

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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

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Friday 22 May 2020

Afternoon (Time: 1 hour 45 minutes)

Paper Reference **1DT0/1A**

Design and Technology
Component 1: Metals

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.

Picture of product	Material and product	Property
	Polyester school tie	Crease resistant
	Brass garden tap	(1) (i)
	Acrylic soap tray	(1) (ii)
	Folding box board breakfast cereal box	(1) (iii)
	Beech kitchen steps	(1) (iv)

Figure 1

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(b) The school tie is made from a piece of fabric measuring 135 cm long by 9 cm wide.

The fabric is supplied in a roll that is 90 mm wide and costs £3.55 per metre.

The fabric can be bought to the nearest cm.

Calculate the cost of fabric required to make one tie giving your answer in pounds (£) to 2 decimal places (dp).

(2)

Cost £

(c) An advantage of using polyester for the school tie is that it is crease resistant.

Explain **one** other advantage of using polyester for the school tie.

(2)

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(Total for Question 1 = 8 marks)



2 Figure 2 shows a bending jig that is used to make three separate, different-sized wire flowers for some jewellery.

The flowers are formed by wrapping copper wire around the different-sized circles.

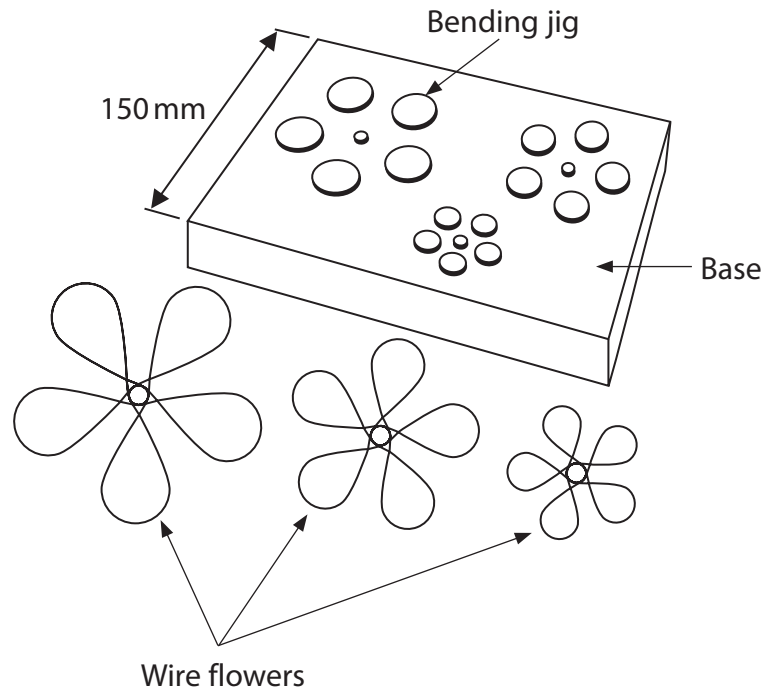


Figure 2

(a) Name **one** manufactured timber that could be used to make the base of the bending jig.

(1)

(b) Prototype wire flowers were made using shape memory alloys (SMAs) to test the design before producing the final product from copper wire.

Explain **one** reason for using SMAs to make the prototype wire flowers.

(2)



Figure 3 shows two of the circles used on the bending jig.

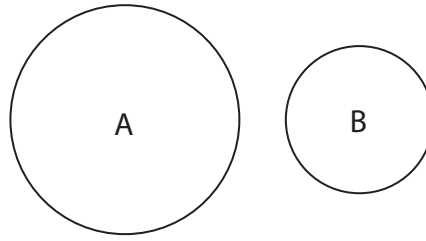


Figure 3

Diagram not to scale

The two circles have different diameters in the ratio of 5:3.

(c) (i) Calculate the radius of circle B if circle A has a radius of 35 mm.

(2)

Radius of circle B mm

(ii) Calculate the area of circle A giving your answer to the nearest cm^2 .

(2)

Use $\pi = 3.142$

Area of circle A cm^2



(d) Explain **one** reason why copper wire was used to make the flowers.

(2)

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(Total for Question 2 = 9 marks)

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3 Figure 4 shows a games controller.

The case is made from high impact polystyrene (HIPS).



Figure 4

(a) Other than impact resistance, give **one** property of HIPS that makes it an appropriate material from which to make the case.

(1)

(b) The games controller is only sold online and is sent through the post in a corrugated board package.

Explain **one** reason for using corrugated board to make the package.

(2)

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(c) The manufacturer is developing a new games controller that uses robotic materials.
Explain **one** way that robotic materials can be used in the new games controller.

(2)

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(d) The original games controller cost £12.50 and the new games controller costs £19.00.
Calculate the percentage increase in the cost of the new games controller.

(2)

Percentage increase %

(e) Explain **two** environmental issues related to the development and release of the new games controller.

(4)

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(Total for Question 3 = 11 marks)

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4 Figure 5 shows a picture of a firefighter.



(Source: © John Kasawa/Shutterstock)

Figure 5

The firefighter's uniform has electronic sensors built into it to detect heat.

(a) Name an electronic sensor that is used to sense heat.

(1)

(b) The firefighter's uniform is made from protective textiles.

Explain **one** disadvantage for the firefighter of wearing a uniform made from protective textiles.

(2)

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P 6 2 0 0 4 A 0 9 2 8

(c) The firefighter's uniform contains an electronic system which is powered by a small 9V battery.

(i) Draw the circuit symbol for a battery in the space below.

(1)

Figure 6 shows some information about the battery and the consumption rate for the electronic system used in the firefighter's uniform.

Analyse the information.

Battery capacity (mAh)	1000
Load current (mA)	350
Consumption rate	0.7

Figure 6

(ii) Calculate the battery life for the electronic system used by the firefighter's uniform.

Use the formula below to calculate the answer.

Give your answer in minutes.

(2)

$$\text{Load current (mA)} = \frac{\text{Battery capacity (mAh)} \times \text{Consumption rate}}{\text{Battery life (hours)}}$$

Battery life minutes

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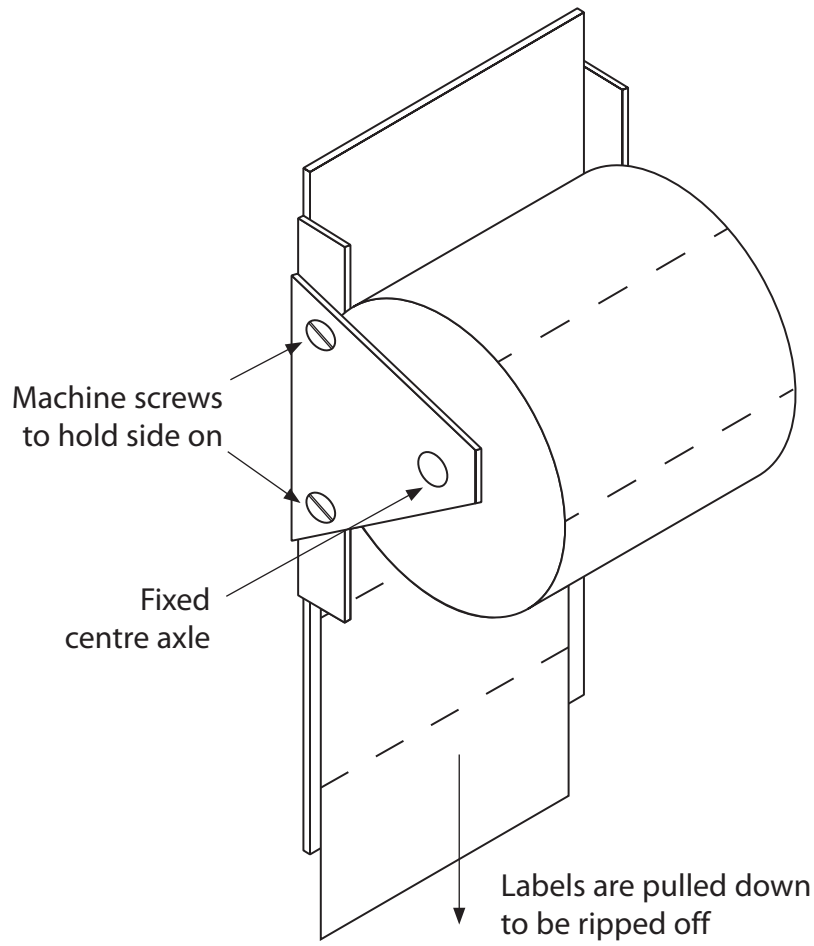
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SECTION B – METALS

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

- 5 Figure 7 shows a design solution for a label dispenser together with some additional information.



Additional information

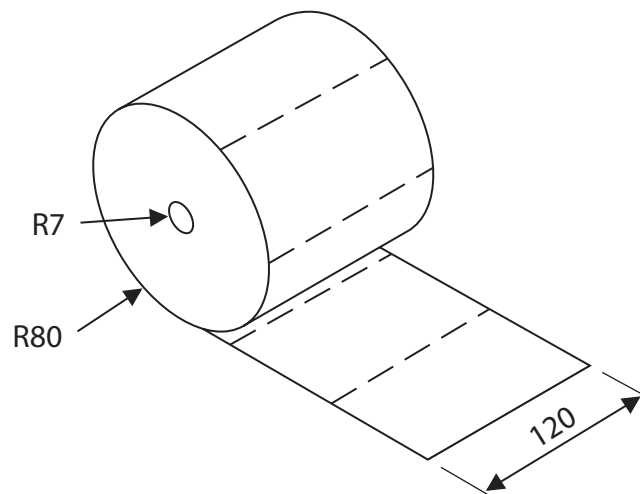


Figure 7

All dimensions in mm

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- (a) The label dispenser needs to be improved to include the following specification points.

The label dispenser must:

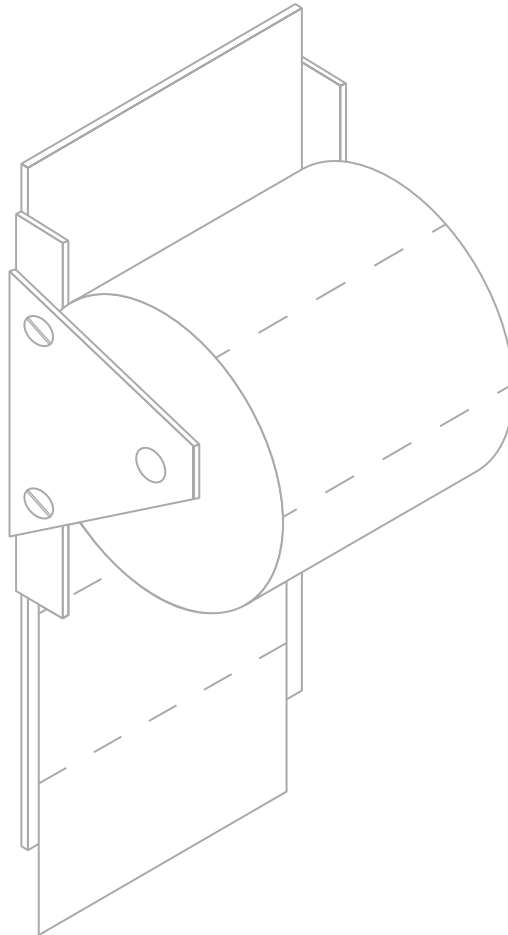
- allow an empty roll of labels to be removed easily and replaced securely
- be held vertically on a wall and not move when a label is pulled off
- provide easily accessible storage space for a spare roll of labels.

Use notes and sketches to show how the label dispenser 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.

Use the outline of the original design solution to show your modifications.

(6)



(b) Figure 8 shows some examples of stamped vegetable markers that are used by gardeners to show where they have planted specific vegetables in the garden.

They are manufactured from 2 mm thick copper and are 150 mm long.

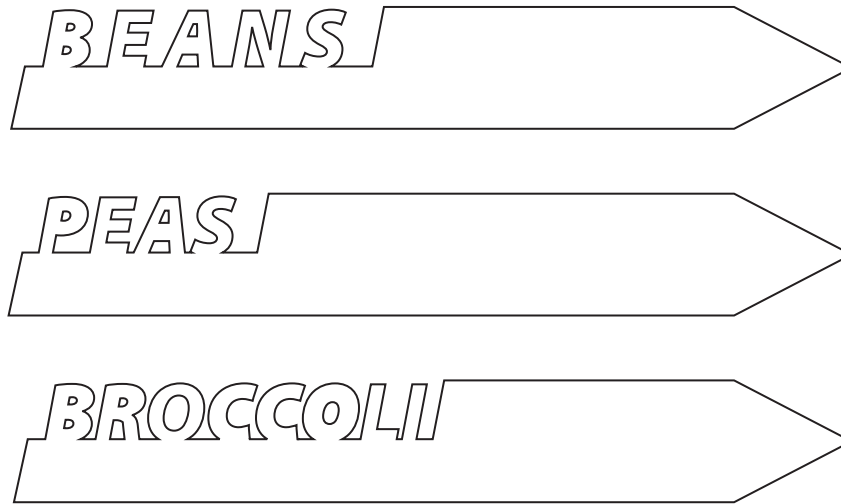


Figure 8

Explain **two** ways that the vegetable markers meet or fail to meet the criteria of providing a method to show where specific vegetables are planted in the garden.

(4)

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(Total for Question 5 = 10 marks)

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6 Figure 9 shows a tool hook that can be used in a workshop.
The tool hook is made from mild steel.

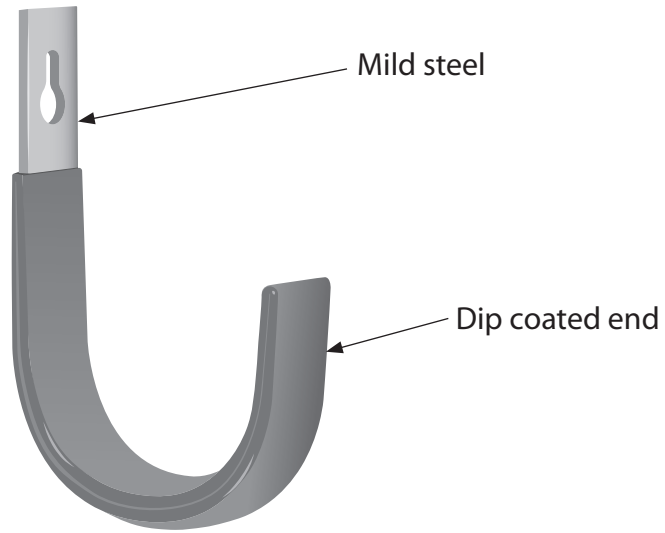


Figure 9

(a) Explain **two** availability factors that could result in mild steel becoming a difficult metal to source for the tool hook.

(4)

1

2



(b) Part of the tool hook has been dip coated.

Use notes and sketches to show how the surface of the tool hook should be prepared and dip coated.

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

(4)



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(c) The mild steel for the tool hook will be a specified gauge when it is supplied to the manufacturer.

Explain **one** reason why the manufacturer would buy mild steel of a specified gauge to make the tool hook.

(2)

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(d) Give **two** different properties of mild steel that make it an appropriate choice of material for the tool hook.

For each property, explain **one** advantage of using mild steel for the tool hook.

(6)

Property 1

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Explanation

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Property 2

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Explanation

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(Total for Question 6 = 16 marks)

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7 Figure 10 shows a bicycle chain cover and rivet.

The chain cover will be attached to the bicycle using rivets.

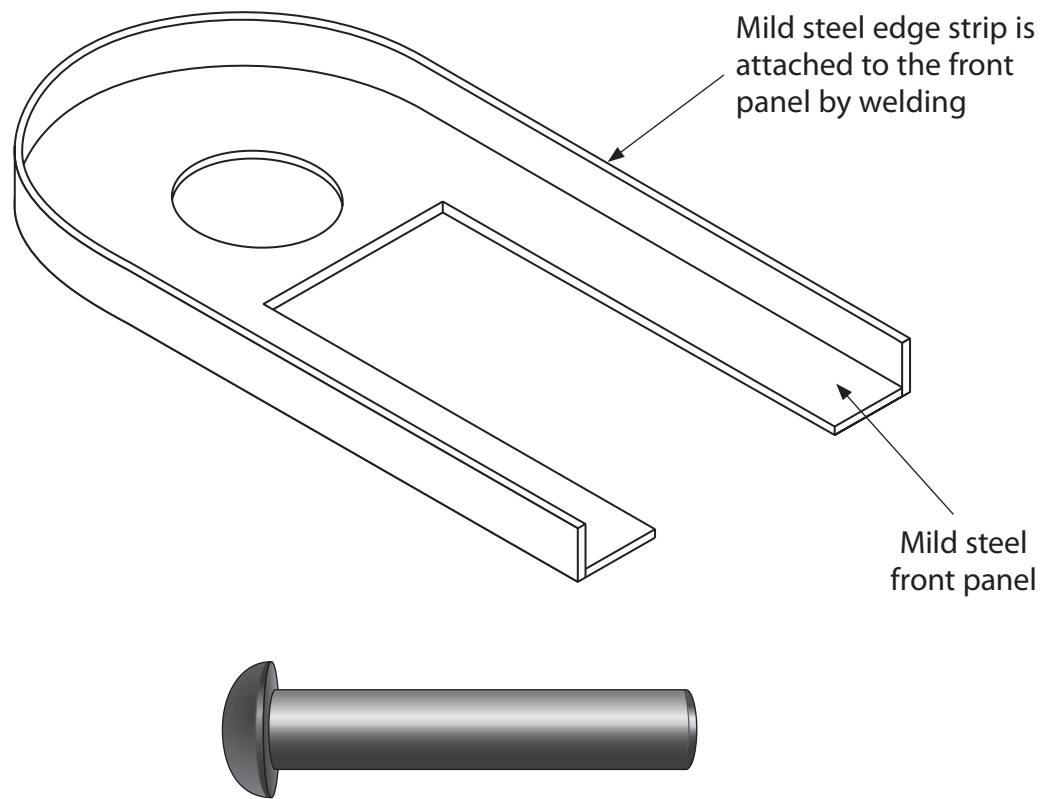


Figure 10

(a) Name the specific type of rivet shown in Figure 10.

(1)

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Figure 11 shows a template that is used when marking out the front panel of the chain cover.

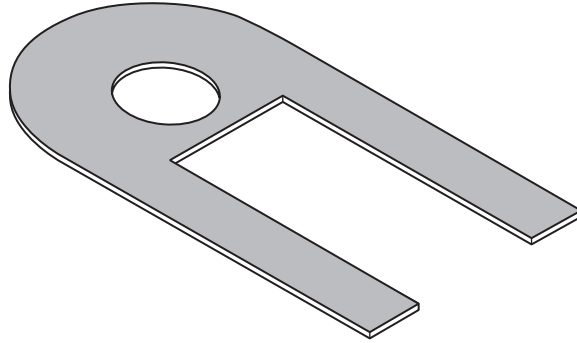


Figure 11

(b) Explain **two** advantages of using a template to mark out the front panel when manufacturing in large quantities.

(4)

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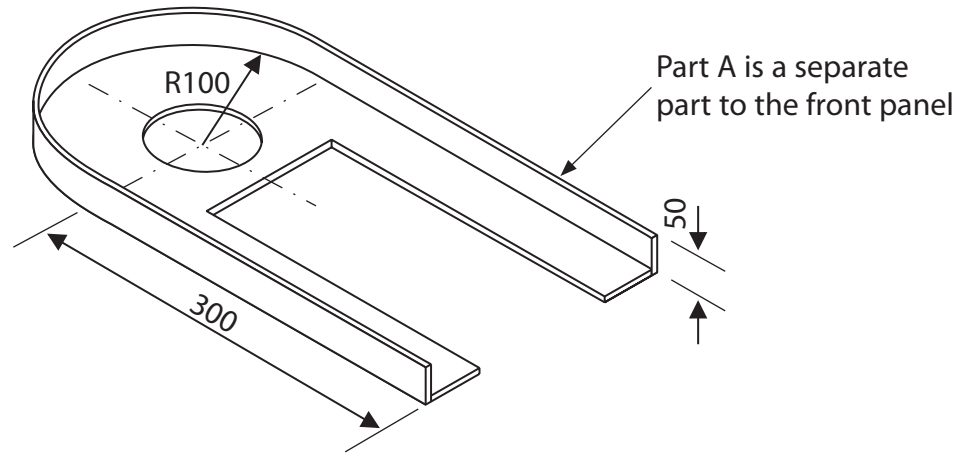
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Figure 12 shows the dimensions for the chain cover.



All dimensions in mm

Figure 12

Use $\pi = 3.142$

Curved surface area of an open cylinder = $2\pi rh$

- (c) Calculate the whole internal surface area of Part A, the edge strip, that goes around the front panel as shown.

Give your answer to the nearest whole cm^2 .

(5)

Answer cm^2



Figure 13 shows the shape of the mild steel edge strip, Part A.

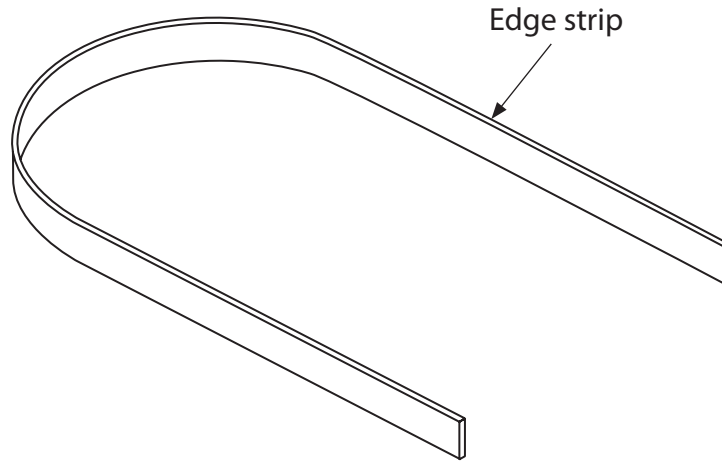


Figure 13

(d) The edge strip is attached to the front panel by welding.

Explain **two** reasons for welding the edge strip to the front panel.

(6)

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(Total for Question 7 = 16 marks)



8 Figure 14 shows three different metal parts from a toy construction kit.

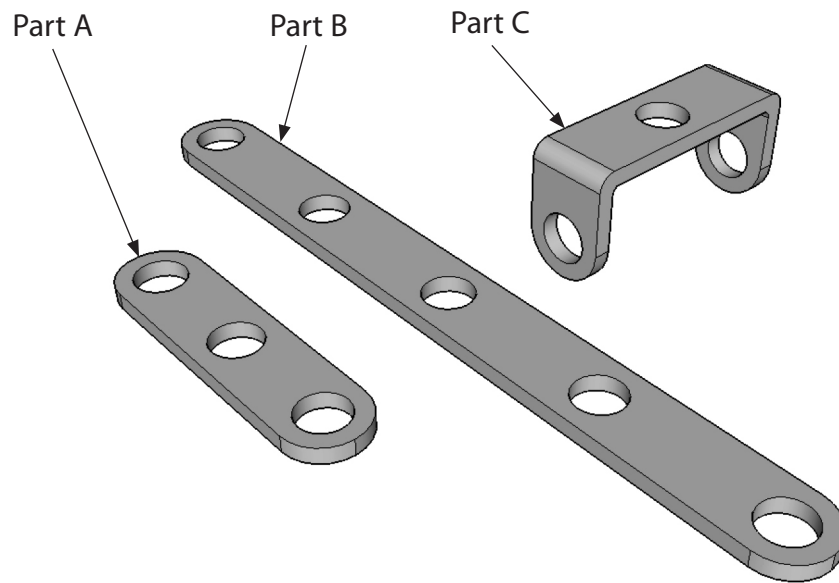


Figure 14

(a) Explain **one** reason for anodising different parts of the construction kit in different colours.

(2)

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(b) Parts A, B and C are manufactured from stock forms of metal.

Explain **one** reason for using stock forms of metal to make parts A, B and C.

(3)

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(c) Parts of the construction kit are made from aluminium.

Explain **two** reasons why aluminium could be considered a sustainable material.

(4)

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(d) The metal construction kits are manufactured in China and transported all around the world.

Figure 15 shows information about the construction kits.

Scale of production	Mass
Potential market	World wide
Life span	5 years
Intended market	Parents with children between 5 and 10 years old
Surface finish	Colour anodised

Figure 15

Analyse the information in Figure 15.

Evaluate the construction kits with reference to cultural and ethical factors including:

- suitability for intended market
- the consumer society
- built-in product obsolescence.

(9)

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Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 8 = 18 marks)

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





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