Pearson Edexcel

GCSE (9-1) Design and Technology

Exemplars

Marked student responses with examiner commentary

GCSE Design and Technology (9-1) Exemplars

Give (1-mark)

Exemplar 1 – Question 1aiii

1 (a) The materials that products are made from are chosen because of their characteristics.

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	Description of product	Property
	Urea formaldehyde mains voltage plug	Insulator of electricity
	A corrugated board pizza box	(1) (iii) cheap

Examiner commentary

0 marks

The candidate has given a generic answer that is not a property of the material. Answers such as 'cheap' should be avoided where possible

Exemplar 2 – Question 1aiv

1 (a) The materials that products are made from are chosen because of their characteristics.

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	Description of product	Property
	Urea formaldehyde mains voltage plug	Insulator of electricity
	Copper plumbing pipe	(iv) Corrosion resistant

Examiner commentary

1 mark.

The candidate has correctly stated a specific property of copper that makes it a suitable material for use as a plumbing pipe. It is important that responses are related to the product in the question, as is the case in this example.

Name (1-mark)

Exemplar 1 – Question 2ai

(a) (i) Name the type of cam shown in Figure 4.

(1)

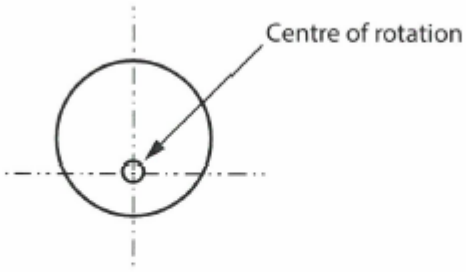


Figure 4

Type of cam:

Eccentric

1 mark.

The candidate has correctly named the specific type of cam shown in the diagram. There are a number of areas of the specification where materials and components are listed; it is important that candidates have knowledge and understanding of these.

Exemplar 1 – Question 7a

7 (a) The majority of polymers are manufactured using crude oil.

Name **one** country that crude oil can be sourced from.

(1)

Saudi arabia

1 mark.

The candidate has correctly stated one country where crude oil can be sourced from. Where a question asks a candidate to 'name' something, one word or short responses are acceptable. There is no requirement to answer in a sentence.

Calculate (2-marks)

Exemplar 1 – Question 1c

(c) Figure 2 shows a table of average daily costs related to running two types of light bulb.

Traditional filament bulb

LED Bulb

Bulb type	Average daily cost (Pence)
Traditional filament bulb	5.69 p
LED bulb	1.12 p

Figure 2

Calculate the percentage daily cost saving of using an LED bulb instead of a traditional filament bulb.

Give your answer to the nearest whole number.

(2)

5·69 | 100

1·12 | 19·7 (1dp.) ↓ 20% (whole number)

Answer: 20 %.

Examiner commentary

1 mark.

The first part of the calculation is incorrect, with the candidate not subtracting 1.12 from 5.69 to calculate the daily cost saving of an LED bulb. The second calculation is however correct and has been correctly rounded up. Candidates should always show their working out when completing calculations so that they are able to gain credit where it is appropriate.

Exemplar 2 – Question 3d

(d) In 2014, the worldwide denim market was valued at £144 million with demand estimated to grow at 8% annually.

Calculate what the worldwide value of the denim market will be in 2016.

Give your answer to the nearest whole number.

(2)

1·08 × 144 = 155·52

1·08 × 155·52 = 167·9616 ≃ 168

£168 million.

Examiner commentary

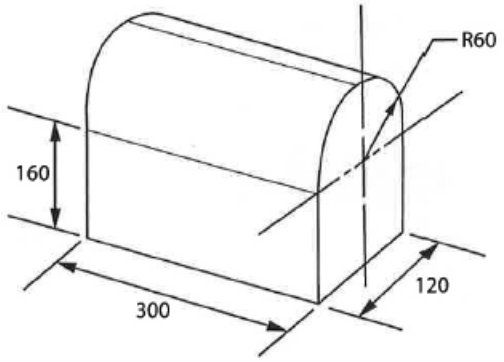
2 marks

The candidate has completed the correct calculation, showing their working clearly. They have calculated the correct answer and also rounded this up correctly.

Calculate (5-marks)

Exemplar 1 – Question 7c (papers and board)

(c) Figure 16 shows a dimensioned drawing of the packaging.



All dimensions in mm

Figure 16

120 x 160 = 19200 x2 = 38400

300 x 160 = 48000 x2 = 96000

300 x 120 = 36000

2πr = 2(3.142) x 60 = 377.04 ÷2 x 300 =

56556

38400 + 96000 + 36000 + 377.04

56556

~~= 170777.04.~~

~~170777.04 x 10 = 1707770.4,~~

= 226956ml x10 = 2269560ml.

Calculate the volume of UV varnish required to coat the exterior of 10 boxes with one coat, in millilitres (ml).

Ignore any flaps, tabs and wastage that might occur due to drips and spillages.

Give your answer to two decimal places.

Area of a circle = πr^2

Circumference of a circle = $2 \pi r$

Use $\pi = 3.142$

1 litre of UV varnish covers 18 m^2

(5)

$\frac{\pi r^2}{2}$ = Area of a semi-circle.

$\frac{\pi (60)^2}{2} = \frac{3.142 \times (60)^2}{2} = \frac{3.142 \times 3600}{2} = 565516$

$5,655.16 \times 300 =$ Area of a semicircle cylinder

$= 1,696,680$

W x B x h = rectangle area.

~~W 300~~

~~120 x 300 x 160 = 576~~

Answer 2269560.00 ml

Examiner commentary

4 marks

In this example, the candidate has completed the majority of the calculation however they have not divided the total surface area by the amount of coverage each litre of varnish. There are some rounding errors in some stages of the calculation, however calculation questions allow for 'error carried forward (ECF)' so that candidates are not penalised for mistakes at earlier stages of their working.

Exemplar 2 – Question 7b (Metals)

(c) Figure 16 shows a dimensioned drawing of one top arch.

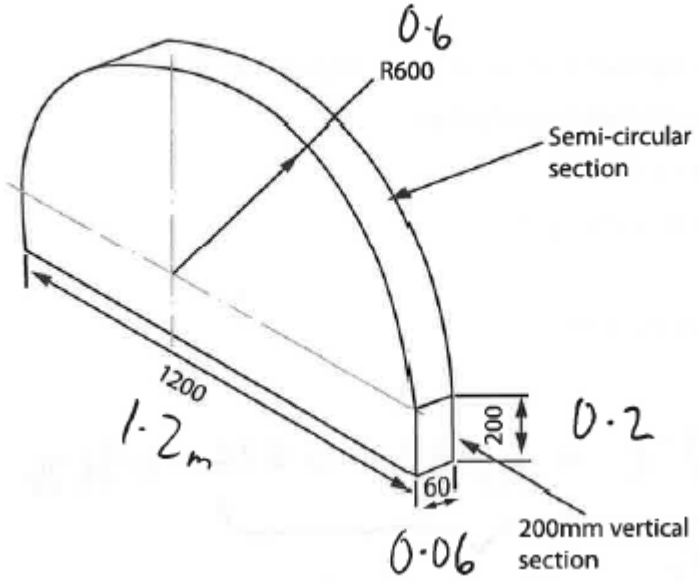


Figure 16

All dimensions in mm

$\pi r \times 0.06$

$= 0.036\pi$

$2\times$ ⌒ $= \frac{1}{2}\pi r^2$

$= 0.36\pi \text{ m}^2$

$2\times$ □ $= 2 \times 0.2 \times 0.06$

$= 0.024 \text{ m}^2$

$2\times$ ▭ $= 2 \times 0.2 \times 1.2$

$= 0.48 \text{ m}^2$

$1\times$ ▭ $= 0.06 \times 1.2$

$= 0.072$

Calculate the volume of paint required to coat five top arches with one coat, in millilitres (ml).

Ignore any wastage that might occur due to drips and spillages.

Give your answer to two decimal places.

Area of a circle = πr^2

Circumference of a circle = $2 \pi r$

Use $\pi = 3.142$

1 litre of paint covers 7 m^2

(5)

$0.072 + 0.48 + 0.024 + 0.36\pi$

$(5 \times 0.576 m^2) + (5 \times 0.36\pi)$

$2.88 + 1.8\pi + 0.18\pi$

$2.88 + 1.98\pi$

$2.88 + 6.22 = 9.1 m^2$

$\frac{9.1}{7}$

$= 1300 ml$

Examiner commentary

5 marks

In this example, the candidate has completed the unit conversion as the first stage of the calculation, and has then calculated the areas of each of the pieces that are to be painted. These have been correctly added together to find the total area. Finally, the candidate has divided this area by the coverage from one litre paint to find the total amount of paint needed.

Note that the candidate has not performed the calculations as set out in the mark scheme; this is acceptable and candidates will not be penalised for following alternative approaches. Some aspects of the candidate's answer have been included in areas that are not part of the answer space, which may result in work being missed by examiners. It is important that candidates show their working and their final answers in the spaces provided for answers.

Describe (2-marks)

Exemplar 1 – Question 2aii

2 Figure 3 shows a drawing of a mechanical toy that uses a cam.

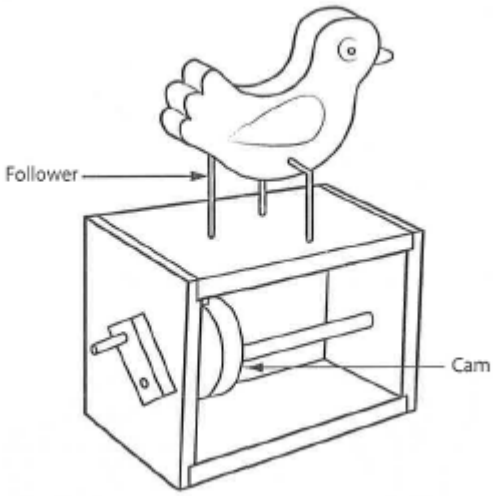


Figure 3

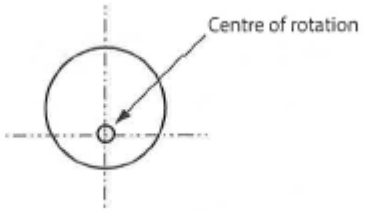


Figure 4

(ii) Describe the movement of the bird in Figure 3 as the cam rotates.

The follower will move in a reciprocal motion so the back of the bird will move up and down.

Examiner commentary

2 marks.

The candidate has shown some understanding of reciprocal motion which is representative of the second half of second bullet point in the mark scheme 'follower goes up and down'. The second mark can be awarded as the candidate has stated that 'the back of the bird going up and down' which is an appropriate interpretation of 'rocking'.

Exemplar 2 – Question 2aiii

(iii) Describe the effect on the movement of the bird if the cam shown in Figure 3 is replaced by a drop (snail) cam.

[2]

The bird will gradually move up and down slowly.

Examiner commentary

0 marks.

The candidate has not recognised that the movement of a snail cam involves a gentle rising motion followed by a sudden dropping action. The description offered by the candidate is somewhat generic and would be more representative of either an eccentric cam or a pear-shaped cam.

Explain (2-marks)

Exemplar 1 – Question 3b

(b) Explain **one** reason for manufacturing the mobile phone pocket hangers in small batches.

[2]

There may not be many recycled jeans around because people don't want to throw their stuff away.

Examiner commentary

1 mark.

There is some recognition by the candidate that there may only be a limited supply of jeans available for use, which is linked to the first part of bullet point 1 in the mark scheme and can be awarded one mark.

Exemplar 2 – Question 3c

(c) The company that makes the mobile phone pocket hangers was funded by a government start-up loan.

Explain **one** advantage of government funding for new business start-ups.

(2)

You get all the money you need and can pay it back over a fixed time.

Examiner commentary

0 marks.

When answering questions, it is important that candidates link their answers to the scenarios or specific details given in the question. In this example, the concept that the candidate is referring to is correct, but it is not linked to government start-up loans. As a result, no credit can be given to the candidate for their response.

Explain (2+2-marks)

Exemplar 1 – Question 6a (Textiles)

(a) Explain **two** advantages of manufacturing the jacket by bonding the seams together rather than by using any form of stitching.

(4)

1 If the seams where stitched together the needle would make tiny holes in the fabric which may let water pass through to the wearer, bonding the seams heat seals them and so would stop these holes being made.

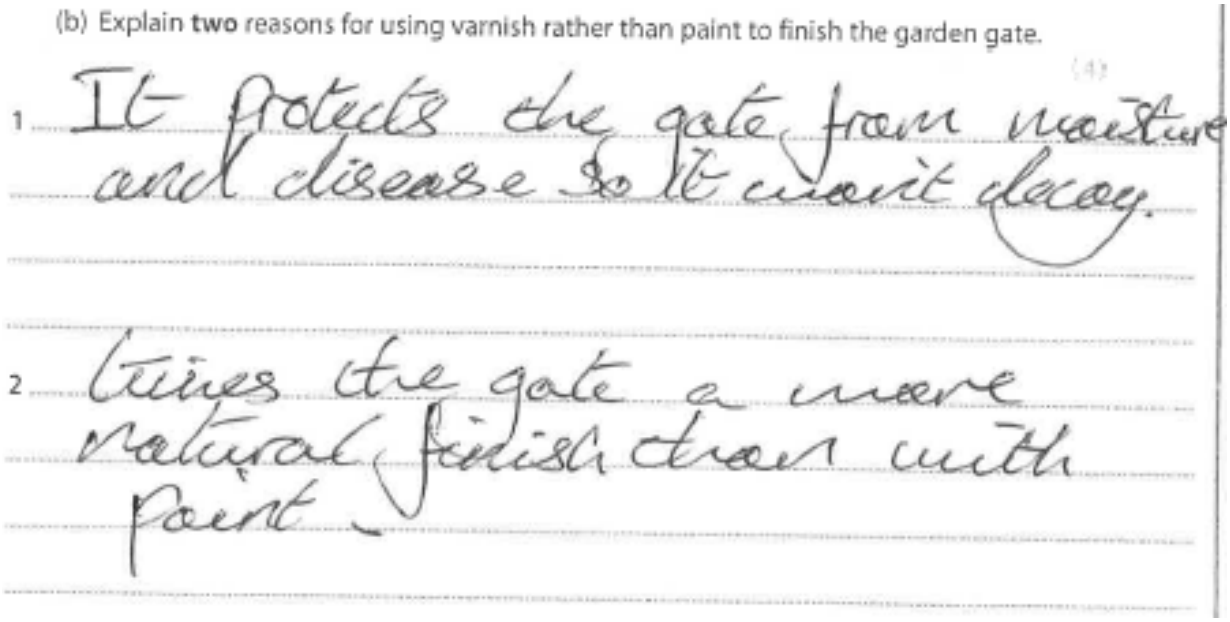
2 Bonding allows different materials to be attached together so the cotton lining could be attached to the synthetic outer fabric.

Examiner commentary

4 marks.

Where a question asks for two explanations, it is important that the explanations offered by the candidate in their response are sufficiently different in order to be able to access all of the marks available. In this example, the candidate has recognised two pertinent advantages of bonding over stitching for the seams of the jacket. The answers related to bullet points 1 and 3 in the mark scheme and are sufficiently different to allow access to all of the marks awardable for the question.

Exemplar 2 – Question 7b (Timbers) (89)


(b) Explain **two** reasons for using varnish rather than paint to finish the garden gate.

(4)

1 It protects the gate from moisture and disease so it won't decay.

2 Gives the gate a more natural finish than with paint.

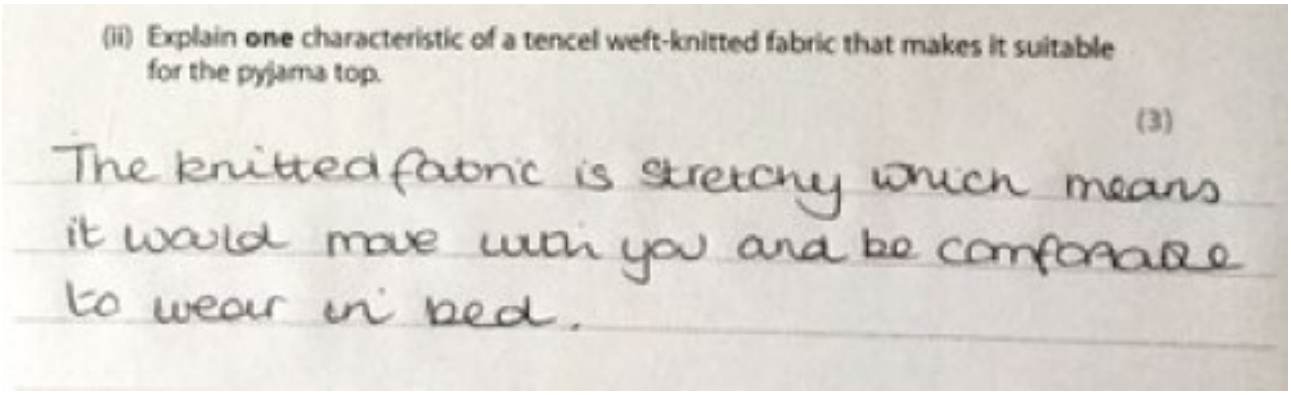
Examiner commentary

1 mark.

Where a question provides candidates with specific information, such as in this example where a comparison is needed between varnish and painting, the answers to be given must show some discrimination between the two finishes involved. In this example, the first response gains no credit as the statement would equally apply to paint as it does to varnish. One mark can be awarded for the second response that references the oak being enhanced which would not be the case with a paint finish. No further expansion or justification has been offered therefore no further mark can be awarded.

Explain (3-marks)

Exemplar 1 – Question 8aii (Textiles)



(ii) Explain **one** characteristic of a tencel weft-knitted fabric that makes it suitable for the pyjama top.

(3)

The knitted fabric is stretchy which means it would move with you and be comfortable to wear in bed.

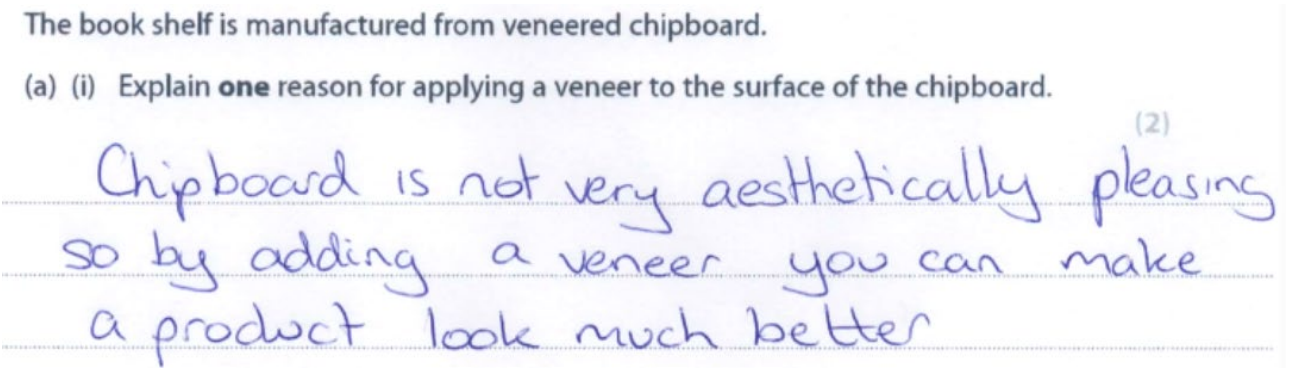
Examiner commentary

2 marks.

The candidate has provided a linked response that makes reference to the knitted fabric being stretchy which means it would move with you and be comfortable to wear in bed. These are both part of the same marking point. In order to achieve the third mark a further linked response would be needed. For example, stating that the pyjama top would be 'easy to put on/take off'.

Where an explain type question is worth three marks, the initial lead point needs to be justified and expanded upon.

Exemplar 2 – Question 8ai (Timbers)



The book shelf is manufactured from veneered chipboard.

(a) (i) Explain **one** reason for applying a veneer to the surface of the chipboard.

(2)

Chipboard is not very aesthetically pleasing so by adding a veneer you can make a product look much better

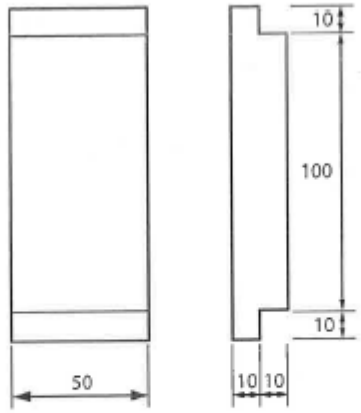
1 mark.

The candidate has recognised that chipboard is not aesthetically pleasing. However, they have not indicated why or how it is not aesthetically pleasing. They have expanded on their answer by stating that veneer will make the product look much better, which is an interpretation of the second part of bullet point 1 in the mark scheme. One mark can be awarded for this. To be able to be awarded the second mark, the candidate would have needed to state why chipboard is unattractive.

Draw (4-marks)

Exemplar 1 – Question 2b

(b) Figure 5 shows an orthographic drawing of one of the pieces of the mechanical toy.

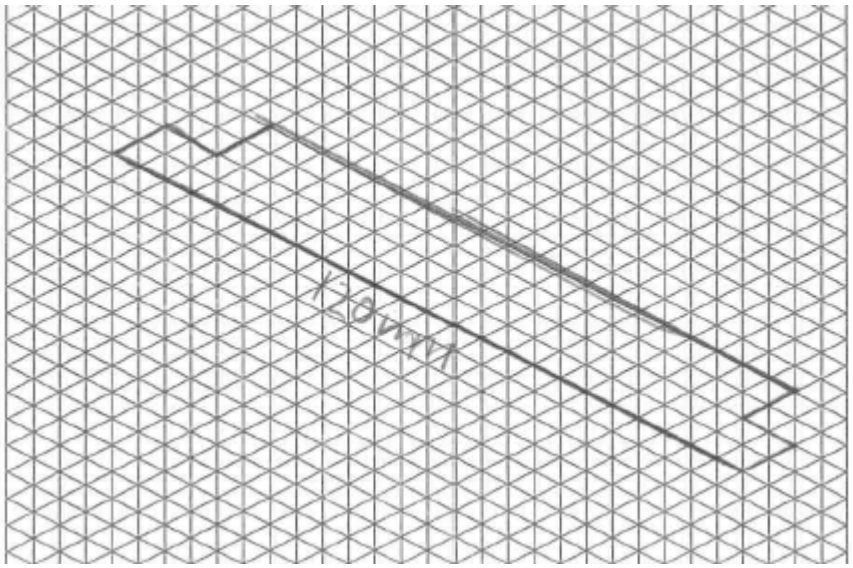


Not to scale
All dimensions in mm

Figure 5

Draw an accurate full-sized view of the piece shown in Figure 5.

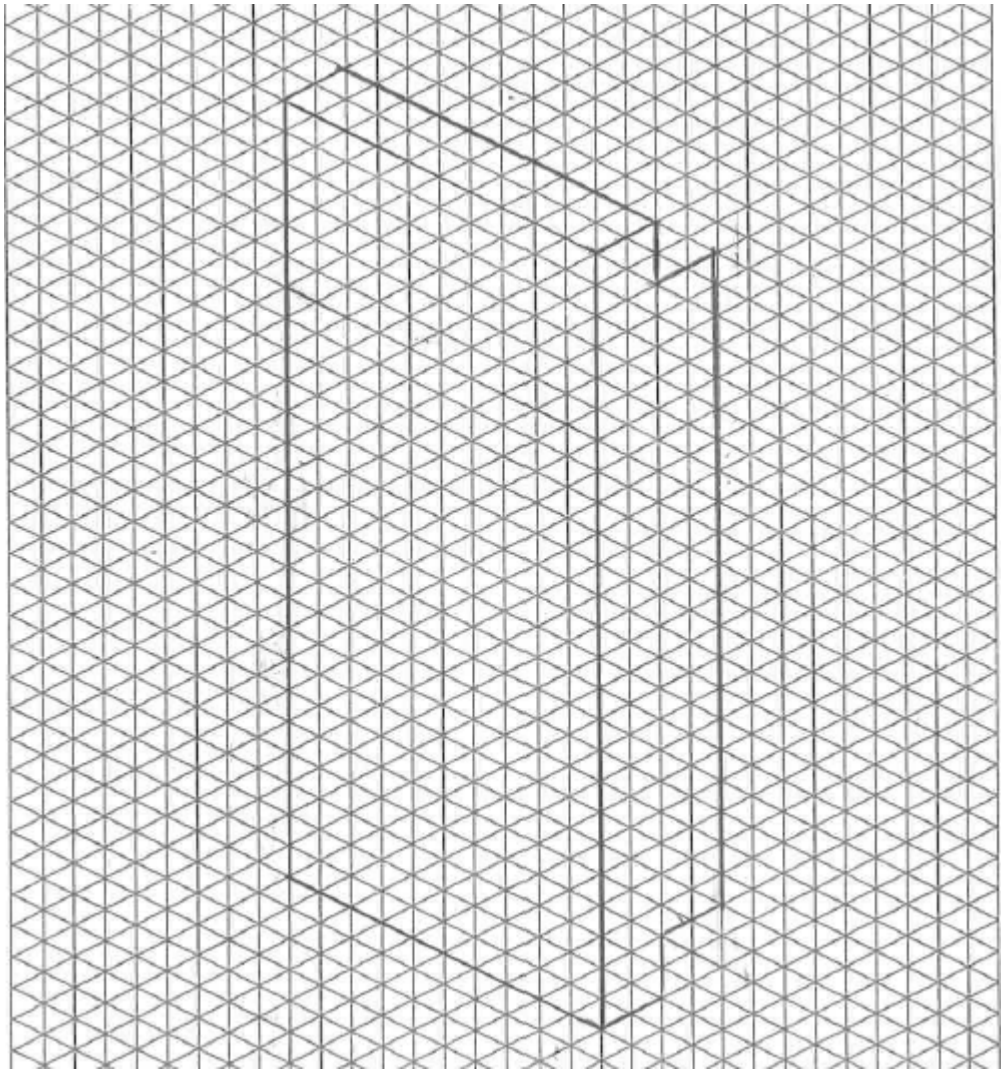
Use the grid provided on the opposite page.



Examiner commentary

2 marks.

The candidate has started to draw the part using the isometric grid provided. They have been awarded one mark for the correct length of the part of 120 mm, and one further mark for the 10x10 mm rebates at each end of the part. Note that the candidate has used the grid effectively.



Examiner commentary

3 marks.

The candidate has started to draw the part using the isometric grid provided. They have not drawn the length of the part with accuracy, it should be 120 mm but the candidate has drawn this as 125 mm. The height and width of the part are however both accurate and have been awarded one mark each, with one further mark for the 10x10 mm rebates at each end of the part. Note that the candidate has used the space provided on the grid effectively. It is important that where grids or similar are provided, that drawings are set out to make effective use of this space.

Discuss (6-marks)

Exemplar 1 – Question 4c

(c) Figure 9 shows the percentage of aluminium manufactured by countries in 2014.

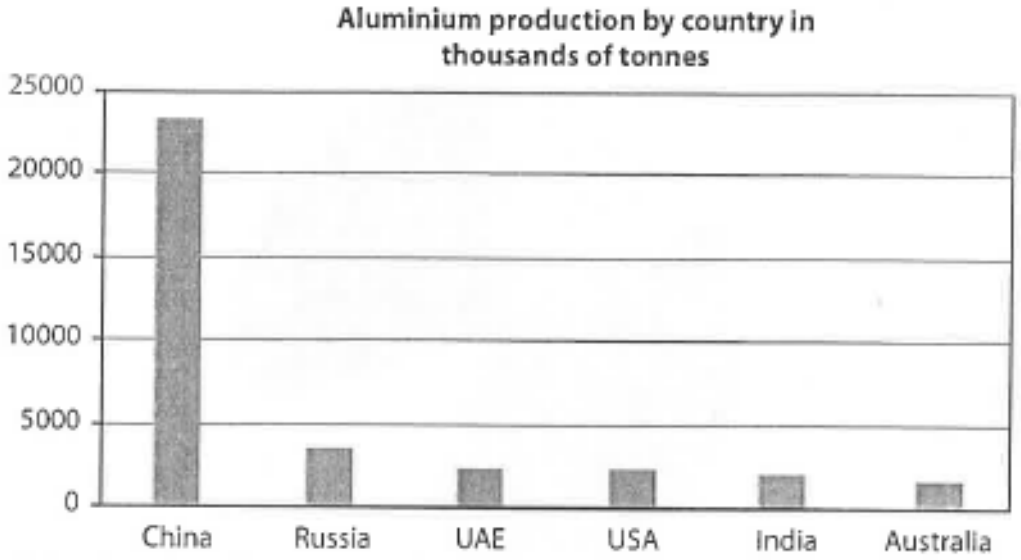


Figure 9

Discuss the environmental, social and economic issues that relate to the manufacture of aluminium.

Use the data in Figure 9 to support your answer.

(6)

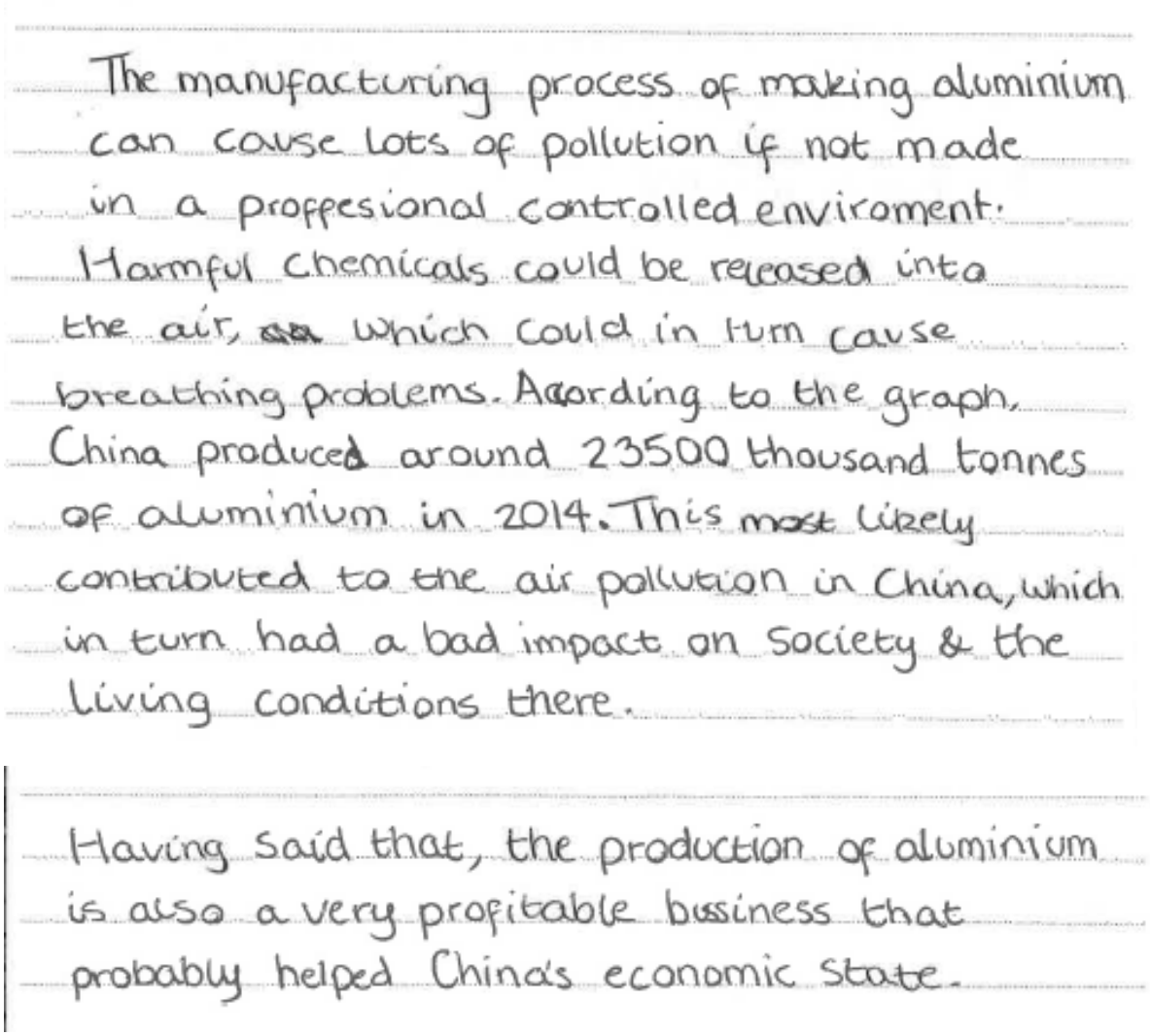
The country that produces the most aluminium is China. This is bad because China has a massive population all crammed into quite a small country. However, Russia is massive country meaning the population is spread out (sparsely populated). Due to how deresely populated China is people have to wear masks to stop them from breathing in the pollution in the air. All of this pollution is caused by the thousands of factories in China.

Examiner commentary

Mark Band 1.

The candidate has, to some extent, interpreted the information provided in the question, however there are few links between the data and the social, environmental and economic issues associated with aluminium production. There is a limited consideration of pollution affecting densely populated areas however some of this is based on inaccurate assumptions. The candidate has given an unbalanced answer which limits the marks awardable to band one.

Exemplar 2 – Question 4c


The manufacturing process of making aluminium can cause lots of pollution if not made in a proffesional controlled enviroment. Harmful chemicals could be released into the air, which could in turn cause breathing problems. According to the graph, China produced around 23500 thousand tonnes of aluminium in 2014. This most likely contributed to the air pollution in China, which in turn had a bad impact on society & the living conditions there.

Having said that, the production of aluminium is also a very profitable bussiness that probably helped China's economic state.

Examiner commentary

Mark Band 2.

The candidate has demonstrated that they have some understanding of the factors involved, with both environmental and economic points being made in the response. There is an attempt to Interrogate and deconstruct the provided information, with some connections being made. The candidate has not referenced the links between pollution and breathing problems, but has nonetheless provided a concise and sophisticated answer. Unfortunately, it is limited in scope which limits the response to mark band 2.

Analyse and Evaluate (9-marks)

Exemplar 1 – Question 8c (Textiles)

(c) The pyjamas are manufactured in China and sold all around the world.

Figure 19 shows information about the pyjamas.

Pyjama top	Tencel® fibres
Pyjama bottoms	Raised cotton fabric
Potential market	Worldwide
Target market group	Parents, children (3 to 8-years-old)
Life span	1-2 years

Figure 19

Analyse the information in Figure 19.

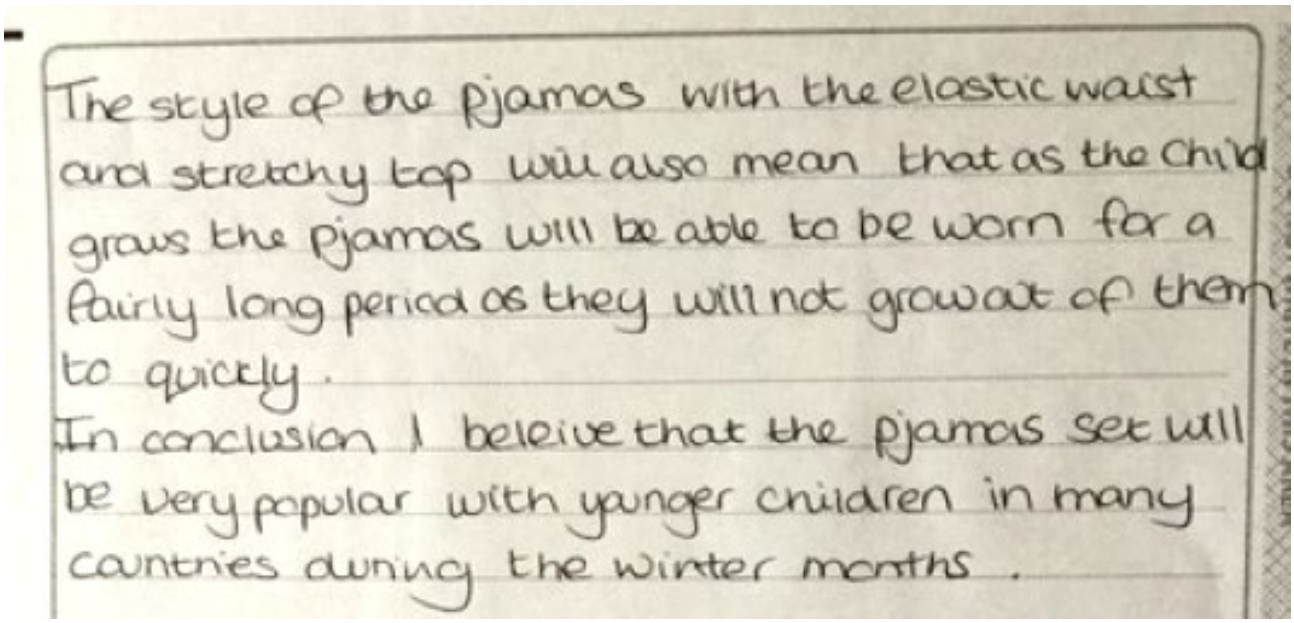
Evaluate the pyjamas with reference to social factors including:

- use for different social groups – teddy for young children. childish for older
- trends / fashion
- popularity – teddy comfy warm unisex

(9)

The pjamas have a large picture of a teddy bear on them which would proberly appeal to younger children in many different countries instead of say a phrase written in a language that may not be understood. The teddy bear may not appeal to older children as they may find the image quite childish.

The style of the pjamas looks like they would be most suited to being worn in the winter months when it is colder as the top has a high neck and long sleeves and the pjama bottoms are long. The fabrics used are also more suited to being worn in colder weather as the weft-knitting and raised cotton fabric would naturally trap air and insulate the wearer


The style of the pjamas with the elastic waist and stretchy top will also mean that as the child grows the pjamas will be able to be worn for a fairly long period as they will not grow out of them to quickly.
In conclusion I beleive that the pjamas set will be very popular with younger children in many countries during the winter months.

Examiner commentary

Mark Band 2.

The candidate has demonstrated good technical knowledge around the target audience and social groups and also the technical use of the fabric. However, trends and fashion has been mostly overlooked which is key requirement of the question, therefore the response cannot be considered well balanced and therefore not able to access mark band 3. There is a short conclusion which is partially supported by the reference to 'winter months' which is appropriate for a mark band 2 response.

Exemplar 2 – Question 8c (Timbers)

(c) The flat-pack book shelf is manufactured in Sweden and sold all around the world.

Figure 19 shows information about the flat-pack book shelf.

Finishing method	Veneering
Construction method	Knock down fittings
Material source	Chipboard made from recycled wood chip and fibre, veneers
Potential market	Worldwide
Life span	5-10 years

Figure 19

Analyse the information in Figure 19.

Evaluate the flat-pack book shelf with reference to social factors including:

- use for different social groups
- trends / fashion
- popularity.

(9)

is produced world wide so is available to anyone. Some groups like environmental groups may be more interded as it is made from reycled materials, has a long life span so people know that it will be high quality making it more popular with people who want something reliable.

Examiner commentary

Mark Band 1.

This candidate response is rather limited and only takes into account environmental groups which can be considered to be a social group. To achieve marks in the higher mark bands a candidate would need to consider each of the three social factors listed in the question and also make reference to the five pieces of information in Figure 19. In order to reach the higher mark bands, candidates need to analyse the information, then consider

the links between the factors and finally arrive at a conclusion that is justified by judgements they have made.

Notes and Sketches (6-marks)

Exemplar 1 – Question 5a (Metals)

5 Figure 10 shows a design solution for a restaurant menu holder made from steel.

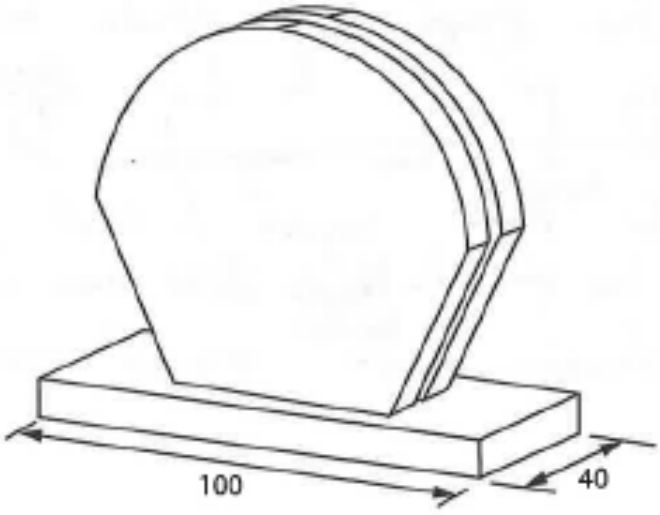
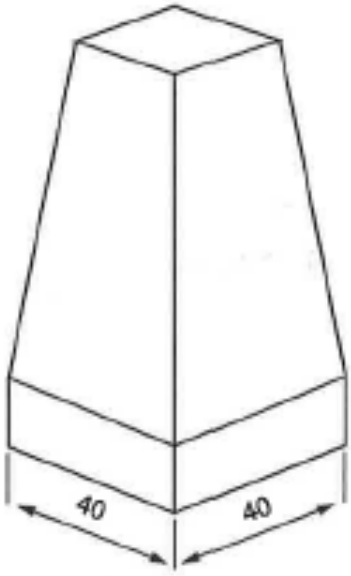


Figure 10

Additional information: salt and pepper pot



All dimensions in mm

(a) The menu holder needs to be improved to include the following specification points.

The menu holder must:

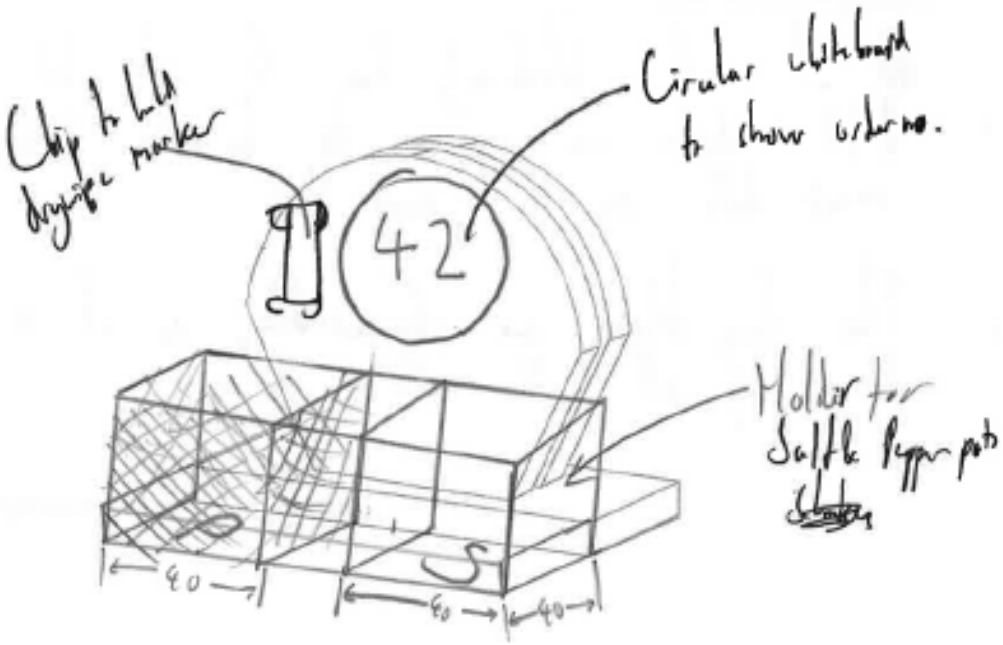
- provide a method to show the order number for each customer than can be changed easily for new customers
- allow secure and stable storage of salt and pepper pots
- must not damage the restaurant table top when being placed or moved around.

Use notes and sketches to show how the menu holder 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)



Examiner commentary

3 marks awarded.

The candidate has been awarded marks as follows for meeting, or failing to meet, the given specification points.

Point 1 - 2 marks awarded for the circular whiteboard and marker. These are clearly linked in terms of their use and application.

Point 2 - 1 mark has been awarded for the salt and pepper holders which will be clearly held given the depth of the cubes shown graphically. Although the boxes are dimensioned at 40mm^2, it might be more convincing to have made the squares 42mm to allow for some clearance.

Point 3 has not been met as there is no clear method shown that would prevent damage to the table.

Exemplar 2 – Question 5a (Systems)

(a) The door alarm needs to be improved to include the following specification points.

The door alarm must:

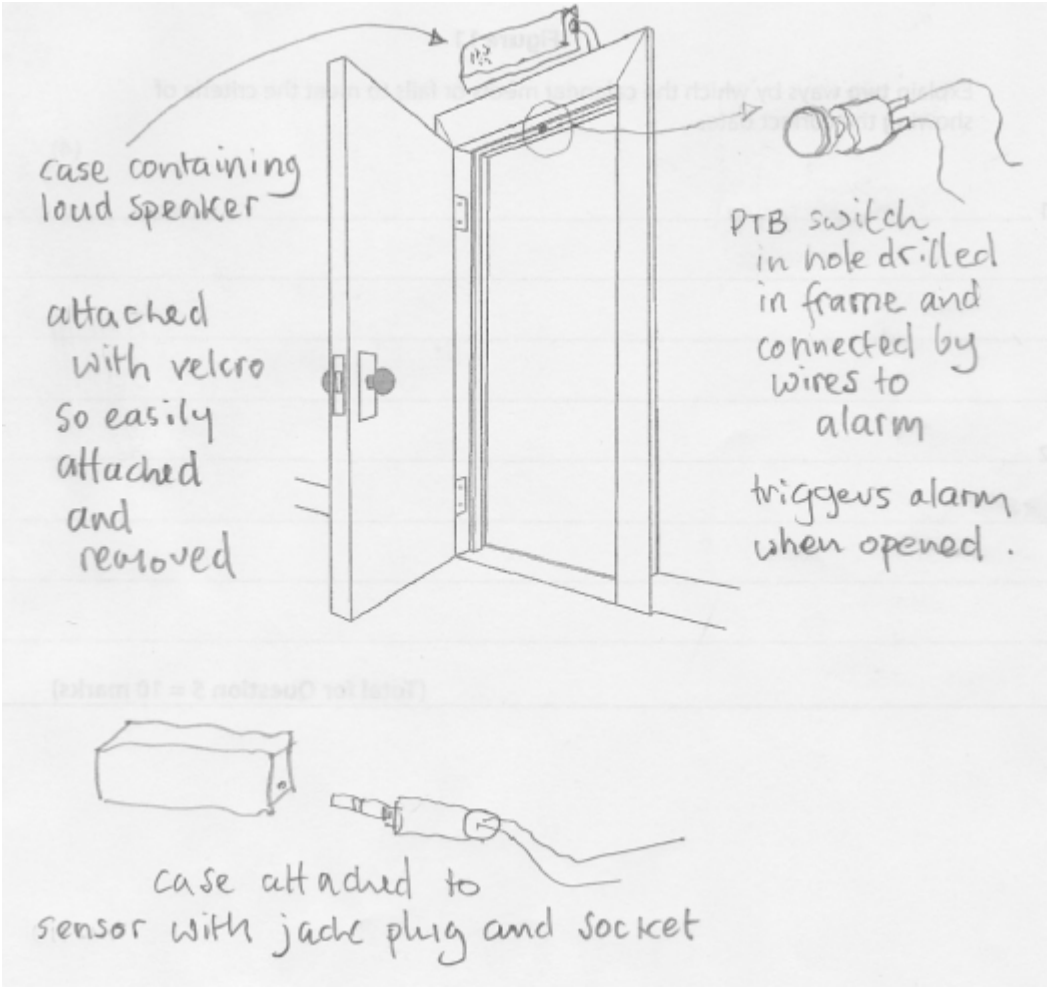
- be able to sense when the door is open and closed during light and dark conditions
- have an audible method of alerting the owner when the door is opened
- be securely attached and removable.

Use notes and sketches to show how the door alarm 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 door frame to show your modifications

(6)



Examiner commentary

5 marks awarded.

The candidate has been awarded marks for meeting the majority of the specification points. Only 1 mark has been awarded for specification point 1 as the candidate has not fully explained as to how

the push to break switch works in both the light and the dark. The candidate needs to be explicit in the description that it is mechanical device rather than dependent on light/dark sensing.

Notes and Sketches (4-marks)

Exemplar 1 – Question 6b (Timbers) 89

(b) Figure 13 shows a forstner bit which is used on a pillar drill to make the 20 mm deep hole for the candle.

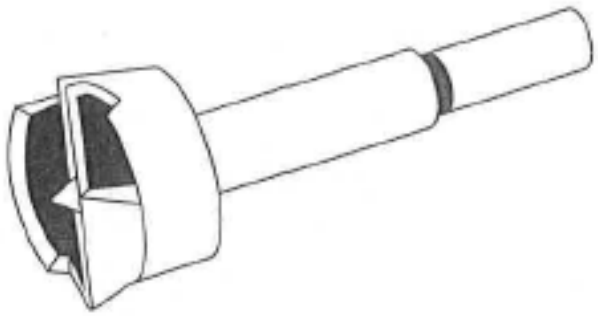


Figure 13

Use notes and sketches to show how you would set up the pillar drill to drill the hole for the candle when making a batch of 50 identical candle tea-light holders.

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

Fix the drill part in. Mark where the center of the drill is being placed on the piece of timber*. Hold the timber in place with clamps. Do multiple sections at a time of different products

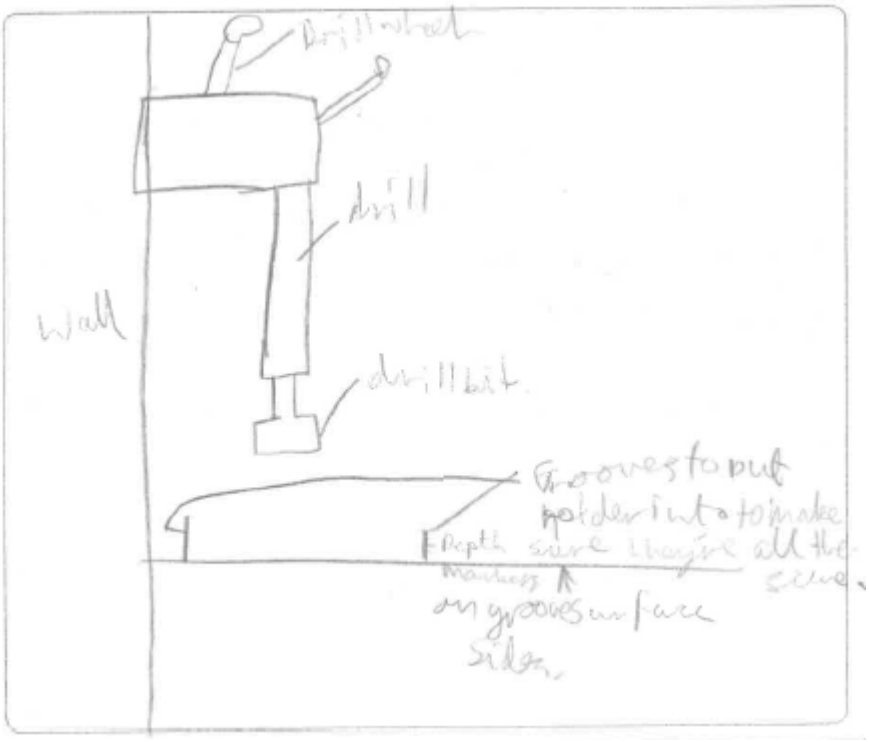
* mark how far down the drill has to go so you have a rough idea

Examiner commentary

1 mark awarded.

The candidate has included some reference to holding the timber in place. However, in this response the candidate runs the risk of not accessing all of the marks here as the question refers to notes and sketches. Where notes and sketches are asked for in the question, candidates should make sure both feature in their answers.

Exemplar 2 – Question 8c (Timbers)



Examiner commentary

2 marks awarded.

The candidate has referenced two of the marking points from the mark scheme in their answer. One mark can be awarded for reference to the grooves to put the holder in to make sure they are all the same (jig) for bullet point two, whilst a further mark can be awarded for reference to depth markers which relates to bullet point three in the mark scheme.