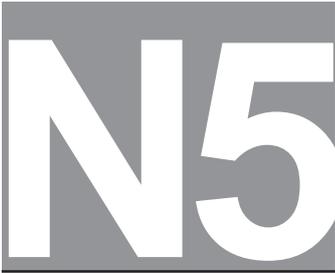


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Mark

**SQ09/N5/01**

**Design and Manufacture**

Date — Not applicable

Duration — 1 hour and 30 minutes



Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day

Month

Year

Scottish candidate number

**Total marks — 60**

**SECTION 1 — 24 marks**

Attempt ALL questions.

**SECTION 2 — 36 marks**

Attempt ALL questions.

Read every question carefully before you attempt it.

Write your answers, clearly in the spaces provided, using **blue** or **black** ink.

**Show all working and units where appropriate.**

Before leaving the examination room you must give this booklet to the Invigilator.

If you do not, you may lose all the marks for this paper.



SECTION 1 — 24 marks  
Attempt ALL questions

1. A pupil's project for a TV stand and storage unit is shown in the photo below.



(a) The base of the drawer was constructed from a manufactured board and the sides from softwood.

(i) State the name of a suitable manufactured board for the base of the drawer. 1

\_\_\_\_\_

(ii) Describe **three** benefits of using a manufactured board for the base of the drawer. 3

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1. (a) (continued)

- (iii) Describe **two** sustainability issues that may have made softwood the preferred material for the sides of the TV stand.

2

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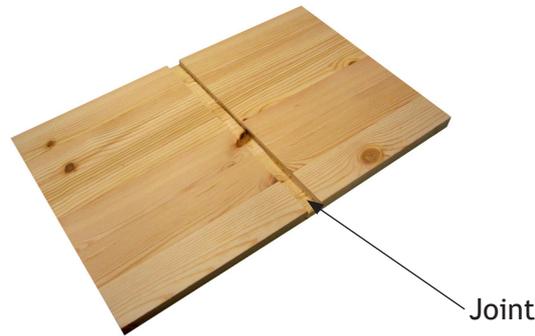


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- (b) The photo below shows the joint in the side of the TV stand used to hold the shelf.



- (i) Give a reason why the joint shown above is suitable.

1

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- (ii) Describe **three** stages required to manufacture this type of joint using hand tools in a school workshop.

3

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- (c) Clear varnish was used as a surface finish for the softwood.

- (i) Describe **two** benefits of using clear varnish as a surface finish for the softwood.

2

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1. (c) (continued)

(ii) Describe **two** stages in the preparation of the softwood before applying the varnish.

2

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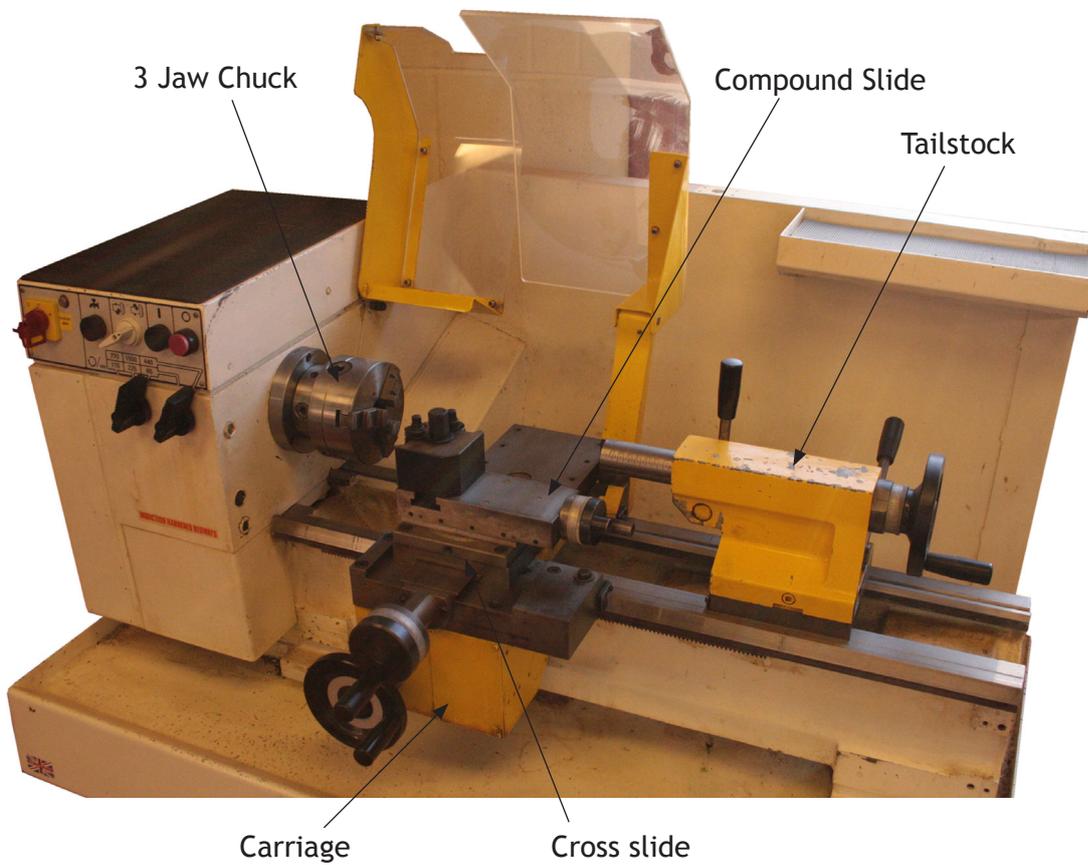


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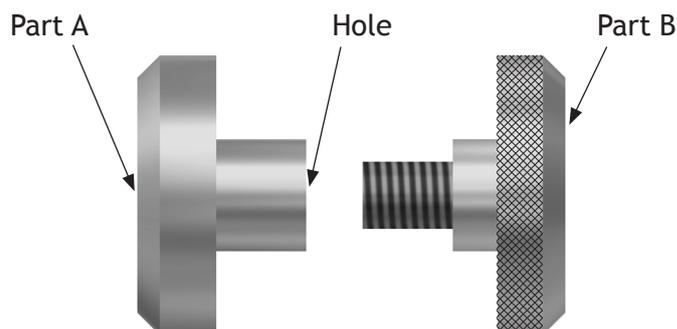


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(d) The handle was made from a blank using a centre lathe similar to the one shown in the photo below.



The handle consists of two parts as shown in the diagram below:



1. (d) (continued)

Part B has been knurled.

(i) Describe the process of knurling on a centre lathe.

3

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(ii) State the functional reason for knurling Part B.

1

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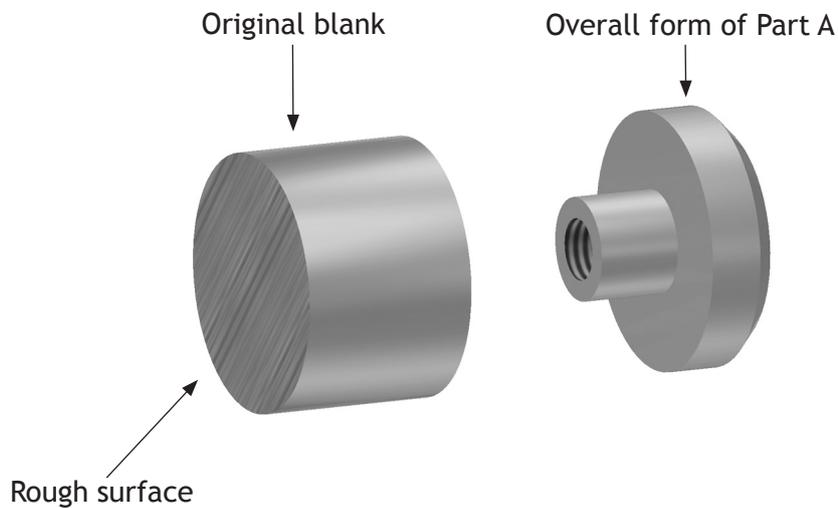


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Part A was created from a blank roughly sawn from a piece of aluminium bar as shown in the diagram below.



(iii) State **two** processes that would be carried out on a centre lathe to manufacture the overall form of Part A from a blank.

2

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1. (continued)

The drawer of the TV stand contains a thermoplastic facing. The photos below show the piece of plastic cut to size and the rough edge of the plastic after sawing.



↑  
Plastic cut to size



↑  
Rough

- (e) Describe **four** stages required to create a smooth surface finish on the sawn edges of the piece of plastic.

4

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Total marks 24



2. (continued)

(b) Before producing a design specification for a hairdryer, the designer would have researched various design factors.

Explain why the following design factors would be researched when designing hairdryers.

(i) Aesthetics

1

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(ii) Performance

1

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(iii) Materials

1

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Total marks 9



3.

MARKS

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Over recent years, there has been a steady increase in the number of electronic products available to consumers in the marketplace.

- (a) Explain the term “Technology Push” with reference to electronic products. 2

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All of the electronic products shown in the photo above were launched under a successful brand name.

- (b) Describe **two** benefits to the designer of launching a product under a successful brand name. 2

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Total marks 4



4. Designers often make models of their designs as they work through the design process as shown in the photos below.



Model of an iron



Model of a vacuum head

(a) Describe **two** benefits a designer could gain from modelling.

2

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(b) State the names of **two** modelling materials and explain why **each** would be suitable for building models.

2

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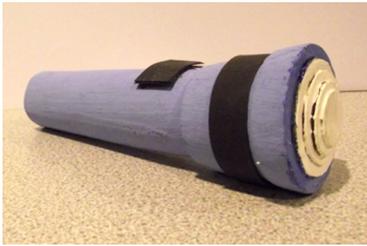
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4. (continued)

MARKS

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In addition to physical modelling, designers often use computer generated models as shown in the photos below.



Physical foam and card model



Computer generated model

- (c) State **two** advantages to the designer of using a computer generated model rather than a physical model. 2

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Rapid prototyping is another type of model used by designers as shown in the photo below.



Rapid prototype of a mobile phone casing

- (d) Describe **one** benefit that rapid prototyping offers the designer. 1

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Total marks 7



5. A typical classroom chair is shown in the photo below.



(a) (i) State the name of a suitable material for the seat of the chair. 1

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(ii) Give **two** reasons why the material you have stated would be suitable for use in this type of product. 2

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

(iii) State a suitable manufacturing process that could be used to manufacture the seat of the chair. 1

\_\_\_\_\_

5. (continued)

Tubular steel was used to manufacture the frame of the chair.

- (b) (i) State a joining technique that could be used to permanently join the horizontal support bars to the rest of the frame.

1

\_\_\_\_\_

- (ii) State the name of a suitable finish for the tubular steel frame.

1

\_\_\_\_\_



- (c) Standard components, as shown in the photos above, are used in many products and are used to join the seat to the frame of the school chair. Explain **two** advantages to the manufacturer of using “standard components”.

2

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Total marks 8



6. Two different types of coffee machines are shown below



Coffee shop coffee machine



Home coffee machine

The home coffee machine allows consumers to produce coffee shop style drinks in their own home.

In order to ensure the product would be a success, the designers would have had to carry out a detailed evaluation of the prototype.

(a) Describe **one** evaluation technique that may have been used when evaluating **each** of the following design factors.

*(Note: a different technique should be used for each factor.)*

(i) Ease of use

2

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(ii) Aesthetics

2

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MARKS

DO NOT  
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THIS  
MARGIN

6. (a) (continued)

(iii) Value for money

2

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(b) Describe the roles of **two** design team members who would have been involved in the evaluation of the home coffee machine prototype.

2

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Total marks 8

[END OF SPECIMEN QUESTION PAPER]



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**SQ09/N5/01**

**Design and Manufacture**

## Marking Instructions

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These Marking Instructions have been provided to show how SQA would mark this Specimen Question Paper.

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## Part One: General Marking Principles for National 5 Design and Manufacture

*This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question. The marking schemes are written to assist in determining the “minimal acceptable answer” rather than listing every possible correct and incorrect answer.*

- (a) Marks for each candidate response must always be assigned in line with these General Marking Principles and the specific Marking Instructions for the relevant question.
  
- (b) Marking should always be positive, ie marks should be awarded for what is correct and not deducted for errors or omissions.

## Part Two: Marking Instructions for each question

### Section 1

Question			Expected response	Max mark	Additional guidance
1	a	i	Any one of the following: <ul style="list-style-type: none"> <li>• Hardboard</li> <li>• Plywood</li> <li>• MDF</li> </ul>	1	One mark for correct response.
1	a	ii	A description that covers three of the following benefits: <ul style="list-style-type: none"> <li>• Low cost</li> <li>• Strong (enough)</li> <li>• Uses recycled materials</li> <li>• Available in large boards</li> <li>• Can be cut to any shape</li> <li>• Easy to machine</li> <li>• Uniform thickness</li> <li>• Durable</li> <li>• Readily available</li> <li>• Any other suitable response</li> </ul>	3	One mark for each correct benefit up to a maximum of three marks.
1	a	iii	A description that covers two of the following issues: <ul style="list-style-type: none"> <li>• Softwood trees grow faster</li> <li>• Softwoods grow in farmed forests</li> <li>• Using hardwoods endangers rainforests</li> </ul>	2	One mark for each correct issue up to a maximum of two.
1	b	i	It supports the shelf across its width.	1	One mark for correct response.
1	b	ii	A description that covers the following three stages: <ul style="list-style-type: none"> <li>• Marking out two parallel lines and required depth</li> <li>• Cutting slot between the two parallel lines</li> <li>• Levelling the slot to a consistent depth</li> </ul>	3	One mark for each correct stage up to a maximum of three marks.
1	c	i	A description that covers two of the following benefits: <ul style="list-style-type: none"> <li>• Enhances appearance of softwood</li> </ul>	2	One mark for each correct benefit up to a maximum of two marks.

			<ul style="list-style-type: none"> <li>• Allows you to see the natural wood (unlike paint)</li> <li>• Hard surface protects against bumps/scratches</li> <li>• Gives a waterproof finish</li> <li>• Prevents softwood drying out and splitting/warping</li> </ul>		
1	c	ii	<p>A description that includes two of the following stages:</p> <ul style="list-style-type: none"> <li>• Remove pencil marks/blemishes with sandpaper</li> <li>• Wet wood to raise the grain</li> <li>• Sand lightly</li> </ul>	2	One mark for each correct stage up to a maximum of two marks.
1	d	i	<p>A description that includes the following three points:</p> <ul style="list-style-type: none"> <li>• Fit the knurling tool</li> <li>• Slow the speed of the lathe down</li> <li>• Slowly move the cross-slide towards Part B until it makes the knurled pattern to the required depth</li> </ul>	3	One mark for each correct point up to a maximum of three marks.
1	d	ii	It provides grip for the user.	1	
1	d	iii	<p>Any two of the following processes:</p> <ul style="list-style-type: none"> <li>• Face off the ends</li> <li>• Chamfer the edge</li> <li>• Parallel turn the smaller diameter</li> </ul>	2	One mark per correct process up to a maximum of two marks.
1	e		<p>A description that includes four of the following stages:</p> <ul style="list-style-type: none"> <li>• Through filing</li> <li>• Draw filing</li> <li>• Wet/dry paper</li> <li>• Emery cloth</li> <li>• Steel wool</li> <li>• Polish</li> </ul>	4	One mark per correct stage up to a maximum of four marks.
<b>Section 1 total marks</b>				<b>24</b>	

Section 2

Question		Expected response	Max mark	Additional guidance
2	a	<p><b>Anthropometrics:</b></p> <p>The length of the handle will have taken into consideration the male 95th percentile dimension for hand width. This would ensure that as many people as possible could grip the handle comfortably.</p> <p>The designer would have to find the index finger width/ circumference to determine the size of any switches or buttons to ensure as many people as possible could use the hairdryer with ease. If buttons are too small, people could find them difficult to locate and press.</p> <p><b>Physiology:</b></p> <p>The strength or power required to press the on/off button would have been considered to ensure users do not have to apply too much force. This excess force could result in the product being hard to use or even worse, causing injury.</p> <p>The strength or power required to operate the hinge of the green hairdryer would have to be considered by the designer. It needs to be easy to fold but not so loose as to fold during operation.</p> <p>The material used for the handles would have been considered to ensure the user can grip them comfortably. The user's hands could be damp from their wet hair so it is important that a slippery material is not selected.</p> <p><b>Psychology:</b></p> <p>A colour which contrasts with the main body of the hairdryer could be chosen to make the buttons stand out. This will make it obvious to the user which parts need to be pressed or adjusted to operate the hairdryer.</p> <p>A style or pattern on the hairdryer makes it appeal to a user's sense of style.</p>	6	<p>Any suitable description relating to human dimensions and parts of the hairdryer should be awarded one mark.</p> <p>The candidate must link body part to a part of the hairdryer and describe its influence to gain a further mark.</p> <p>Any suitable description relating to physical/muscular movements should be awarded one mark. The candidate must describe how it would have an impact on easy interaction with the product to gain a further mark.</p> <p>Any suitable description relating human thoughts and feelings to the product or part of the product should be awarded one mark. The candidate must describe how this affects the use of the product to be awarded a further mark.</p>

2	b	i	<b>Aesthetics</b> would have to be considered when designing a hairdryer as it would have to appeal to the target market, whilst standing out against the competition.	1	Suitable description of factor.
2	b	ii	<b>Performance</b> would have to be considered when designing a hairdryer to ensure it safely dried hair in a reasonable amount of time.	1	Suitable description of factor.
2	b	iii	<b>Materials</b> would have to be considered when designing a hairdryer to make sure it did not heat up when in use and burn the user.	1	Suitable description of factor.
3	a		<p>An explanation that includes two of the following points.</p> <p>Products would be redesigned where:</p> <ul style="list-style-type: none"> <li>• Changes in manufacturing technology become available allowing electronic products to be manufactured at a lesser cost, more quickly or easily</li> <li>• Changes in materials technology become available allowing more complex or interesting shapes and forms to be manufactured, eg allowing them to be lighter, smaller, miniaturised, or more attractive to market</li> <li>• Changes in technology become available allowing electronic products to perform additional functions, eg motion sensors or GPS.</li> </ul>	2	<p>Candidates must make reference to electronic products to gain full marks for this question.</p> <p>One mark is awarded for each correct point up to a maximum of two marks.</p>
3	b		<p>Benefits of launching a product under a successful brand name are that it is:</p> <ul style="list-style-type: none"> <li>• Less risky for the designer</li> <li>• The brand will be recognised by consumers</li> <li>• People will be more willing to spend their money on the product if they have used</li> </ul>	2	One mark awarded for each benefit explained up to two marks.

			<p>the brand before</p> <ul style="list-style-type: none"> <li>• Successful brands have more money available for advertising.</li> </ul>		
4	a		<ul style="list-style-type: none"> <li>• Models will allow the designer to test/check the proportion and ergonomics of the product by allowing them to touch, hold and interact with it. They could then make changes as they develop the design further.</li> <li>• Models could be used to communicate the designs with other members of the design team. It may be easier for others to understand the design or parts of it in a 3D model rather than a sketch.</li> </ul>	2	One mark awarded for each relevant benefit described up to two marks.
4	b		<p>Materials such as paper, card, MDF, wire, expanded foam, clay, balsa wood, sheet plastic could be listed.</p> <p>Reasons for suitability may include:</p> <ul style="list-style-type: none"> <li>• Low cost</li> <li>• Easy to work with and shape</li> <li>• Quick to work with</li> <li>• Give good results</li> <li>• Any other suitable answer.</li> </ul>	2	One mark should be awarded for each material and valid reason for material suitability, up to a maximum of two marks.
4	c		<p>Possible advantages:</p> <ul style="list-style-type: none"> <li>• Time</li> <li>• Quality</li> <li>• Ease of communication between designers and offices, eg email</li> <li>• Ability to add material surface effects</li> <li>• Ability to rapid prototype</li> <li>• Can be used for marketing</li> <li>• Any other suitable answer</li> </ul>	2	One mark awarded for each advantage given up to two marks.
4	d		<p>Possible benefits:</p> <ul style="list-style-type: none"> <li>• Quick to produce</li> <li>• Can be tested</li> <li>• Communication with design team and clients</li> </ul>	1	One mark should be awarded for one benefit described.

			<ul style="list-style-type: none"> <li>• Material finishes can be applied to make it look realistic</li> <li>• Can be used for marketing</li> <li>• Any other relevant answer</li> </ul>		
5	a	i	<p>Any one of the following:</p> <ul style="list-style-type: none"> <li>• Polypropylene</li> <li>• ABS</li> </ul>	1	One mark awarded for selection of suitable material
5	a	ii	<p>Reasons could include:</p> <ul style="list-style-type: none"> <li>• Strength and durability relating to repeated daily use</li> <li>• Strength to weight ratio relating to portability around school/class</li> <li>• Aesthetics—inbuilt colour, making it more attractive to the user</li> <li>• Cost—school budgets</li> <li>• Suitable for manufacturing process</li> <li>• Any other suitable answer</li> </ul>	2	One mark awarded for each suitable reason, linking the product to school use up to two marks. Simple statements should not be awarded any marks.
5	a	iii	Injection moulding	1	
5	b	i	Welding	1	
5	b	ii	<p>Suitable finishes:</p> <ul style="list-style-type: none"> <li>• Paint</li> <li>• Spray paint</li> <li>• Plastic dip coating</li> </ul>	1	One mark awarded for selection of suitable finish.
5	c		<p>An explanation that includes any two of the following points:</p> <ul style="list-style-type: none"> <li>• Cheaper than producing them yourself</li> <li>• Reliable</li> <li>• Variety available for different jobs</li> <li>• Secure fixing</li> <li>• Semi-permanent fixings</li> <li>• Any other suitable answer</li> </ul>	2	One mark for each point explained up to two marks.

6	a	i	<p><b>Ease of use:</b></p> <ul style="list-style-type: none"> <li>A user trial could be used to evaluate the ease of use of the coffee machine. The designer may have asked consumers to make a cup of coffee whilst watching them to see if they had any problems in doing so. For example, finding switches, removing lids etc. Any problems noted could then be adjusted or changed before manufacturing the product.</li> </ul>	2	<p>The candidate must select and describe a suitable evaluation technique whilst relating it to the coffee machine to gain full marks.</p> <p>No marks should be awarded for simply stating an evaluation technique.</p> <p><i>(Note: a different technique should be used for each factor.)</i></p>
6	a	ii	<p><b>Aesthetics:</b></p> <ul style="list-style-type: none"> <li>A survey or questionnaire could be used to evaluate the aesthetics of the coffee machine.</li> <li>Consumers could be shown a prototype of the product and asked their opinions on shape, form, colour, etc to ensure the designer has made it appealing to the target market.</li> </ul>	2	<p>The candidate must select and describe a suitable evaluation technique whilst relating it to the coffee machine to gain full marks.</p> <p>No marks should be awarded for simply stating an evaluation technique.</p> <p><i>(Note: a different technique should be used for each factor.)</i></p>
6	a	iii	<p><b>Value for money:</b></p> <ul style="list-style-type: none"> <li>A product comparison could have been used to evaluate if the coffee machine is good value for money. Similar products could be researched to find out how much they sell for, as well as the functions they offer. This would help give the team an idea of whether people would be willing to pay for their design or not.</li> </ul>	2	<p>The candidate must select and describe a suitable evaluation technique whilst relating it to the coffee machine to gain full marks.</p> <p>No marks should be awarded for simply stating an evaluation technique.</p> <p><i>(Note: a different technique should be used for each factor.)</i></p>
6	b		<p>A description that includes any two of the following:</p> <ul style="list-style-type: none"> <li>Market researcher/ marketing team—would have been involved in evaluating how well the coffee maker met the needs and wants of the market or how competitively priced it is</li> </ul>	2	<p>One mark awarded for each relevant member of the design team chosen from list up to two marks.</p>

			<ul style="list-style-type: none"> <li>• Designer—would evaluate how well the design met the overall requirements of the design brief</li> <li>• Ergonomist—would have evaluated how easy the product was to use in terms of human factors, eg comfort, etc</li> <li>• Accountant—would have evaluated how financially viable the product would be, how much it has cost to design and produce</li> <li>• Retailer—would have evaluated how successful the product was in terms of sales</li> </ul>		
			<b>Section 2 total marks</b>	<b>36</b>	

**[END OF SPECIMEN MARKING INSTRUCTIONS]**