Candidate surname		Other names

Centre Number

Candidate Number

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

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 ▶

P 6 9 5 5 4 A 0 1 2 8

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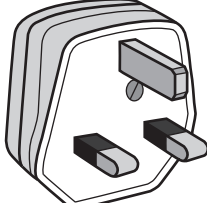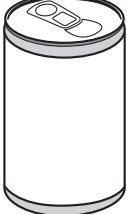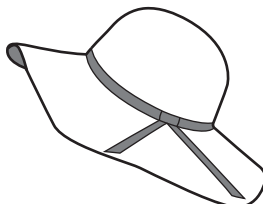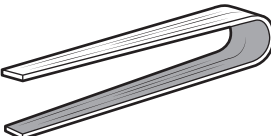
Picture of product	Material and product	Property
	Urea formaldehyde 3-pin plug	Insulator of electricity
	Aluminium drinks can	**(1)** (i) ....
	Felted wool fabric hat	**(1)** (ii) ....
	Tracing paper	**(1)** (iii) ....
	Laminated plywood salad servers	**(1)** (iv) ....

Figure 1

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

(2)

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....

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.

Book →

DT

Wall mounted book holder

Screwed to the wall through the front of the book holder
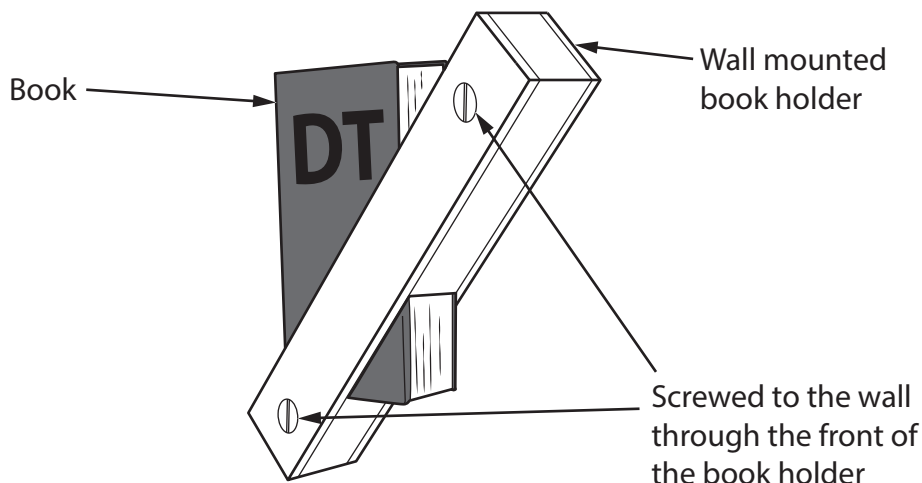
Figure 2

(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.

2 required at this length

|← 30 →|

1 required at this length

|← 40 →|
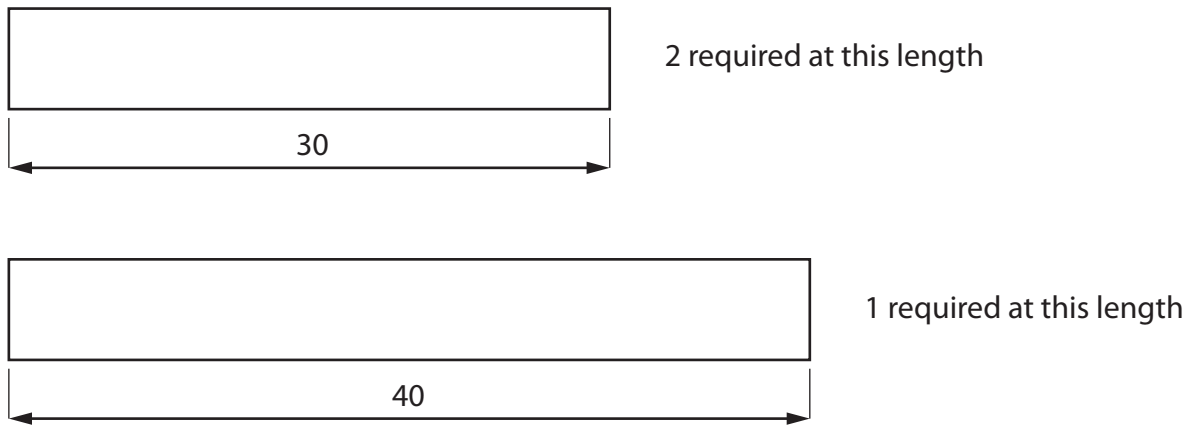
Figure 3

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 £1,200 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.
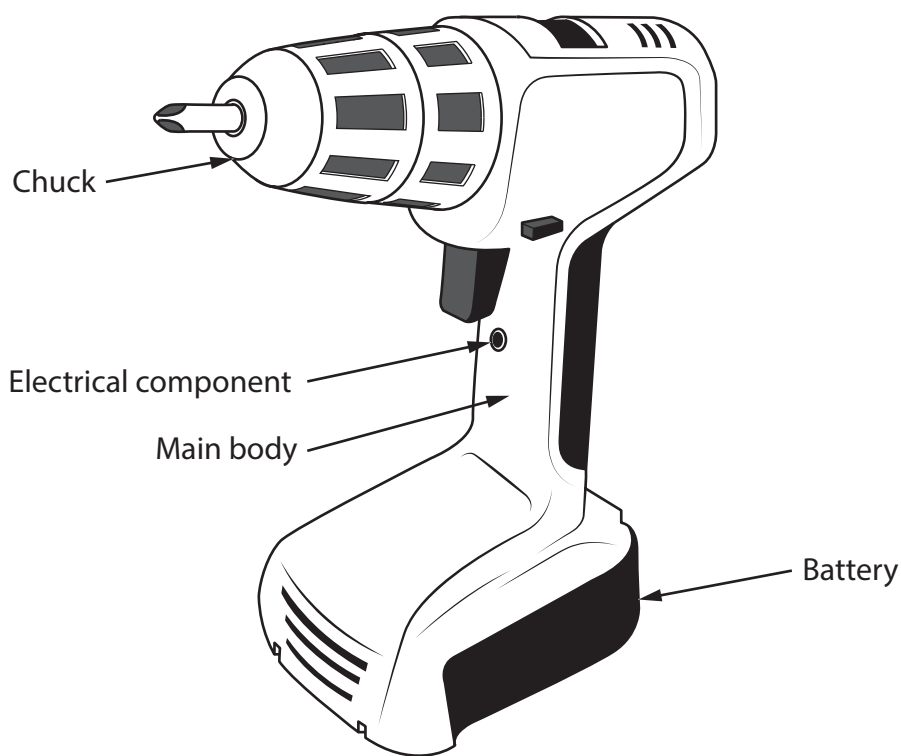
Circuit symbol for the electrical component

Figure 4

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

(1)

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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)

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

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

40T   20T   40T   20T

Driver gear   Driven gear
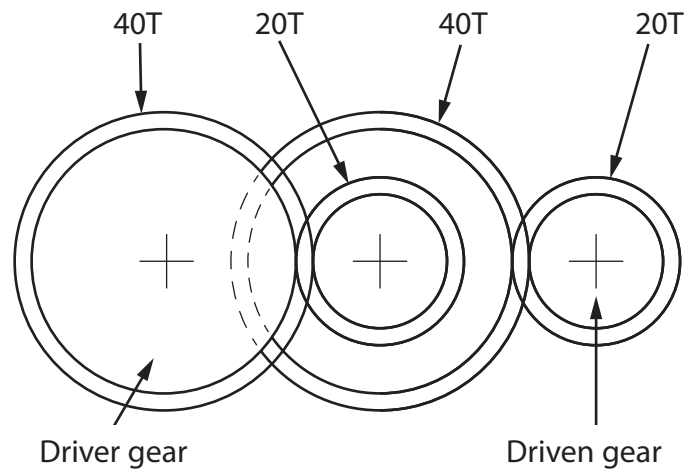
T = Teeth

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)

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....

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 ....

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2 ....

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(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 ....

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2 ....

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(b) A farmer requires 420 m² 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 ....

(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

Metals

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

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

Back plate

Full jar of peanut butter with the lid removed

Jar support

Additional information

R30

15

R35

PEANUT BUTTER

70
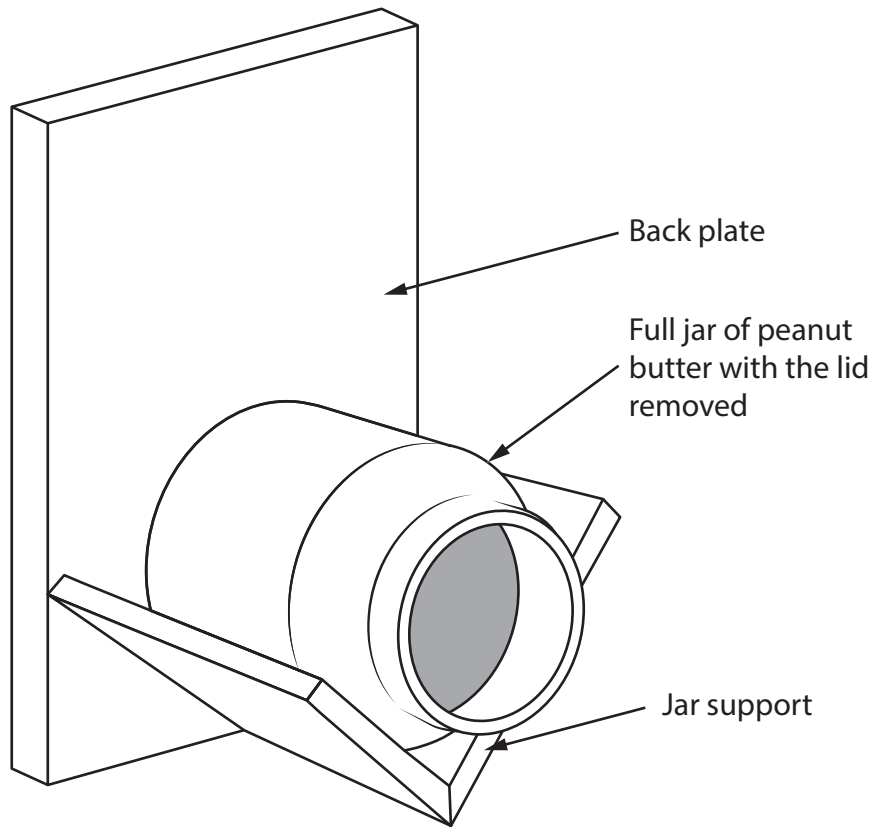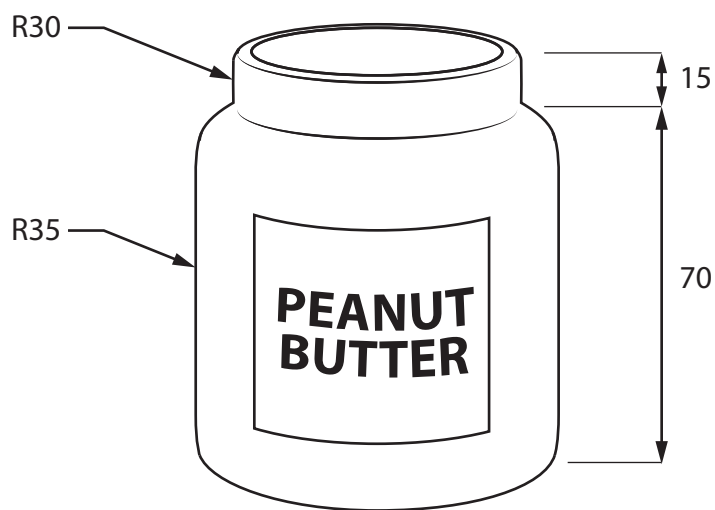
Dimensions of the jar of peanut butter in mm

Diagram not to scale

Figure 6

(a) The bird feeder holds a full jar of peanut butter and needs to be improved to include the following specification points.

The bird feeder must:

• prevent the jar from moving and allow an empty jar to be easily replaced

• include a cover that protects the back plate and jar support and keeps the jar dry

• 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 feeder 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)

Turn over ▶
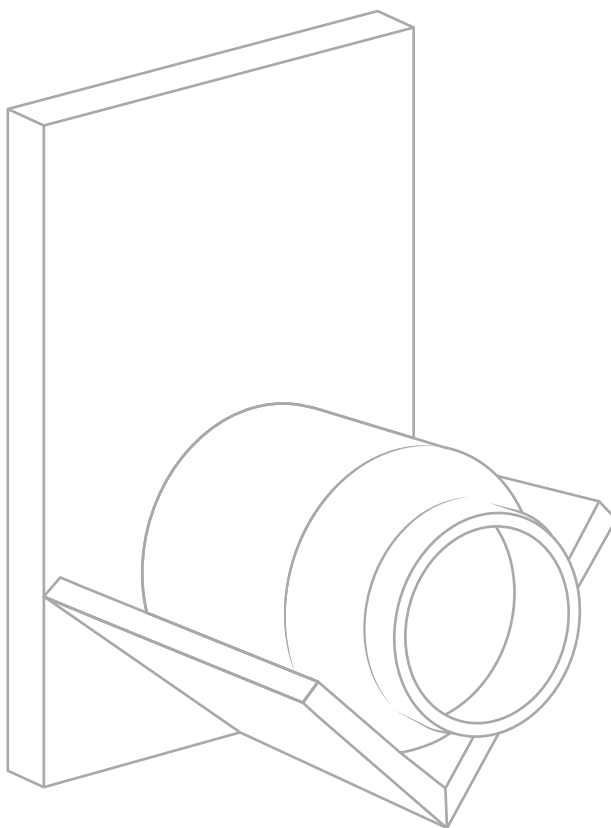
(b) Figure 7 shows a metal money box in the shape of a tea cup.

Slot for coins

See-through screen
on both sides
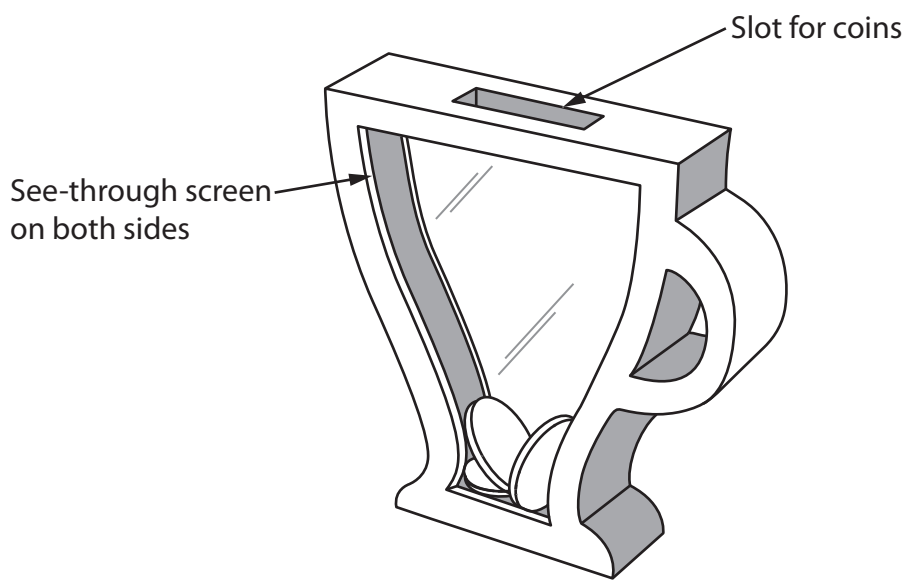
Figure 7

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

(4)

1 ....

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2 ....

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(Total for Question 5 = 10 marks)

6 Figure 8 shows a children's easel.

The front and back sections of the frame open using hinges and the uprights and rails are made from aluminium.

Paper is placed on the aluminium painting surface.

Upright

Top rail

Front section of frame

Back section of frame

Aluminium painting surface

Bottom rail
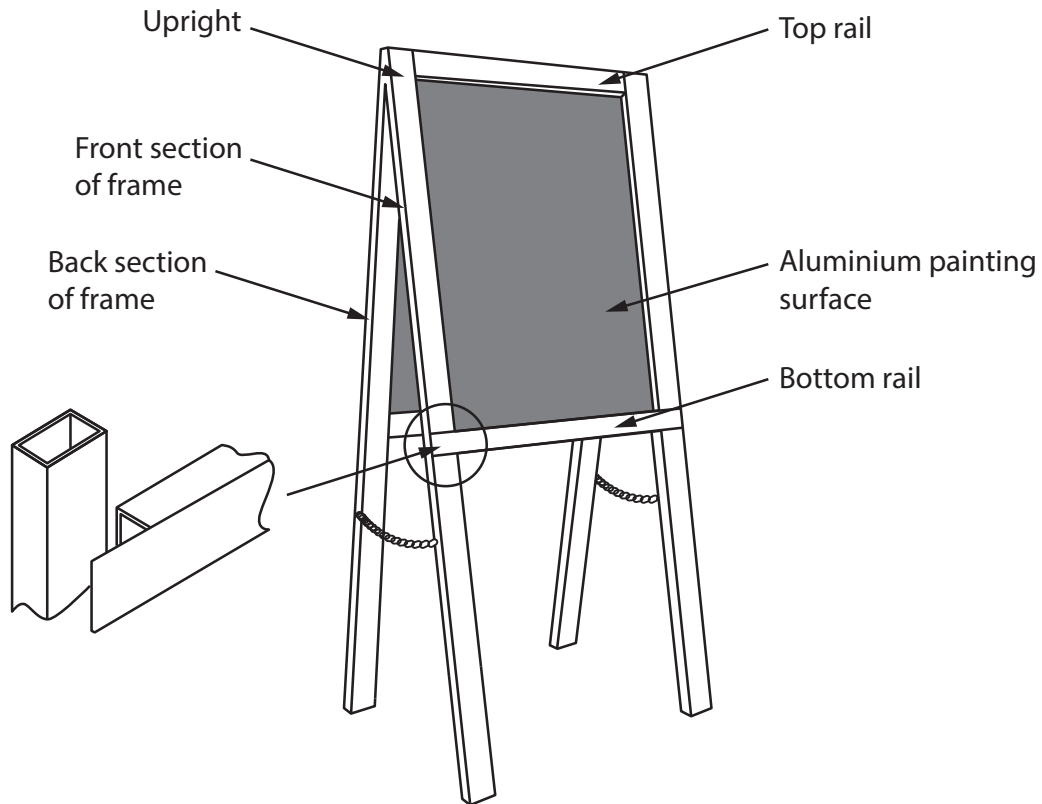
Figure 8

The aluminium for the painting surface is manufactured from a standard sized sheet.

(a) Explain **two** advantages for the manufacturer of using a standard sized sheet for the aluminium painting surface.

(4)

1 ....

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2 ....

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(b) Figure 9 shows an angle that has to be cut at the bottom of one of the uprights.

50 mm × 15 mm rectangular aluminium tube
1.5 mm wall thickness

To be cut off
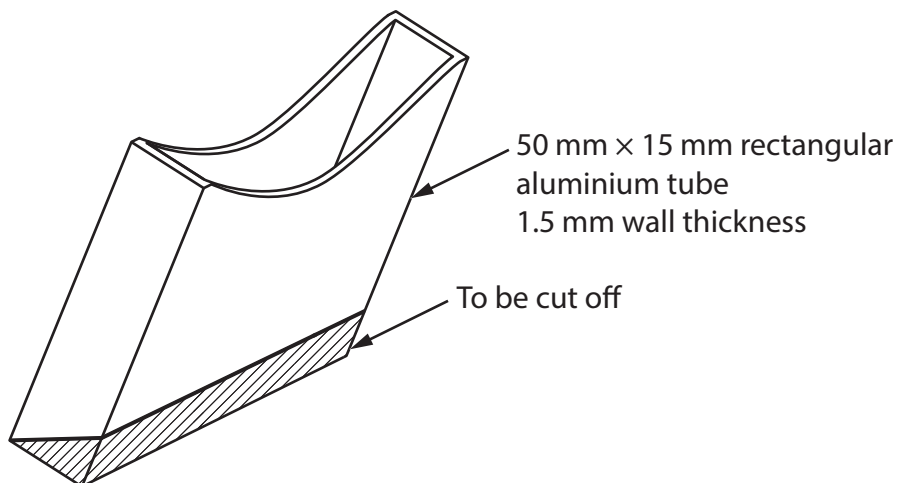
Figure 9

Use notes and sketches, in the space below, to show how the angle on the upright would be cut using hand tools.

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

(4)

(c) The frame of the children's easel has been finished with a powder coating.

Explain **one** reason why a powder coating has been applied to the frame of the children's easel.

(2)

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(d) Give **two** different methods that could be used to join the bottom rail and an upright on the easel.

For each method, explain **one** advantage of using the method to join the bottom rail and an upright on the easel.

(6)

Method 1

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Explanation

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....

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Method 2

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Explanation

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(Total for Question 6 = 16 marks)

7 Figure 10 shows a table lamp made from brass that holds a light fitting.

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

Top part

Light fitting
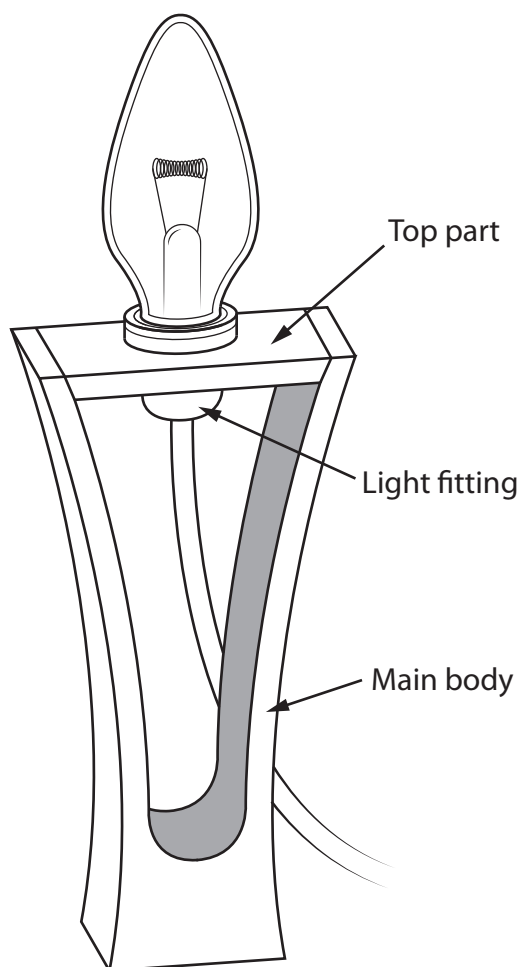
Main body

Figure 10

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

(1)

....

(b) Explain **two** working properties of brass that make it an ideal material for the table lamp.

(4)

1 ....

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2 ....

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P 6 9 5 5 4 A 0 1 9 2 8

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

The main body is manufactured from a single piece of brass.

Waste material

100

20

R15
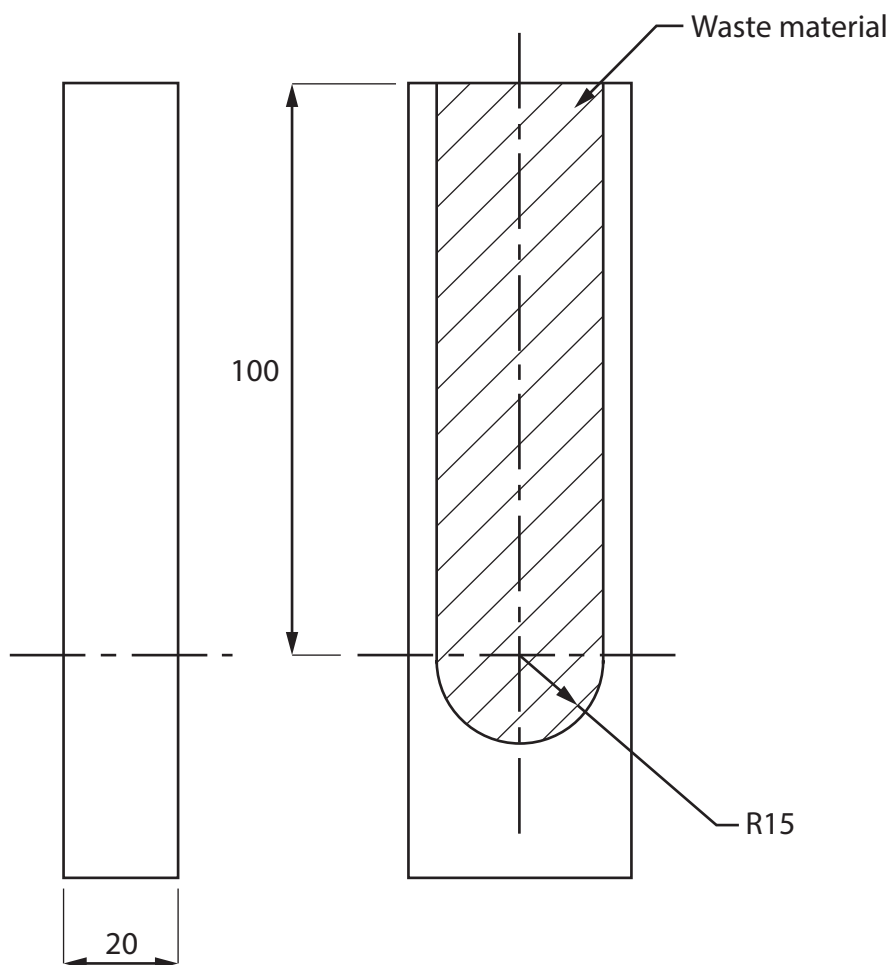
All dimensions are in mm

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 cm³.

Use $\pi = 3.142$

(5)

Answer .... cm³

The main body of the table lamp could be fabricated from separate pieces of brass rather than from a single piece.

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

(6)

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(Total for Question 7 = 16 marks)

8 Figure 12 shows a holder for salt and pepper pots that is manufactured from stainless steel.

The salt and pepper pots are placed in holes that are 9 mm deep.
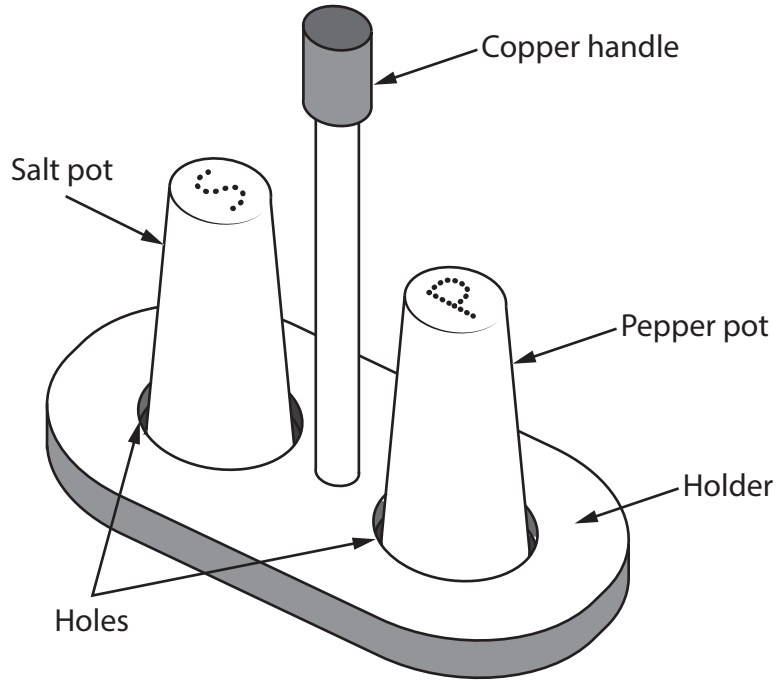
Figure 12

(a) Explain **one** benefit of manufacturing the holder from stainless steel.

(2)

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The holders are subjected to quality control checks during manufacture.

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

(3)

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(c) Explain **two** reasons for using a milling machine to manufacture the holders.

(4)

1 ....

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2 ....

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P 6 9 5 5 4 A 0 2 4 2 8

(d) The holder is manufactured from stainless steel and has a copper handle.

Figure 13 shows some additional information about the holder.

Source of copper handle	USA
Holder material	Stock sized 8 mm stainless steel plate
Potential market	Hotels, cafes and restaurants
Scale of production	Batch

Figure 13

Analyse the information in Figure 13.

Evaluate the holder 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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