fixed directly to the polymer case.

Use notes and sketches, in the space below, to show how to drill a 5 mm hole in one of the corners of the circuit board using a pillar drilling machine.

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

(4)



(c) Explain **one** reason why the holes in the circuit board must be manufactured to a tolerance.

(2)

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(d) Give **two** different surface finishes or treatments that could be used to show the words 'LEARN TO ADD' on the polymer case.

Explain **one** advantage of using each surface finish or treatment.

(6)

Surface finish or treatment 1

Explanation

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Surface finish or treatment 2

Explanation

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(Total for Question 6 = 16 marks)



7 Figure 11 shows a circuit diagram for an automatic LED light.

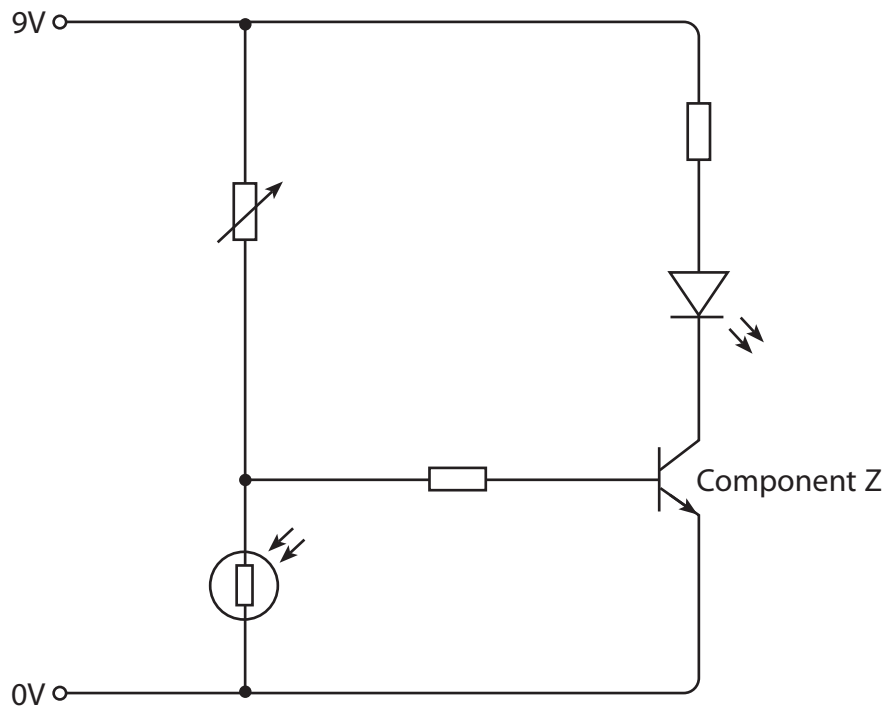


Figure 11

(a) Name the component represented by the symbol Z shown in Figure 11.

(1)

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Figure 12 shows the printed circuit board (PCB) for the automatic LED light that has been designed using computer-aided design (CAD).

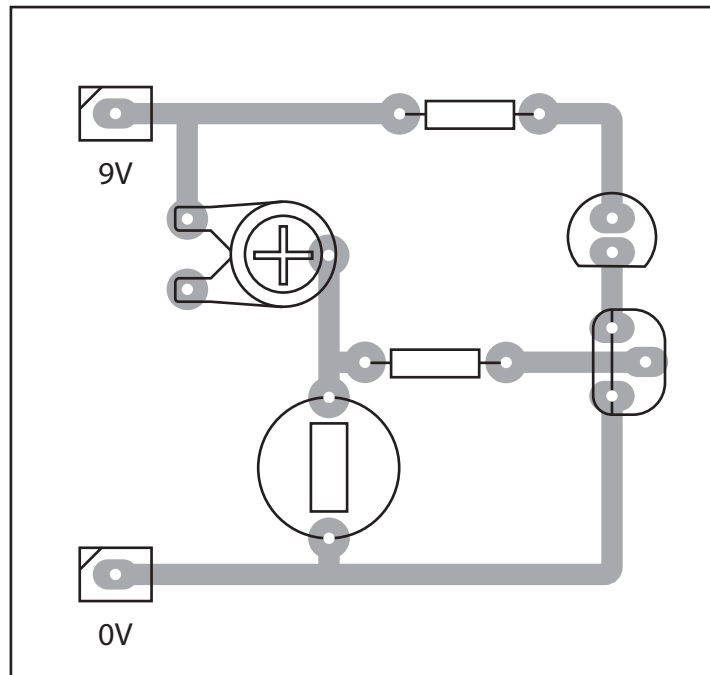


Figure 12

(b) Explain **two** advantages of using CAD when designing the PCB.

(4)

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(c) The manufacturer of the PCB produces a range of different sized PCBs.

Figure 13 shows a cutting list for a customer order.

The sheet material used to make the PCBs costs £0.01 per cm².

Complete the cutting list by calculating the missing information for each of the five empty boxes, including the total cost.

All dimensions are in centimetres (cm).

(5)

PCB	Length (cm)	Width (cm)	Area (cm ²)	Number required	Cost (£)
A	10	5	50	15
B	8	3	24	20
C	4	2	40
Total cost (£)				

Figure 13

Working out space



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Products are manufactured using different scales of production.

(d) Explain **two** reasons for manufacturing the PCBs in batches.

(6)

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(Total for Question 7 = 16 marks)



8 Figure 14 shows a remote control, model tower crane made from High Impact Polystyrene (HIPS).

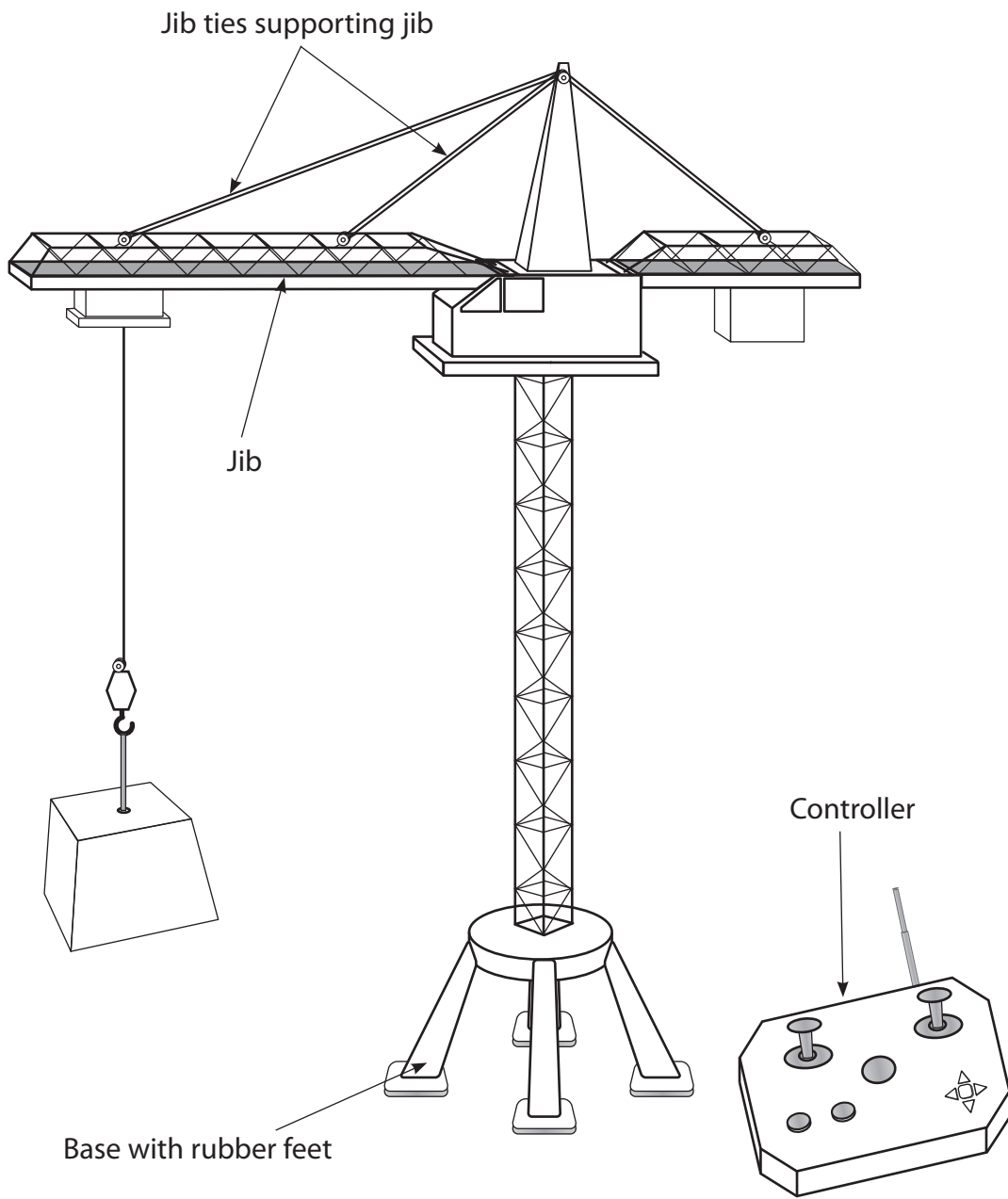


Figure 14

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The jib ties are in tension.

(a) Explain **one** possible effect of the tension acting upon the jib ties and jib.

(2)

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The base is manufactured as a sub-assembly for the model tower crane.

(b) Explain **one** advantage of manufacturing the base as a sub-assembly.

(3)

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The HIPS for the tower crane is produced from crude oil transported from Saudi Arabia.

(c) Explain **two** ecological impacts of oil extraction and processing.

(4)

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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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