

# Example Candidate Responses

## Paper 1

### Cambridge International AS & A Level Design & Technology 9705

For examination from 2016



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## Introduction

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The main aim of this booklet is to exemplify standards for those teaching Cambridge International As and A Level Design and Technology (9705), and to show how different levels of candidates' performance (high, middle and low) relate to the subject's curriculum and assessment objectives.

In this booklet candidate responses have been chosen to exemplify a range of answers. Each response is accompanied by a brief commentary explaining the strengths and weaknesses of the answers.

Each essay is annotated with clear explanation of where and why marks were awarded or omitted. This, in turn, followed by examiner comments on how the answer could have been improved. In this way it is possible for you to understand what candidates have done to gain their marks and what they will have to do to improve their answers. At the end there is a list of common mistakes candidates made in their answers for each question.


This document provides illustrative examples of candidate work. These help teachers to assess the standard required to achieve marks, beyond the guidance of the mark scheme. Some question types where the answer is clear from the mark scheme, such as short answers and multiple choice, have therefore been omitted.

The Mark schemes used here are available to download as a zip file from Teacher Support as the Example Candidate Responses Files. These files are:

| <b>Question Paper 12, November 2016</b> |                    |
|---|--------------------|
| Question paper                          | 9705_w16_qp_12.pdf |
| Mark scheme                             | 9705_w16_ms_12.pdf |
| <b>Question Paper 32, November 2016</b> |                    |
| Question paper                          | 9772_w16_qp_32.pdf |
| Mark scheme                             | 9772_w16_ms_32.pdf |

Past papers, Examiner Reports and other teacher support materials are available on Teacher Support at <https://teachers.cie.org.uk>

## How to use this booklet

| Example candidate response – high  | Examiner comments   |
|--|---|
| <p>Section A</p>  <p>Hexagonal nut. ①</p> <p>Answers by real candidates in exam conditions. These show you the types of answers for each level.</p> <p>Discuss and analyse the answers with your learners in the classroom to improve their skills.</p> <p>long tape is used<br/>at appropriate length</p> <p>Note: Case must be taken to</p> | <p>① The candidate has shown a 3D view of the nut as the question requests.</p> <p><b>Examiner comments</b> are alongside the answers, linked to specific part of the answer. These explain where and why marks were awarded. This helps you to interpret the standard of Cambridge exams and helps your learners to refine exam technique.</p> |

### How the candidate could have improved the answer

In all three parts technical language was used in a detailed answer.

This explains how the candidate could have improved the answer. This helps you to interpret the standard of Cambridge exams and helps your learners to refine exam technique.

### Common mistakes candidates made in this question

Candidates often did not add technical details or precautions that should be followed.

Lists the common mistakes candidates made in answering each question. This will help your learners to avoid these mistakes at the exam and give them the best chance of achieving a high mark.

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## Assessment at a glance

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Cambridge International AS Level candidates take only Components 1 and 2.

Cambridge International A Level candidates have two choices. Candidates who want to take the whole of the Cambridge International A Level qualification at the end of a course of study take all four components together. Candidates who want to take the Cambridge International A Level qualification in two stages take the Cambridge International AS Level first. If they pass Cambridge International AS Level, they then only need to take Components 3 and 4 in order to complete the Cambridge International A Level.

### Cambridge International AS Level

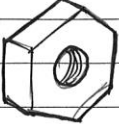
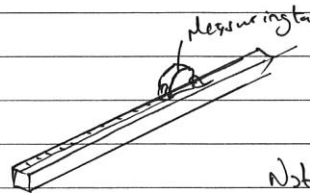
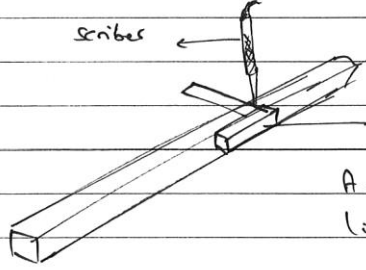
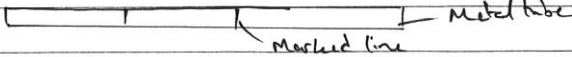
| <b>Component 1</b>   | <b>3 hours</b> | <b>Component 2</b>   | <b>40–50 hours</b> |
|--|----------------|--|--------------------|
| This is a written paper which tests knowledge, understanding, product analysis and design.<br><br>There are three sections; in each section candidates answer one question from a choice of three. |                | This is a coursework project which involves an individual design problem and production of a design model. |                    |
| Weighted at 60% of total marks   |                | Weighted at 40% of total marks   |                    |

### Cambridge International A Level

| <b>Component 1</b>  | <b>3 hours</b> | <b>Component 2</b>   | <b>40–50 hours</b> |
|---|----------------|--|--------------------|
| Component 1 for Cambridge International A Level is the same as Component 1 for Cambridge International AS Level.  |                | Component 2 for Cambridge International A Level is the same as Component 2 for Cambridge International AS Level.   |                    |
| Weighted at 30% of total marks  |                | Weighted at 20% of total marks   |                    |
| <b>Component 3</b>  | <b>3 hours</b> | <b>Component 4</b>   | <b>40–50 hours</b> |
| This is a written paper which tests design, knowledge and understanding in three focus areas; candidates specialise in one of these areas.<br><br>There are two sections in this paper. In Section A candidates answer two structured knowledge application questions from a choice of three on their chosen focus area. In Section B candidates answer the one design question on their chosen focus area. |                | This is a coursework project, and it can either be developed from the Component 2 project or be a completely new project covering Components 2 and 4 in an holistic way. |                    |
| Weighted at 30% of total marks  |                | Weighted at 20% of total marks   |                    |

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# Question 1

| Example candidate response – high   | Examiner comments   |
|---|---|
| <p>Section A</p> <p>1(a)</p>  <p>Hexagonal nut.</p> <p>1</p> <p>Bending</p> <p>(i) Marking out.</p>  <p>measuring tape</p> <p>A measuring tape is used to find the appropriate length.</p>  <p>scribes</p> <p>Engineer's square</p> <p>A scribe is used to mark the line, all round the tube.</p> <p>Note: A sharp scribe must be used to scratch the metal evenly. The block must be well placed against the metal.</p>  <p>marked line</p> <p>metal tube</p> | <p><b>1</b> The candidate has shown a 3D view of the nut as the question requests.</p> <p>Mark awarded for (a) = 2 out of 2</p> |

| Example candidate response – high, continued | Examiner comments |
|--|-------------------|
|--|-------------------|

② Placing in jig:

The metal (mild steel) is bent at its bending line as shown on the diagram.

Note: if the metal is too hard it should be annealed first to prevent cracking at bent line.

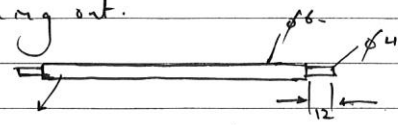
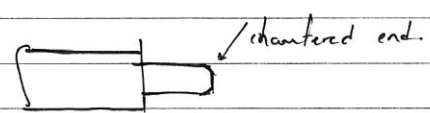
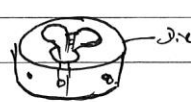
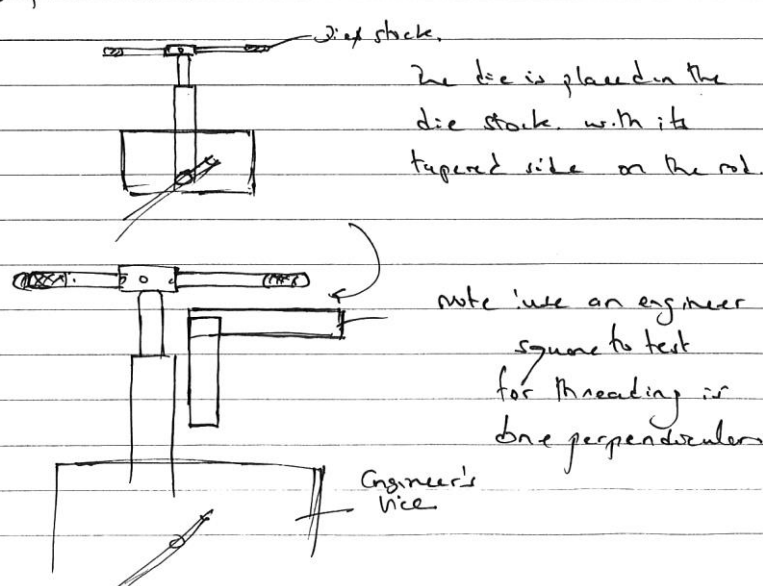
Note: The metal is bent slightly more to cater for the spring back effect of the mild steel bar.

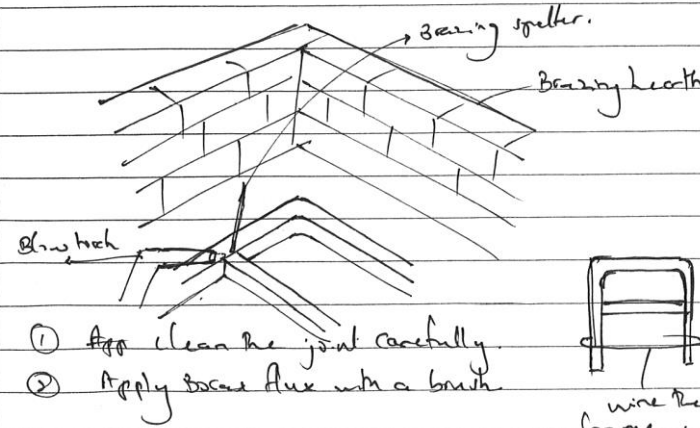
The same is done for the other bent, to obtain the final shape

**2** Clear sketches with supporting communication of well written notes. These include clear details of tools, equipment and processes. Safety precautions are included.

Mark awarded for (b) (i) = 6 out of 6



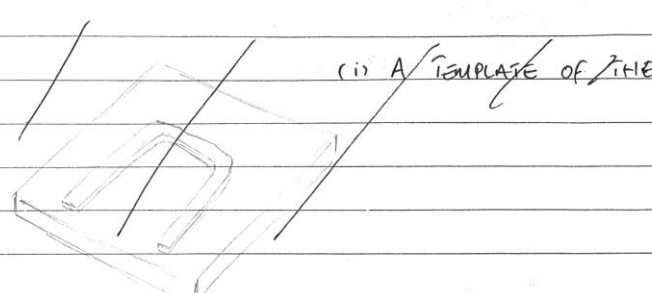
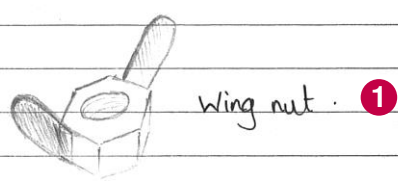
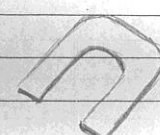
| Example candidate response – high, continued   | Examiner comments |
|--|-------------------|
| <p>(1) <u>Marking out.</u></p>  <p>The axle is turned on a metal lathe to reduce the diameter of the rod at its end.</p>  |                   |
| <p>(2) The ends are chamfered to ease threading.</p>  <p><u>Cutting thread.</u></p>   |                   |
| <p>The correct size die is used.</p>  <p>Note: To ensure a</p>  |                   |
| <p>(3) placed in vice</p>  <p>die stock.</p> <p>The die is placed in the die stock, with its tapered side on the rod.</p> <p>note: use an engineer square to test for threading is done perpendicular</p> <p>Engineer's vice</p> |                   |

| Example candidate response – high, continued   | Examiner comments   |
|--|---|
| <p>(4) Start to cut the thread by adding lubricant (oil) with the die wide open</p> <p>(5) For every 2 clockwise turns, perform an anticlockwise turn to break any swarf produced so as to ease the threading process.</p> <p>(6) Note: check for squareness with the engineer's square regularly.</p> <p>(7) Repeat cutting with dies close by slackening the middle screw and tightening the two side screws</p> <p>(8) Cut the thread the entire length of the rod <math>\phi</math> mm</p> <p>Note: use lubricant <b>3</b></p> | <p><b>3</b> Clear sketches which support the communication of well written notes. These include clear details of tools, equipment and processes. Safety precautions are included.</p> <p>Mark awarded for (b) (ii) = 6 out of 6</p> |
| <p>Oil</p>  <p>(1) App clean the joint carefully.</p> <p>(2) Apply Brazing flux with a brush</p>  |   |

| Example candidate response – high, continued   | Examiner comments  |
|--|--|
| <p>① Note! The joint should be well used and close fitting.</p> <p>② Use the blow torch to <del>one</del> dry the flux.</p> <p>③ Apply torch on the joint until a red hot metal is seen.</p> <p>④ Dip in the brazing filler in the joint.</p> <p>⑤ Reverse the frame and perform for the other side.</p> <p>Precautions: 1. Use gloves and protective clothing when brazing.</p> <p>2. Use flux to protect the work from oxidation and allows the brazing filler to penetrate the joint.</p> <p>3. Perform the process in a brazing hearth to ensure an even distribution of heat. ④</p> | <p>④ Clear sketches which support the communication of well written notes. These include clear details of tools, equipment and processes. Safety precautions are included.</p> |
|  | <p>Mark awarded for (b) (iii) = 6 out of 6</p> <p><b>Total mark awarded = 20 out of 20</b></p>   |

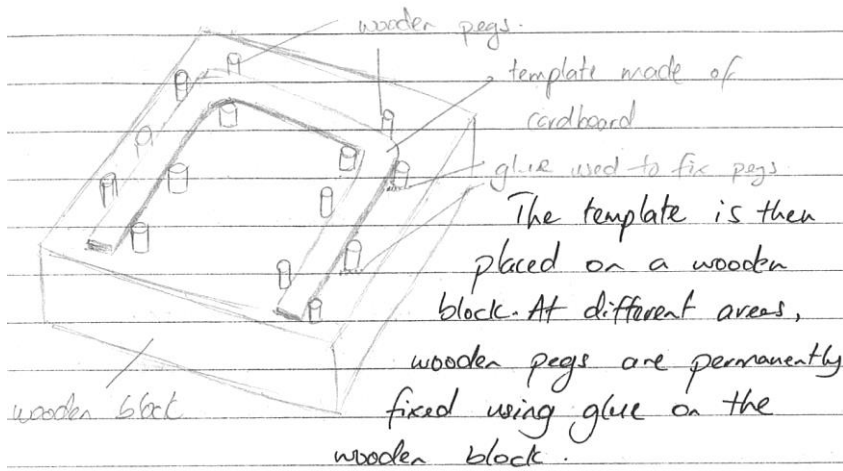
### How the candidate could have improved the answer

In all three parts technical language was used correctly and quality control, jigs and fixtures added to a detailed answer.

| Example candidate response – middle  | Examiner comments   |
|--|---|
| <p>Section A</p> <p>1/ (a)</p>  <p>(i) A TEMPLATE OF THE</p> <p>Section A</p> <p>1. (a)</p>  <p>Wing nut . 1</p> <p>b (i)</p>  <p>- A template made of cardboard is made using a compass, pencil and ruler.</p> <p><u>Precaution</u>: Make accurate measurements and avoid parallax error.</p> <p><u>Safety</u>: Do not point compass towards body.</p> | <p>1 The candidate has stated a wing nut but has not sketched clear threads.</p> <p>Mark awarded for (a) = 1 out of 2</p> |

## Example candidate response – middle, continued

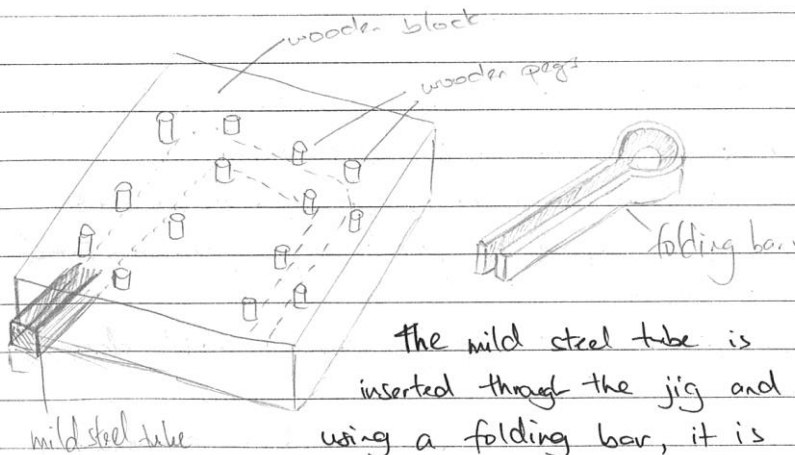
## Examiner comments



The template is then placed on a wooden block. At different areas, wooden pegs are permanently fixed using glue on the wooden block.

This will give a jig to bend the mild steel.

Safety: Make sure to wear gloves when using glue.



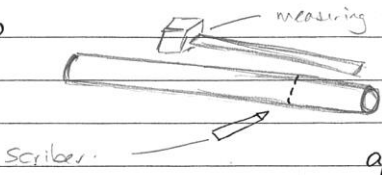
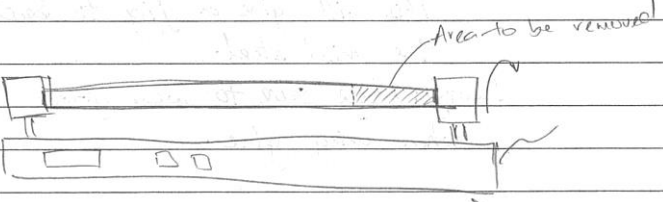
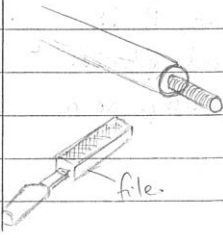
The mild steel tube is inserted through the jig and using a folding bar, it is bent at the required places.

Precaution: Carry out process step by step so as not to damage the material. **2**

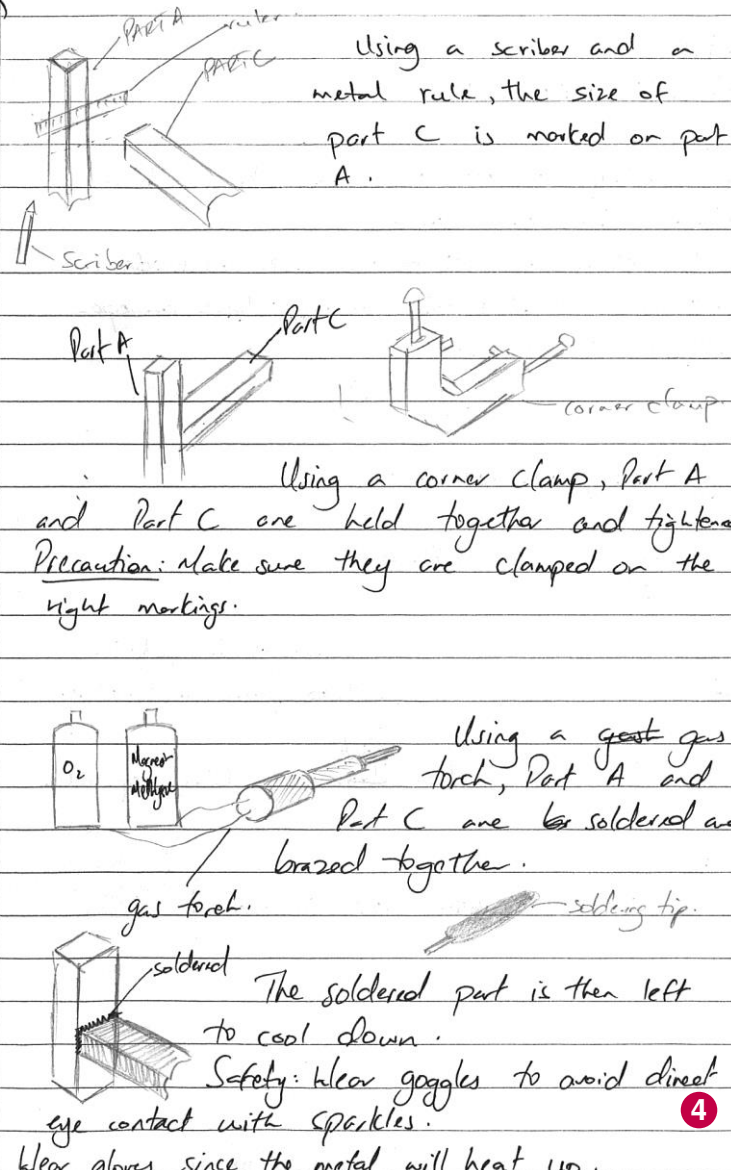
Safety: Wear gloves and goggles.

**2** Bending part of A is explained reasonably well with technical language, although benefit of doubt given to a wooden jig for the bending used rather than a metal one.

Mark awarded for (b) (i) = 4 out of 6

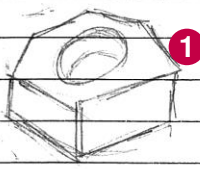
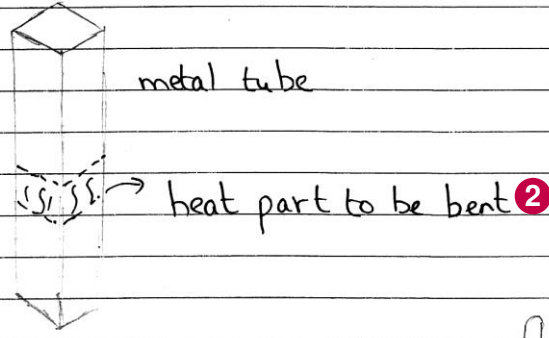
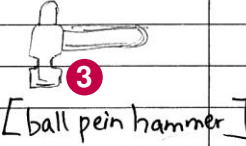
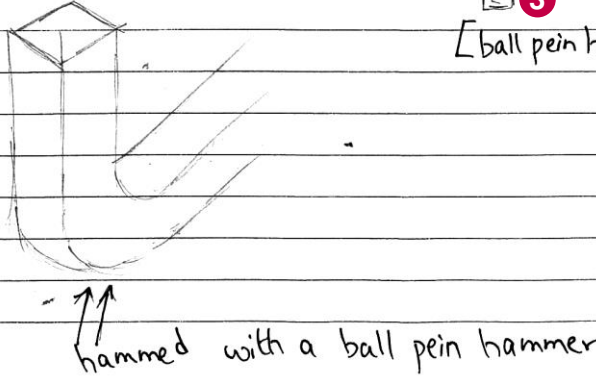
| Example candidate response – middle, continued   | Examiner comments  |
|--|--|
| <p>(b)(ii)</p>  <p>The mild steel tube is marked at the appropriate distance using a scribe and a measuring tape.</p> <p><u>Precaution:</u> Avoid parallax error.</p> <p>The tube is then placed on a lathe and so the area to be removed is <del>now</del> that the marked area could be removed.</p>  <p>The lathe is switched on and the <del>noted</del> <sup>metal lathe</sup> area is removed at a certain depth only.</p> <p><u>Safety:</u> Wear gloves while carrying out procedure<br/>Wear goggles to protect eyes from small bits of metal</p> <p><u>Precaution:</u> Carry out step by step to avoid damaging material.</p> <p>Once the part has been removed, the part is <del>can</del> left to cool down and polished using thin filing.</p>  | <p><b>3</b> The candidate explains how the 4mm diameter might be reduced from the 6mm diameter standard bar.</p> <p>Mark awarded for (b) (ii) = 2 out of 6</p> |



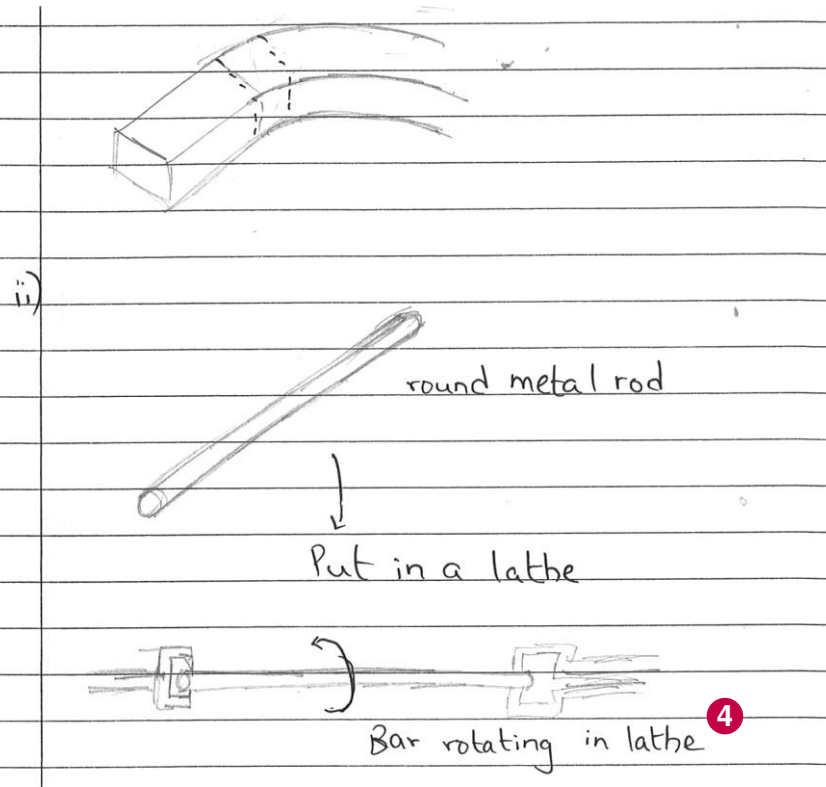
| Example candidate response – middle, continued   | Examiner comments   |
|--|---|
| <p>(b) (iii)</p>  <p>Using a scribe and a metal rule, the size of part C is marked on part A.</p> <p>Using a corner clamp, Part A and Part C are held together and tightened.<br/> <u>Precaution:</u> Make sure they are clamped on the right markings.</p> <p>Using a gas gas torch, Part A and Part C are soldered and brazed together.</p> <p>The soldered part is then left to cool down.<br/> <u>Safety:</u> Wear goggles to avoid direct eye contact with sparks.<br/>         Wear gloves since the metal will heat up.</p> | <p><b>4</b> The answer offers clear sketches which support the communication of well written notes. These include details of tools, equipment and processes. Safety precautions are included. Marking out, jigs and fixtures add to a detailed answer.</p> <p>Mark awarded for (b) (iii) = 5 out of 6</p> <p><b>Total mark awarded = 12 out of 20</b></p> |

**How the candidate could have improved the answer**

- (a) For full marks a hexagonal nut should have been sketched with clear threads shown.
- (b) (i) The candidate should have marked out of the mild steel so that bending is accurate. Correct tools and detailed processes for quality control should have been used e.g. engineer's square and scribe would have been helpful. Heat could well be used to soften the mild steel before bending which allows for further safety precautions.
- (b) (ii) The candidate should have explained with either notes or sketches how the thread would be applied to the bar.
- (b) (iii) To improve the answer the candidate should have given the actual process of brazing with the joint having being cleaned and flux/brazing rod included.

| Example candidate response – low  | Examiner comments   |
|---|---|
| <p>Section A</p> <p>i)</p> <p>a)</p>  <p>b)</p> <p>i)</p>    | <p><b>1</b> Benefit of doubt given for full marks as hexagonal nut sketched with feint threads shown.</p> <p>Mark awarded for (a) = 2 out of 2</p> <p><b>2</b> Position to be heated shown on tube.</p> <p><b>3</b> Limited explanation of hammer being used to bend tube to 90 degrees.</p> <p>Mark awarded for (b) (i) = 2 out of 6</p> |



| Example candidate response – low, continued  | Examiner comments  |
|--|--|
|  | <p><b>4</b> The candidate briefly covers the use of the lathe to rotate the bar.</p> <p>Mark awarded for (b) (ii) = 1 out of 6</p> <p>Mark awarded for (b) (iii) = 0 out of 6</p> <p><b>Total mark awarded = 5 out of 20</b></p> |

### How the candidate could have improved the answer

**(b) (i)** The marking out of the mild steel so that bending is accurate with correct tools and processes for quality control e.g. engineer's square and scribe would have been helpful. A jig would have been worthwhile to ensure accuracy of the bend. Safety precautions could also be added relating to use of heat and force to bend the tube.

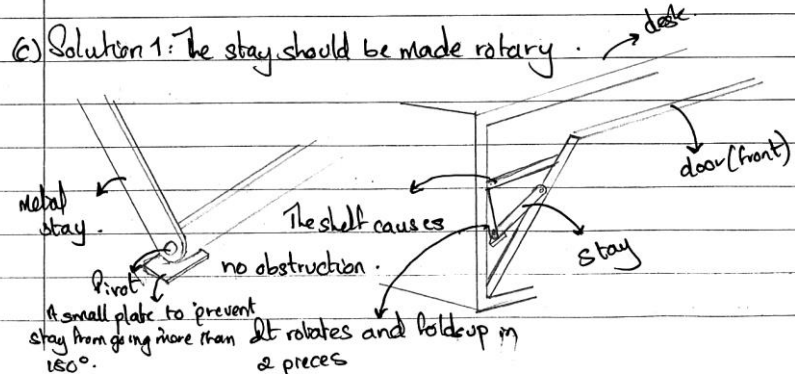
**(b) (ii)** The candidate should have explained how the 4mm diameter might be turned on the lathe or how the thread would be applied to the bar with either notes or sketches.

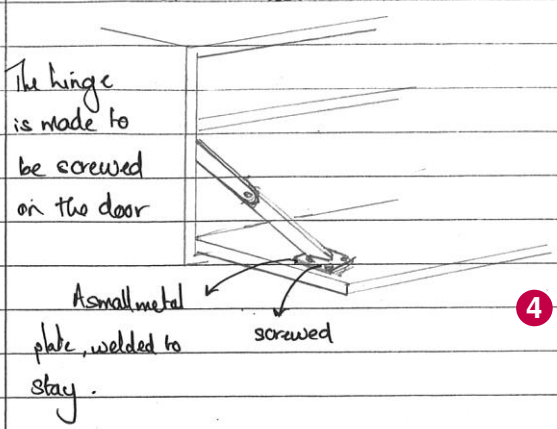
**(c) (iii)** Not attempted – see exemplar for high response above.

### Common mistakes candidates made in this question

Candidates often did not add technical details or terminology for tools, equipment, processes and safety precautions that should be followed.

## Question 6

| Example candidate response – high   | Examiner comments   |
|---|---|
| <p>Sec 6</p> <p>Q6 (a) (i) A: hinge <b>1</b></p> <p>(ii) B: Magnetic catch. <b>2</b></p> <p>(b) Problem 1: The metal stay consisting a single metal bar cannot rotate and fold to go in the carcass. It prevents the folding up of the front. Also the shelf prevent it too.</p> <p>Problem 2: The stay being fixed to the sides of the front door will prevent it from <del>been</del> closing as the door and the carcass is <del>lightly</del> tightly fixed. <b>3</b></p> <p>(c) Solution 1: The stay should be made rotary.</p>  | <p><b>1</b> Correct.</p> <p>Mark awarded for (a) (i) = 1 out of 1</p> <p><b>2</b> Lock or lock key is the correct answer – it is not magnetic.</p> <p>Mark awarded for (a) (ii) 0 out of 1</p> <p><b>3</b> Both problems identified and described.</p> <p>Mark awarded for (b) = 4 out of 4</p> |

| Example candidate response – high, continued   | Examiner comments   |
|--|---|
| <p>Solution 2: Fixing the metal stay on the back of the door rather than the sides.</p>  <p>The hinge is made to be screwed on the door.</p> <p>A small metal plate, welded to stay.</p> <p>4</p>   | <p><b>4</b> Two problems identified in section (b) are clearly explained with detailed 3D sketches which are labelled.</p> <p>Mark awarded for (c) = 6 out of 6</p> |
| <p>(d)(i) • Knock-down fittings can be quickly <del>set</del> and easily <del>setted</del> set.</p> <ul style="list-style-type: none"> <li>• It is cheap and causes small amounts of <del>waste</del> wastage.</li> <li>• They allow assembling as well as disassembling the product.</li> </ul>   | <p>Mark awarded for (d) (i) = 3 out of 3</p>  |
| <p>(ii) • Jigs can be used to locate and easily fix the fittings, also no need of advance skills to do it.</p> <ul style="list-style-type: none"> <li>• Knock down fittings are usually made of wood or plastic in batch production and <del>it</del> they usually use screws and nails which are cheap.</li> <li>• The disassembling feature makes transportation easier of item easier.</li> </ul> | <p>Mark awarded for (d) (ii) = 2 out of 3</p>   |
| <p>(iii) • For users, the disassembling feature allows a big furniture to fit their doors and rooms as usually <del>the</del> a big furniture would not.</p>   |   |

| Example candidate response – high, continued  | Examiner comments   |
|---|---|
| <p>• Cheaper fabrication cost for manufacturer means a lesser price for the customers.</p> <p>• The <del>extra</del> customers themselves can <del>be</del> assembled the product due to the easiness of knock down fittings.</p> | <p><b>5</b> Good answer with three relevant issues identified which are supported by examples of materials and the advantages of knock down fittings. Explanations do not always fully justify the issues being raised.</p> <p>Mark awarded for (d)(iii) = 2 out of 2</p> <p><b>Total mark awarded = 18 out of 20</b></p> |

**How the candidate could have improved the answer**

- (a) (ii) Lock or key lock is a more realistic answer and it is not magnetic
- (d) The answer did not always fully justify the issue was raised.

Example candidate response – middle

Examiner comments

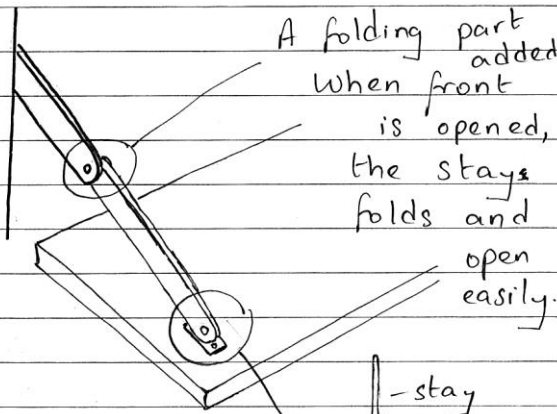
Section B.

6. (a) (i) Butt hinge **1**  
 (ii) Magnetic catch **2**

(b) The metal stay does not fold on the inside.

The stay is fixed to the ~~front~~ side of the front and may not close. **3**

(c) (i)



A metal plate is attached to the stay and the front. The unit will open and close easily, without any problem. **4**

**1** Correct.

Mark awarded for (a) (i) = 1 out of 1

**2** Lock or lock key is a more realistic answer – it is not magnetic.

Mark awarded for (a)(ii) 0 out of 1

**3** Two problem are identified and justified.

Mark awarded for (b) = 4 out of 4

**4** This question asks for the two problems identified in section (b) to be explained with notes and sketches. However, only one problem is explained.

Mark awarded for (c) = 3 out of 6

| Example candidate response – middle, continued  | Examiner comments |
|---|-------------------|
| <p>(d) Due to the increased demand in solid timber, it has become very expensive and rare. Furthermore the tree takes a long time to mature, 80 years for hardwood and 40 years for softwood. Thus other alternatives such as manufactured board like M.D.F and plywood has increased used.</p> <p>On manufactured boards, traditional joints such as housing and dovetail that were used on solid timber, cannot be used. Thus knock-down fittings are mostly used for these boards. Since knock down fittings are temporary joints, the unit can be assembled and disassembled easily. Furniture using K.D fittings are known as flat-pack furnitures since they can be transportable.</p> <p>K.D fittings are easy to use and does not require any skills. The flat-pack furniture comes with a set of instructions on how to mount the fitting and the unit. The customer can assemble his unit</p> |                   |



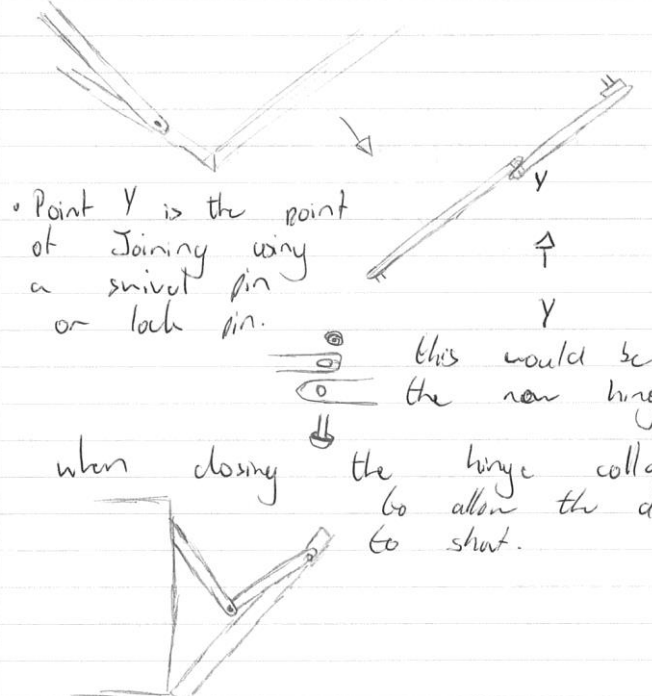
| Example candidate response – middle, continued                              | Examiner comments   |
|---|---|
| <p>by himself and also disassemble it<br/> for transportation. <b>5</b></p> | <p><b>5</b> Three relevant issues identified with explanations which do justify the issues being raised for the most part. However specific examples/evidence is limited.</p> <p>Mark awarded for (d) (i) = 3 out of 3</p> <p>Mark awarded for (d) (ii) = 2 out of 3</p> <p>Mark awarded for (d) (iii) = 0 out of 2</p> <p><b>Total mark awarded = 13 out of 20</b></p> |

### How the candidate could have improved the answer

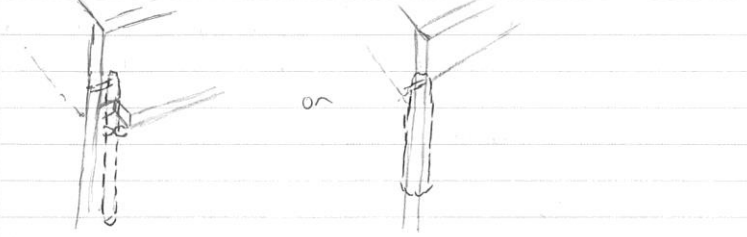
**(a) (ii)** Lock or lock key is a more realistic answer and it is not magnetic

**(c)** To be awarded full marks the candidates should have identified the second problem as asked in the question.

**(d)** The candidate should have used more specific examples/evidence. A helpful way to improve this answer would have been to give examples of different furniture types and why they need to be disassembled for transportation and the benefits of this for the consumer and manufacturer.

| Example candidate response – low  | Examiner comments   |
|---|---|
| <p>ai) hinge A) butt hinge <b>1</b><br/>                     B) Magnetic lock. <b>2</b></p> <p>b) • The box won't be able to close as the stays are one solid piece<br/>                     • The top shelf is flush with the frame so the metal stays would not be able to allow the door to close properly. <b>3</b></p>   | <p><b>1</b> Correct.<br/>                     Mark awarded for (a) (i) = 1 out of 1</p> <p><b>2</b> Lock or key lock is a more realistic answer – it is not magnetic.<br/>                     Mark awarded for (a) (ii) = 0 out of 1</p> <p><b>3</b> One problem is only identified.</p> |
| <p>c) Problem 1: You would have to modify the fixing position of the stays and create a middle hinge or bending point on the stay</p>  <p>• Point Y is the point of joining using a pivot pin or lock pin.</p> <p>this would be the new hinge.</p> <p>when closing the hinge collapses. to allow the door to shut.</p> <p>Problem 2: To either cut back or cut a groove in the top shelf to allow the stay to close properly.</p> | <p>Mark awarded for (b) = 2 out of 4</p>  |



| Example candidate response – low, continued   | Examiner comments  |
|---|--|
|  <p>to cut a groove could be the best option.</p> <p>to shorten the width completely to allow for a complete shut and no possible contact.</p> <p>The stay would slot into Area x with coming into contact with the shelf <b>4</b></p> <p>d The situation stated is why increased KD fittings are being used, relevant issues could be the hassle or speed of setting up the furniture. As well as the process of taking down or moving it. In addition to make it simpler for everyone to assemble and de-semble. These issues are relevant due to the fact that they are day to day issues, as no one wants to spend days assembling furniture or trying to move a permanently</p> | <p><b>4</b> This question asks for the two problems identified in section b to be clearly explained with notes and sketches. Only one problem is explained, the folding stay that is identified in section b is sketched in detail.</p> <p>Mark awarded for (c) = 3 out of 6</p> |

| Example candidate response – low, continued   | Examiner comments   |
|---|---|
| <p>fittings will go through tight spaces in a house, so quick temporary fittings are easy to make disassemble, now or just assemble in no time, such as a TV cabinet or new cupboard, quick to assemble and disassemble when required to move or pack away. 5</p> | <p><b>5</b> Answer has two issues identified but with only limited justification of the relevance. Specific examples/evidence is also limited.</p> <p>Mark awarded for (d) (i) = 2 out of 3</p> <p>Mark awarded for (d) (ii) = 1 out of 3</p> <p>Mark awarded for (d) (iii) = 0 out of 2</p> <p><b>Total mark awarded = 9 out of 20</b></p> |

**How the candidate could have improved the answer**

- (a) (ii) Lock or key lock was a more realistic answer and this was not magnetic.
- (b) Two problems should have been identified.
- (c) Only one problem is explained.
- (d) Further relevant issues related to the increased use of knock down fittings could have covered for example being more cost effective due to the increased speed of manufacture as well as the assembly stage being removed within the factory setting.  
 Environmentally friendly transportation is more efficient to carry flat packed items via container or lorry as less space is used when compared to fully assembled items.  
 Immediate availability as the flat packed product can be taken home by the consumer.  
 Less storage is required after manufacturing as flat packed items require less space than fully assembled items.

# Question 9

## Example candidate response – high

## Examiner comments

**9(a) IDEA 1**

The seat and head rests are made of nylon and are filled with cushions. This keeps them waterproof and comfortable. Pins are used together with a paint finish to prevent corrosion and for aesthetics. Pins are available to allow comfort. They are also joined through dowels. Dowelled joints are used to allow for a strong joint.

**IDEA 2**

Stainless steel rods of 10 are joined to act as arm rests on both sides. They are joined using counter sunk screws as shown.

Polypropylene is used to make the seat through press forming. No finish is required but dyes are added to the plastic.

A fabric cushion provides a comfortable back rest and can be easily removed for maintenance as velcro pads are glued using Epoxy resin to the seat.

The edges are rounded so as not to injure users.

**Appraisal**

Positive points: Strong joints and very aesthetic due to high quality finish.

Negative points: Armrest prevents a complete from holding hands or cuddling. Uncomfortable due to its perpendicular back.

**Appraisal**

Positive points: Comfortable due to inclined back and aesthetic. Also very easy to maintain.

Negative points: Stainless steel rods may heat up and injure user. The plastic may be damaged when used in very warm sunlight.

**Appraisal**

Positive points: Very aesthetic and will attract people. Fits the garden colour scheme.

Negative points: Highly uncomfortable due to spacing between slats.

**IDEA 3**

Track is used to make the slats for the seat.

22mm spacing allows water to escape.

The slats are joined to mild steel supports using counter sunk screws.

The support is galvanneal to resist harsh weather conditions.

**Appraisal**

Positive points: Comfortable due to inclined back and aesthetic. Also very easy to maintain.

Negative points: Stainless steel rods may heat up and injure user. The plastic may be damaged when used in very warm sunlight.

**Appraisal**

Positive points: Comfortable due to inclined back and aesthetic. Also very easy to maintain.

Negative points: Stainless steel rods may heat up and injure user. The plastic may be damaged when used in very warm sunlight.

**SELECTION OF IDEA**

IDEA 1 is selected as it provides the most easily made a proposal which is also comfortable and aesthetic.

**DEVELOPMENT**

Joining techniques:

- Finger joints reinforced with PVA glue are very strong and aesthetic.
- A wire joint is also very strong and is a considerable proposal.
- Joining using screws allows maintenance.

**Backrest and comfort**

The backrest is made to be inclined for additional comfort.

A single longer head rest is used for added comfort and functionality.

The middle armrest is eliminated so as to prevent awkwardness.

Velcro pads are glued to the back to remove the cushions for maintenance.

**PROPOSED DESIGN**

Mild steel blocks used for maintenance.

Joined using Velcro pads.

Paint finish is used on the pins to allow resistance to climatic conditions and aesthetics.

12  
4  
3  
19

**1** 12/12 awarded as the candidate has developed a single idea from a good range of different design proposals – as is required by the mark scheme. Ideas are clear, technical information is available in both written and graphical form. 4/4 awarded for the excellent clarity and quality of sketching of ideas as well as the more detailed component sketches. Notes are clear and support understanding. 3/4 awarded for evaluation and reasons for selection. The evaluation of each idea is thoughtful and reflective but the actual selection of idea 1 would need more technical commentary and objectivity to improve the answer. Overall this is a very good response.

Mark awarded for (a) = 19 out of 20



Example candidate response – high, continued

Examiner comments

9.(b)

### IDEA 1

First proposal is made for stainless steel rods  $\phi 10$ . No finish is required.

Welded to the frame for strength.

Pins are used to secure the frame to the ground.

The above mechanism is used to allow the swing to oscillate.

A rod passes through the seat to attach it to the frame.

### IDEA 2

Fixed to frame using screws.

Mild steel rod pointed and joined to the frame using hexagonal bolts as shown in the diagram.

A groove is made in the middle bar and the mechanism below allows oscillation.

Hexagonal bolt joins the middle bar to the frame.

If open to let the swinging rod in and is closed using countersunk screws.

Plate allows fixing to the seat by means of countersunk screws.

### IDEA 3

Appraisal

Positive points: Aesthetic and very stable base.

Negative points: Not as strong as other materials, seat may still move left and right.

The base is made of pine for stability.

Pine rod turned on a lathe & so joined to the top of the frame using countersunk screws.

Very stable. Base which allows fixing to the seat frame using hexagonal bolts and wingnuts.

Hugs prevent the seat from moving from left to right.

Pine rods are painted to prevent corrosion and enhance appearance.

### SELECTION OF IDEA

IDEA 1 is selected as it provides the mechanism which is the most marketable and is highly aesthetic.

### AREAS FOR DEVELOPMENT

- Strength of base
- Method of oscillating
- Method of attaching to seat

### DEVELOPMENT

Strength of base:

- A stable wooden pine base could be used to hold together the 4 ends of the frame using countersunk screws.
- Such a base could also be used to hold each leg individually using pins.
- Additional part between the legs in which pins are inserted for stability.

Method of attaching to seat:

- First proposal consists of adding a plate which is screwed to the seat.
- Second proposal consists of a base which is very secure to join to the seat.

Method of oscillating:

Counter sunk screw used for fixing. A hole is drilled in the support so that the ring it passed through it and oscillates freely.

Hammer. A lens placed in the middle to prevent left-right motion.

A hexagonal bolt and a wing nut are used instead of a countersunk screw for added strength.

### PROPOSED SOLUTION

Welded stainless steel rods used.

Hexagonal bolt and wingnut.

1400

1000

Screwed to the bottom of the seat.

No finish is required on the frame as stainless steel is used.

2 12/12 awarded as the candidate has developed a single idea from a good range of different design proposals – as in section a, the candidate has included details on both the stability of the frame and a method for hanging the seat from the frame. 4/4 awarded for the clarity and quality of sketching of ideas as well as the more detailed component sketches. Notes are clear and support understanding. 3/4 awarded for evaluation and reasons for selection. The evaluation of each idea is thoughtful but the actual selection of idea 1 does lack technical commentary and objectivity. Again a very good response.

Mark awarded for (b) = 19 out of 20

Example candidate response – high, continued

Examiner comments

9(c) Idea 1

**Appraisal**

Positive points:  
Aesthetic and prevents heat. Also strong joint to frame.  
Negative points:  
Quite expensive and joining methods are not eye-pleasing.

Aluminium reflects light and will therefore not allow excessive heat below the canopy.

**IDEA 2**

That canopy finished using varnish is used for the top.

**Appraisal:**

Positive points:  
Very aesthetic and strong joints used overall.  
Negative points:  
The canopy may be very costly and the bolts used are not aesthetic.

The canopy shown is made of bent acrylic sheet. No finish is required as sheets are dyed.

Stainless steel rods are added to the canopy to join it to the frame.

Joining is done through arc welding and is very strong.

**Appraisal**

Positive points:  
Very aesthetic and strong. Can be removed and maintained easily.  
Negative points:  
Material may melt and is quite costly.

**SELECTION OF IDEA**

IDEA 1 is chosen as it is the most aesthetic and strongest overall.

**AREAS FOR DEVELOPMENT**

- Method of joining to frame.
- Shape used and strength of shape.
- Methods of fixing canopy together.

**Method of joining to frame:**

① Proposal 1 consists of adding a bar in order to add stability and increase strength.

② The second proposal consists of adding a bar which is screwed onto the bar which is fixed on the frame.

③ The 3rd proposal consists of adding a plate to hold the bar to the canopy at 3 different places.

**Method of fixing canopy together:**

The rods are now placed onto the canopy and are reinforced using hexagonal bolts.

The above shape is much more aesthetic and safer for use.

The rods and canopy are changed to stainless steel and are welded for increased strength.

**Shapes used:**

This shape uses less angle bending and therefore reduces the stress applied on the metal.

**PROPOSED SOLUTION**

Stainless steel also reflects light. No finish required.

Plates added with counter-sunk screws to increase strength.

**3**

**3** 6/12 awarded as the candidate has developed a canopy from a good range of different design proposals, unfortunately they have not designed a system to adjust and fix the canopy at different angles - half marks awarded. 4/4 awarded for the excellent clarity and quality of sketching of ideas as well as the more detailed component sketches. Notes are clear and support understanding. 3/4 awarded for evaluation and reasons for selection. The evaluation of each idea is thoughtful and reflective but the actual selection of idea 1 does lack technical commentary and objectivity.

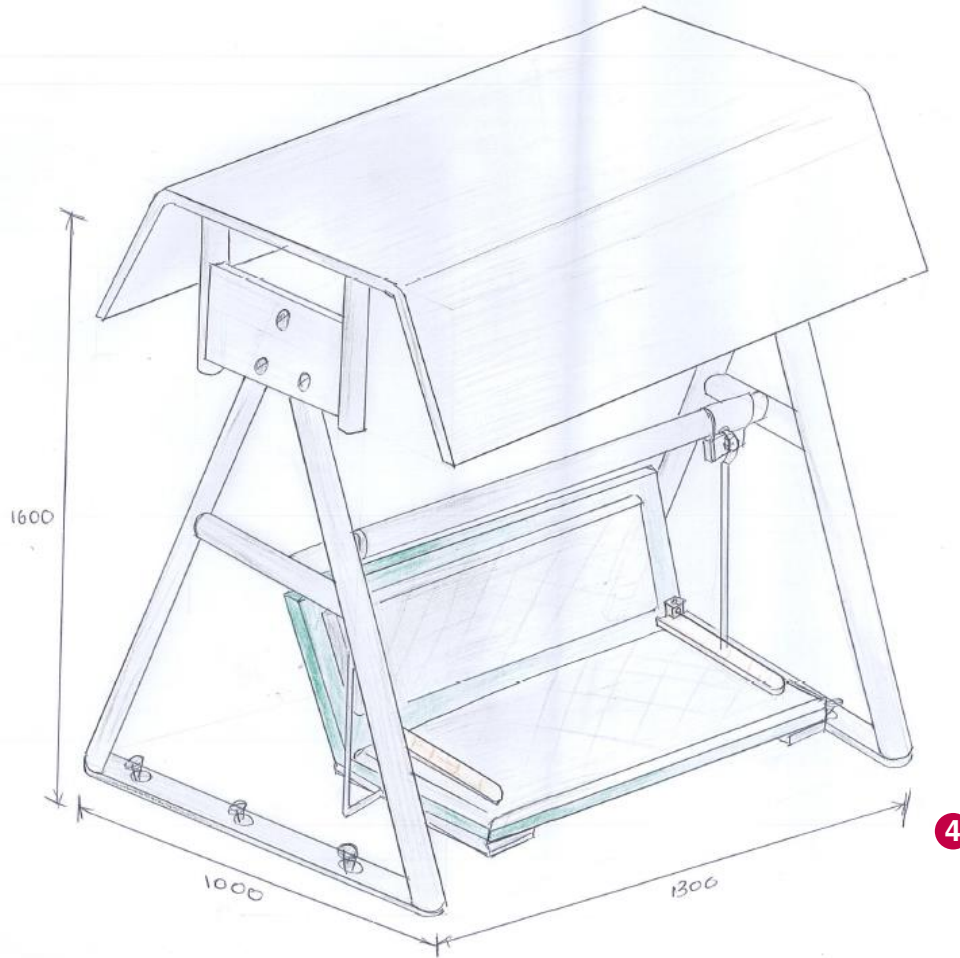
Mark awarded for (c) = 13 out of 20

**Example candidate response – high, continued**

**Examiner comments**

a(d)

PROPOSED SOLUTION



**4** 14/14 awarded for the completion of a high quality drawing that fully shows the design features. 6/6 for the use of colour and tone to enhance the visual impact.

Mark awarded for (d) = 20 out of 20

**Total mark awarded =  
71 out of 80**

**How the candidate could have improved the answer**

**(b)** The evaluation of each idea is thoughtful but the actual selection of idea 1 does lack technical commentary and objectivity.

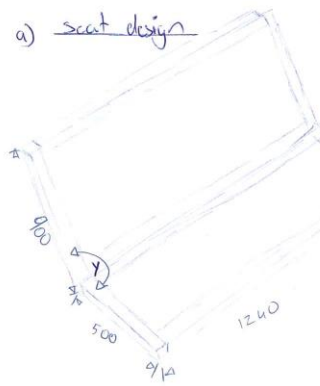
**(c)** The candidate did not design a system to adjust and fix the canopy at different angles. The selection of idea 1 lacked technical commentary and objectivity.



**Example candidate response – middle**

**Examiner comments**

a) seat design

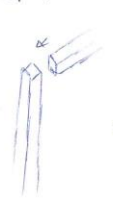


• using square mild steel tubing, you could create a frame then using steel nodes make the seat or  
 • using wood fill in the back and seat.

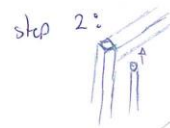
• Final design.



Step 1: The frame



• Methods of cutting - grinder  
 Joining - welding or brassing



The steel nodes are joined by welding for a permanent fitting.

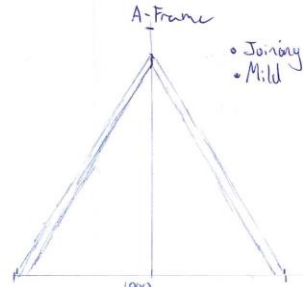
step 3:



• Cushining will be added by not permanently fixed

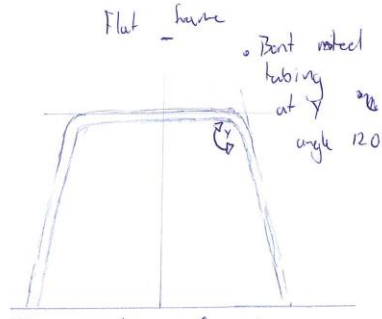
for comfort.  
 "During the processes of safety goggles, gloves and apron must be used."

b) Stable frame



• Joining - welded  
 • Mild steel tubing.

• choice of Flat frame design



• Method of hanging & swinging is a u bolt with a steel ring mounted on.



This idea of mounting allows for back and forth as well as side to side movement.

**1** 4/12 awarded as the candidate has only developed one idea from a single design proposal. 2/4 awarded for the clarity and quality of sketching of ideas. 1/4 was awarded for evaluation and reasons for selection as very few evaluation comments included.

Mark awarded for (a) = 7 out of 20

**2** 4/12 awarded as the candidate has only developed one idea from a limited range of design proposals. 2/4 awarded for the clarity and quality of sketching of ideas. More detailed component sketches would be helpful. Notes are clear and support understanding but there are not many ideas so there are fewer opportunities to comment on technical details. 1/4 awarded for evaluation and reasons for selection as very few evaluation comments included.

Mark awarded for (b) = 7 out of 20



Example candidate response – middle, continued

Examiner comments

c) Canopy

idea 1      or      idea 2.

• Chosen idea 1 as to the design a fitting methods.

Frame design:

Mild steel tubing bent on bending machine

1050

13050

• Mill steel square tubing for frames welded together.

• The canopy cover will be made of canvas and riveted on.

Welded for permanent fixing

• rivet hole marked & drilled

• canopy bolted down for adjustment capability

welded on

The idea of mounting not only allows for adjustment but complete movement of canopy or removal.

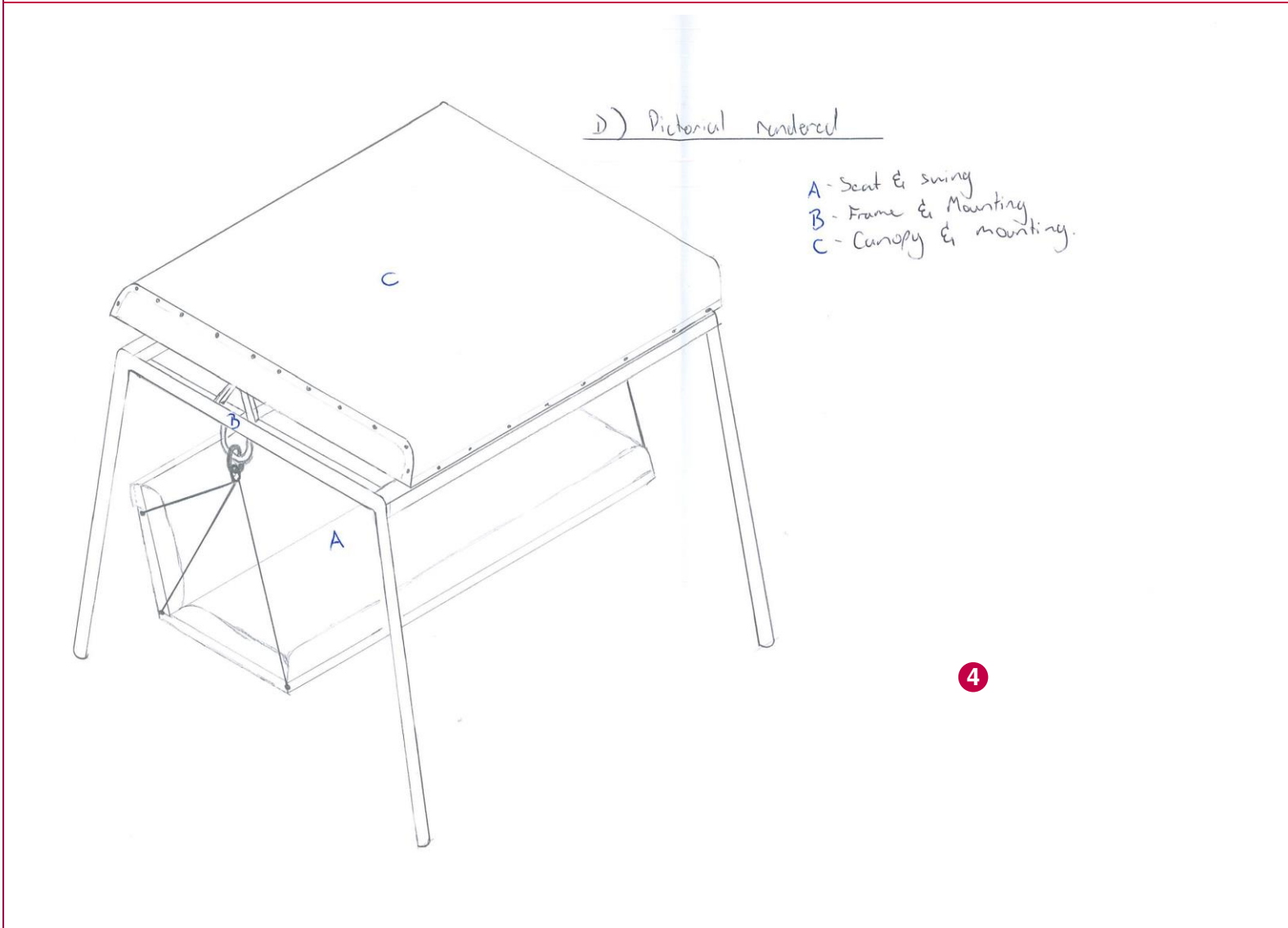
**3**

**3** 6/12 awarded as the candidate has developed a canopy although the range of different design proposals is limited. A system to adjust and fix the canopy at different angles has been attempted but a very basic idea - half marks awarded. 2/4 awarded for the clarity and quality of sketching of ideas. More detailed component sketches would be helpful. Notes are clear and support understanding but there are not many ideas so there are fewer opportunities to comment on technical details. 1/4 awarded for evaluation and reasons for selection as very few evaluation comments included as section a.

Mark awarded for (c) = 9 out of 20

**Example candidate response – middle, continued**

**Examiner comments**



**4** 12/14 awarded for the completion of a good quality drawing that shows most of the design features. 0/6 for the use of colour and tone to enhance the visual impact as no colour was added.

**Total mark awarded = 35 out of 80**

### How the candidate could have improved the answer

(a)–(c) To be awarded full marks a range of ideas was expected that were then developed into a proposed solution. There should also be more detailed component sketches. As there were not many ideas therefore there were fewer opportunities to comment on technical details and there were few evaluation comments included.

(d) No marks awarded for use of colour and tone to enhance the visual impact as no colour was added.

**Example candidate response – low, continued**

**Examiner comments**



**1** 6/12 awarded as the candidate has offered three similar design ideas but they have not been developed into a single proposal. 2/4 awarded for the clarity and quality of sketching of ideas. Notes are reasonably clear and support understanding. 0/4 awarded for evaluation and reasons for selection as very few. Only few evaluation comments are included.

Mark awarded for (a) = 8 out of 20

Mark awarded for (b) = 0 out of 20

Mark awarded for (c) = 0 out of 20

Mark awarded for (d) = 0 out of 20

**Total mark awarded = 8 out of 80**

**How the candidate could have improved the answer**

(a) The candidate should have offered a wide range of ideas and then developed them into a proposed solution. More detailed component sketches would have been helpful. There was a lack of comment on technical details. No mark was awarded for evaluation and reasons for selection as very few evaluation comments included.

Section b, c and d were not attempted; please refer to high level examples.

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