

National Qualifications SPECIMEN ONLY

S819/76/11

Design and Manufacture

Date — Not applicable Duration — 2 hours 15 minutes

Total marks — 80

SECTION 1 — 25 marks

Attempt ALL questions.

SECTION 2 — 55 marks Attempt ALL questions.

Write your answers clearly in the answer booklet provided. In the answer booklet you must clearly identify the question number you are attempting.

Use blue or black ink.

Before leaving the examination room you must give your answer booklet to the Invigilator; if you do not, you may lose all the marks for this paper.





SECTION 1 — 25 marks Attempt ALL questions

1. Two lawnmowers are shown with product information.



Electric hover mower Blade – mild steel Handle – plastic-coated mild steel Body – polypropylene Gears/fasteners – nylon Cable length – 20 m Weight – 4·2 kg Retail price – £29·99

Cylinder mower (manually operated) Blade – HSS (tool steel) Handle – foam rubber-coated aluminium Body – mild steel Gears/fasteners – nylon Wheels – metal alloy Grass catcher – nylon (with polypropylene base) Weight – 7·3 kg **Retail price – £119·50**



MARKS

1. (continued)

(a)	Explain why the materials chosen for each of these products are suitable. (<i>You should make six valid points</i> .)	6
(b)	Name three appropriate manufacturing processes used in the production of these lawnmowers and explain why each one is suitable.	6
(c)	Describe how ergonomics has influenced the design of the lawnmowers.	5
(d)	Describe the appeal of both lawnmowers from the consumer's viewpoint.	4
(e)	Describe how the design of both lawnmowers has been influenced by functional issues.	4

[Turn over

2. Production engineers use a variety of methods when planning for the manufacture of a product.

(a)	Explain three advantages of using a Gantt chart in the production planning process.	3
Star	ndard components are often used in the manufacture of products.	
(b)	Explain two drawbacks to the manufacturer of using standard components.	2

(b) Explain two drawbacks to the manufacturer of using standard components.

3. The bike below was designed and manufactured by Pinarello.



Pinarello holds patents for different parts of the bike.

(a)	Explain why manufacturers patent their design ideas.	3
The	bicycle frame was made from carbon-fibre which is a composite material.	
(b)	Explain two benefits of using composite materials.	2
3D p	printers can be used to manufacture specialised parts.	
(c)	Explain two benefits of using 3D printing to manufacture specialised parts.	2

[Turn over

2

2

4

4. The graph shown below has been used to predict and compare how well two new graphics tablets will sell.



- (a) From the graph above, state which graphics tablet would be commercially viable and explain your reasons for this choice.
- (b) Describe the steps a manufacturer could take to reduce the time required to introduce a product to the market.
- (c) Describe the steps that a company could take to extend the sales life of a product.

4

3

5. A company commissioned a designer to produce a range of kitchen accessories for users with limited manual dexterity. Two of the designer's concepts are shown below.



The company gave the designer an open brief.

(a) Explain why the designer may prefer an 'open brief' rather than a 'closed brief'. 2

The designer carried out research in order to analyse the brief.

(b) Describe how the designer could research the needs of the target market for these kitchen accessories.

Designers often work as part of a design team.

(c) Explain the benefits and drawbacks of working in a design team.

[Turn over

MARKS

6. The Bugatti Vera electric kettle is shown below.





Specification: Stainless Steel body Programmable timer Protective thermal security system stops overheating Saves up to 25% more energy Display integrated in the handle Electronic temperature control Retail price – £189-95

This kettle has been designed for a niche market.				
(a)	Explain the term 'niche market'.	2		
The	kettle could be manufactured using batch production techniques.			
(b)	Explain the issues the manufacturer would have to consider before deciding on a suitable production system.	3		
The	kettle was designed to be easily recycled at the end of its working life.			
(c)	Describe the steps the designer could take to make the kettle easier to recycle.	3		

7.	Designers often need to identify the materials that have been used to manufacture	MARKS
	products.	
	(a) Describe two methods that could be used to identify materials.	2
	Commercial products are designed so that they can be assembled accurately and efficiently.	
	(b) Describe how a product with which you are familiar has been designed so that it can be assembled accurately and efficiently.	4
	The sustainability of a product can be influenced by a range of issues.	
	(c) With reference to a product with which you are familiar, identify two issues and explain why they influence the sustainability of the product.	4
8.	Designers frequently use a wide variety of models and modelling techniques during the development of new products.	
	Describe how designers could use models effectively.	
	(You must refer to different types of models to support your answer.)	8

[END OF SPECIMEN QUESTION PAPER]



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Design and Manufacture

Marking Instructions

These marking instructions have been provided to show how SQA would mark this specimen question paper.

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General marking principles for Higher Design and Manufacture

Always apply these general principles. Use them in conjunction with the detailed marking instructions, which identify the key features required in candidates' responses.

- (a) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted for errors or omissions.
- (b) If a candidate response does not seem to be covered by either the principles or detailed marking instructions, and you are uncertain how to assess it, you must seek guidance from your team leader.
- (c) The term 'or any other valid response' allows for possible variation in candidates' responses. Always award marks according to the accuracy and relevance of an answer.
- (d) Where a question asks a candidate to describe, they must provide a statement or structure of characteristics and/or features. This should be more than an outline or a list. It may refer to, for example, a concept, process, experiment, situation, or facts, in the context of and appropriate to the question.
- (e) Where a question asks candidates to explain, they must relate cause and effect and/or make relationships between things clear, in the context of the question or a specific area within the question.
- (f) Where a question asks candidates to **discuss**, they must communicate ideas and information on a subject. It may be possible to debate two sides of the statement.

Marking instructions for each question

Question	Expected response	Max mark	Additional guidance
1. (a)	Candidates explain why the choices of materials for the lawnmowers are suitable. They should make six valid points. Possible responses could include reference to: durability impact resistance strength-to-weight ratio readily-available materials nylon — self-lubricating gears HSS steel — hardness rubber gives excellent grip chemical resistance comfort of foam foam gives excellent grip suitability of production method function of component parts aesthetic properties ease of cleaning. Or any other valid response.	6	 Award 1 mark for an appropriate point of explanation. Up to a maximum of 6 marks. For example: Aluminium offers an excellent strength-to-weight ratio, which is ideal for use with the cylinder mower as it has to be transported by the user. (1 mark) Do not award a mark for simply stating, for example, that metal alloy is strong. The nylon used for the grass catcher offers an extremely light and hard-wearing material that can be easily cleaned. This makes it suitable for the grass catcher as it has to be easy to carry and is likely to be bumped and knocked when being used. (2 marks) HSS steel is an extremely hard-wearing material that when sharpened maintains its edge. This would be important as the blade should stay sharp for as long as possible. (2 marks)

Question	Expected response	Max mark	Additional guidance
			As the electric hover mower will get bashed and dirty when being used, polypropylene is a good choice of material as it is durable and easily maintained. It also has a good strength-to-weight ratio which will make the lawnmower easier to move around. (3 marks)
			Do not award marks for repetition of properties, benefits or characteristics.
			 Electric hover mower Blade – mild steel durable to withstand tough working conditions when cutting grass can be heated and formed into the shape of the cutting blade can be cut and shaped to form the blade and machined to create a sharp edge to allow it to cut grass can be heat-treated to provide a hard durable blade so it will not go blunt too quickly and need sharpening
			 Handle – plastic-coated mild steel provides a tough finish that will protect it from outdoor weather conditions provides a comfortable grip when wet or in the cold stops the mild steel from rusting when used outside mild steel tubing provides a good strength-to-weight ratio which reduces the weight of the lawnmower, making it easier to use

Question		on	Expected response	Max mark	Additional guidance
					 Body – polypropylene impact-resistant which is important as it will get hit and bashed when used can be coloured, for example orange as in the picture can be moulded into the shape required for a hover mower lightweight so that the large shape of the body isn't too heavy and stops it from hovering resistant to UV light which is important as it is used outside heat-resistant so the heat from the motor will not deform the plastic body provides a good surface finish creating a smooth finish that is easy to clean chemical resistance for cleaning Gears/fasteners – nylon tough and durable so resistant to wear from the gears moving self-lubricating so suitable for moving parts and reducing friction Cylinder mower (manually operated) Blade – HSS (tool steel) tough durable material that that can maintain a sharp edge can be cut and shaped to form blade shape Handle – foam rubber-coated aluminium provides a comfortable grip when pushing and pulling the lawnmower provides good grip when wet which suits working in the garden aluminium tube can be formed into shapes required for the handle aluminium parts could be recycled making the lawnmower more environmentally friendly

Question	Expected response	Max mark	Additional guidance
			 Body – mild steel supplied in sheet form that can be cut and shaped to form the lawnmower body can be press-formed into shape of the lawnmower body creating an accurate and lightweight body Gears/fasteners – nylon tough and durable so resistant to wear self-lubricating so suitable for moving parts and reducing friction Wheels – metal alloy lightweight and durable can be cast which could be used to mass produce wheels can be machined after casting to create finished accurate wheel has more suitable properties than pure metals which create a light and tough wheel water-resistant which means the wheels will not be corroded by wet grass Grass catcher – nylon (with polypropylene base) lightweight so the grass catcher is easy to move, attach and carry good tensile strength providing a strong thin mesh that will not break when full of grass cuttings

Question	Expected response	Max mark	Additional guidance
(b)	 Candidates name three appropriate mass production processes and explain why they are suitable. Suitable processes Electric mower: extrusion; bending; injection moulding; piercing and blanking; plastic-/powder-/dip-coating; sharpening. Cylinder mower: injection moulding; compression moulding; welding; CNC machining; bending/press forming; extrusion; pressure die-casting; sharpening; spray-painting. Possible responses could include reference to the ways in which: the process's manufacturing/assembly techniques are influenced by volume of production the process is suitable for the material, for example sheet metal for press forming the manufacturing process uses a quality approach, that is quality of standard components the process meets the needs of the consumer, for example a high-quality finish. 	6	 Award a maximum of 3 marks for naming of processes (1 mark for each process). Award a maximum of 3 marks for explanations of suitability. Award 1 mark for each explanation of suitability; where more than one explanation is given for a process, award a maximum of 2 marks per process. Up to a maximum of 6 marks. NB You can award marks for correct explanations of an incorrectly named process. Explanations could include: standardisation of sizes: component parts all the same size; no further finishing required; shapes suitable for process standardisation of components and materials chosen because they are easily sourced/formed suitable for mass/batch production — injection moulding economies of scale — mass/continuous production/JIT extrusion (1 mark) is used for the handle of the hover mower because it consistently gives a uniform cross section. (1 mark) Explanations could include: repeatability accuracy level of detail form suitable for process economies of scale quality of finish speed and ease of assembly.

Question	Expected response	Max mark	Additional guidance
Question (c)	Expected responseCandidates describe how ergonomics has influenced the design of the lawnmowers.Responses are likely to include reference to:• anthropometrics relating to handle grip, position, and locking• position of handles for operation (dead man's switch)• handle adjustment (height)• handsize (for access to components)• finger traps 	5	Additional guidance Award 1 mark for a valid point of description. Up to a maximum of 5 marks. For example: The handle on the cylinder mower is adjustable, to allow a variety of people to use it comfortably. (1 mark) The cylinder mower comes with a foam rubber handle, which makes it comfortable for the user to hold. (1 mark) The diameter of both lawnmowers' handles will suit the grip diameter of users in the 50th percentile to ensure the handles can be held tightly. (1 mark) The strength required to twist and turn the handles will have been considered when designing the shape and operation of the locking handles. (1 mark) Psychology has influenced the colours of the cylinder mower. All the moving parts are orange, making them stand out against the body and handle of the
	 of assembly, looks safe and easy to use comfort during use access for cleaning/maintenance. Or any other valid response. 		lawnmower. (1 mark)

Question	Expected response	Max mark	Additional guidance
(d)	Candidates describe the appeal of both lawnmowers to the consumer. Possible responses could include reference to: • cost (only if compared) • aesthetics • durability • brand name/image • recycling • easy to use/store • lightweight • grass catcher (cylinder mower) • safety • no need for electricity (cylinder mower) • easy to move, due to wheels (cylinder mower) • value for money, for example a lower price to suit those with less disposable income (electric mower) • no cable, so it can be used more than 20 m from a power point (cylinder mower) • can be used on severe slopes (electric mower). Or any other valid response.	4	Award 1 mark for a valid point of description. Up to a maximum of 4 marks. Award a maximum of 3 marks if a candidate refers to only one lawnmower. For example: The hover mower is appealing because it costs significantly less than the cylinder mower. (1 mark)

Qu	estion	Expected response	Max mark	Additional guidance
	(e)	Candidates describe how the designs of the lawnmowers have been affected by functional issues	4	Award 1 mark for a valid point of description.
		Possible responses could include reference to:		For example:
		 fitness for purpose (do not accept 'they both cut grass') safety aspects of function – dead man's trigger; electrical safety choice of materials (relating to function) ease of adjustment stability of lawnmower portability storage ease of cleaning. 		The cylinder mower does not use electricity so it can be used anywhere and is designed with a grass collector that will save time when cutting the grass. (2 marks)
		Or any other valid response.		

Question	Expected response	Max mark	Additional guidance
2. (a)	 Candidates explain any three advantages of using a Gantt chart. Possible responses could include reference to: structured project planning of production (JIT) clarity of complex tasks provided in one document improved communication between team better coordination of tasks improved time management increased productivity reduction in stock wastage less hours lost in production time management labour requirements manufacturing costs reduced storage of component parts reduced. Or any other valid response. 	3	Award 1 mark for an appropriate explanation. Up to a maximum of 3 marks. For example: The Gantt chart allows the company to order component parts when they are required, therefore reducing the amount of stock they have in storage. (1 mark) The Gantt chart allows the company to organise when stock will be required, when particular production machines/plant are needed, and how much of the workforce is required at any particular time. (3 marks) Accept explanations relating to lead times.

Question	Expected response	Max mark	Additional guidance
(b)	Candidates explain two drawbacks of using standard components. Possible responses could include reference to: delivery issues costs dealing with a third-party, for example contracts, relationships, stability of supplier quality assurance sustainability issues restrictions in design. Or any other valid response.	2	Award 1 mark for an appropriate explanation. Up to a maximum of 2 marks. For example: A drawback for the manufacturer of using standard components is that standard components are bought in from another company; they do not have direct control over the quality of the product. (1 mark)

Q	uestion	Expected response	Max mark	Additional guidance
3.	(a)	Candidates explain why manufacturers patent their designs. Possible responses could include reference to: legal protection of ideas no one can profit from your ideas without permission competitive edge on other manufacturers can be licensed or sold seen as a market leader/innovative. Or any other valid response.	3	 Award 1 mark for an appropriate point of explanation. Up to a maximum of 3 marks. For example: holder has the exclusive use of the idea stops others from copying, manufacturing, selling or importing your idea or invention provides the holder with set period of time to profit from their ideas before competitors can use it patent holder can license the patent for others to use which provides income patents can be sold to raise money patents can be used when marketing a product.
	(b)	Candidates explain two benefits of composite materials. Possible responses could include reference to aspects/features or characteristics of composites such as: • performance • strength • combined properties/ characteristics • cost. Or any other valid response.	2	 Award 1 mark for an appropriate explanation. Up to a maximum of 2 marks. For example: higher performance to given weight laminated/composited materials are generally stronger final materials share the properties of each material in the composite part/parts cost could be reduced production cost could be reduced most composites offer excellent resistance to corrosion, chemicals and weathering (UV degradation).

Question	Expected response	Max mark	Additional guidance
(c)	Candidates explain two benefits of using 3D printing to manufacture specialised parts. Possible responses could include reference to: • flexibility of manufacturing • reduction in manufacturing costs • reduction in tooling costs • customisation is easier • can replicate mass-produced parts • reduced lead time • no manufacturing skills required • reduction of labour costs • cost-effective at low volume. Or any other valid response.	2	 Award 1 mark for an appropriate explanation. Up to a maximum of 2 marks. For example: parts can be manufactured from similar materials without associated set-up and tooling costs parts can be customised to suit individuals suited to one-off or low-volume production complex components can be manufactured without the need to assemble them.

Question	Expected response	Max mark	Additional guidance
4 . (a)	Candidates state which graphic tablet is the most commercially viable and explain their reasons. Tablet 2 is the most commercially viable. Possible responses could include reference to making more profit due to: • reduced lead time compared to tablet 1 • less time in negative profit compared to tablet 1 • sales start earlier (tablet 2) • sales last longer (tablet 2) • tablet 2 in profit longer.	2	 Award 1 mark for a correct statement. Award 1 mark for an appropriate explanation. Up to a maximum of 2 marks. For example: Tablet 2 is the most commercially viable because, although sales are lower than for tablet 1, it produces more profit for the manufacturer as the graph indicates it spends less time in negative profit. (2 marks)

Question	Expected response	Max mark	Additional guidance
(b)	Candidates describe the steps a manufacturer could take to reduce the time required when introducing a product to market. Possible responses could include reference to: use of rapid prototyping to shorten research and development time outsourcing to specialists ensuring reliable delivery of raw materials efficient production and process scheduling reduction in the number of processes used reduction in transit time efficient quality assurance procedures increasing staffing levels/working longer hours. Or any other valid response.	2	Award 1 mark for a valid point of description. Up to a maximum of 2 marks. For example: The manufacturer could employ rapid prototyping techniques to reduce the time needed for research and development. (1 mark)

Question	Expected response	Max mark	Additional guidance
(C)	Candidates describe how the company could extend the sales life of a product. Possible responses could include reference to: price reduction special offers (eg free tablet case) increased advertising updated versions (software) special editions/additional features. Or any other valid response.	4	 Award 1 mark for a valid point of description. Up to a maximum of 4 marks. For example: The company could extend the life of the product by reducing the price or introducing special editions. More or better advertising would keep the product selling for longer. (3 marks)

Question		on	Expected response	Max mark	Additional guidance
5.	(a)		Candidates explain why a designer would prefer working to an open brief. Possible responses could include reference to: more opportunity for creativity more scope for innovation more opportunity to diversify into new, related product ideas.	2	 Award 1 mark for each appropriate point leading to a clear explanation. Up to a maximum of 2 marks. For example: An open design brief gives the designer more scope to be creative and come up with a variety of ideas. (2 marks)

Questic	on	Expected response	Max mark	Additional guidance
(b)		Candidates describe how the needs of the target market could be researched. Possible responses could include reference to: • questionnaires/surveys • user trials • user trips. Or any other valid response.	4	Award 1 mark for each point of description. Do not award marks for simply naming research techniques. Up to a maximum of 4 marks. <i>For example:</i> The designer could have used a number of techniques when researching the needs of the target market. A questionnaire could have been created focusing on what kitchen products are difficult to use and sent out to people with limited manual dexterity. A user trial could be set up where people with limited dexterity could be observed and questioned when using kitchen accessories. Experts such as doctors, ergonomists and physiotherapists could be interviewed to find out what specific problems people with manual dexterity have. (4 marks) A user trial could be set up where a range of people with different limited manual dexterity are invited to complete a number of kitchen tasks using common kitchen accessories. The user group could be asked to record the difficulties they faced and discuss what would make completing the tasks or using the accessories easier. The designers could also observe the group carrying out the tasks and ask questions during and after the user trials. The group could also be asked to use existing accessories developed for people with manual dexterity and discuss with the designer what works well and what does not. (4 marks)

Question	Expected response	Max mark	Additional guidance
(C)	Candidates explain the benefits and drawbacks of working in a design team. Possible responses could include reference to: promotes diverse thinking gathers ideas from range of people access to expertise access to information ideas can be shared and discussed problems can be approached from different perspectives continued input and feedback from different members of the design team. Or any other valid response.	3	Award 1 mark for each valid point leading to a clear explanation. Up to a maximum of 3 marks. For example: Working in a design team provides more opportunity to share ideas and get inputs from different experts throughout the design process. This means that the product is likely to be developed quicker and with fewer problems. For example, having an ergonomist as part of the design team when developing kitchen accessories means there is less chance of the product not being easy or comfortable to use. However, there is a chance that the design could be driven in the wrong direction by stronger members of the design team, or the design could be constrained as some options could be dismissed before they have been explored. (3 marks)

Question		on	Expected response	Max mark	Additional guidance
6.	(a)		Candidates explain the term <i>niche</i> <i>market</i> . Possible responses could include reference to: • focusing on a smaller target group with specific: — needs — wants. Or any other valid response.	2	 Award 1 mark for each valid point leading to a clear explanation. Up to a maximum of 2 marks. For example: A niche market is a small, well defined segment of the market with specific needs and wants. This makes marketing and designing products easier compared to a mass market. (2 marks)

Question	Expected response	Max mark	Additional guidance
(b)	Candidates explain the issues the manufacturer would have to consider before deciding on a suitable production system for the kettle. Possible responses could include reference to: • volume of production • life expectancy • demand • lead time • price of product • skill and flexibility of workforce • size of workforce • existing plant and machinery • investment • number and type of component parts. Or any other valid response.	3	Award 1 mark for each valid point leading to a clear explanation. Up to a maximum of 3 marks. For example: Before deciding on a suitable production system for the kettle, the manufacturer would have to consider the number of kettles to be produced; how long the demand for the kettle will last; and the kettle's selling price. If there is a large continuous demand for the kettle, the manufacturer could decide to invest in tooling to mass-produce the kettle as they would be confident of making a profit. If the kettle had different models and variations, it may be more economical to invest in machinery that is more flexible so that different models can be made as orders come in in batches. (3 marks)

Question	Expected response	Max mark	Additional guidance	
(C)	Candidates describe the steps that a designer could take to make the kettle easier to recycle. Possible responses could include reference to: • fewer types of materials per product • lower volume of materials per product • materials that are easy to recycle/ renewable • materials easily identifiable • product easily dismantled for recycling.	3	Award 1 mark for each valid point leading to a clear description. Up to a maximum of 3 marks. For example: The designer could make the product easier to recycle by using fewer materials in the product and ensuring the materials used are easily recyclable. (2 marks)	
	Or any other valid response.			

Question		on	Expected response	Max mark	Additional guidance	
7.	7. (a)Candidates describe two methods that could be used to identify the materials used in the manufacture of a commercial product.2Possible responses are likely to 		2	 Award 1 mark for each valid point of description. Up to a maximum of 2 marks. Do not award marks for simply identifying a method. For example: 		
			 testing identification symbols comparisons to other products. Or any other valid response. 		You could use a flame test. (0 marks) If the product was made of plastic you could look for identification symbols that are moulded into a lot of plastic products. The symbol has letters that tell you what plastic has been used. Once you have found the symbol you can look up what the letters stand for. (1 mark)	

Question	Expected response	Max mark	Additional guidance	
(b)	Candidates describe the methods that could be used to ensure a product with which they are familiar can be assembled accurately and efficiently. Possible responses are likely to include reference to: bosses location pins asymmetric parts labelling housing for standard components standard fixings standard components built-in fixings material properties accuracy of construction. Or any other valid response.	4	 Award 1 mark for each valid point of description. Up to a maximum of 4 marks. Do not award marks for simply identifying the assembly method used. For example: The hairdryer uses bosses, standard fixings and components and powered screwdrivers to assemble the product accurately and efficiently. (0 marks) Bosses were integrated into the RedHot hairdryer handle casing to help align the two parts of the handle and allow self-tapping screws to hold the casing together. The self-tapping screws are standard fixings that cut a thread into the bosses and can be screwed in using power screwdrivers that save time and can be set to ensure the screws are not over- or under-tightened. (4 marks) 	

Question	Expected response	Max mark	Additional guidance	
(c)	Candidates identify two issues and explain why they influence a product's sustainability.	4	Award 1 mark for each valid point of explanation. Up to a maximum of 4 marks.	
	Possible responses could include reference to:		Do not award marks for simply identifying issues.	
	 production of raw materials use of materials pollution transport life expectancy maintenance and repair disposal energy consumption. Or any other valid response. 		 For example: Two issues that influence the sustainability of the RedHot hairdryer are where it was manufactured and its life expectancy. (0 marks) As it is manufactured in China and sold in Europe, it has to be transported by sea. This causes a lot of pollution that could be avoided if it was manufactured in Europe. (1 mark) This is a budget hairdryer with a short life expectancy. This means the hairdryer is likely to be disposed of quickly which wastes materials and energy and also contributes to landfill if not recycled. (2 marks) 	

Question	Expected response	Max mark	Additional guidance	
8.	 This question tests the candidate's ability to present a reasoned discussion about a design consideration. Although the question requires an underlying body of design knowledge to answer it, there is a wide range of possible answers. Therefore, mark it holistically. Candidate responses should demonstrate: knowledge of the subject matter ability to comprehend the question and construct an answer use of clear examples to support the points made. Refer to the table below to help you place answers within the mark range. Possible responses could include reference to: variety of models/techniques available appropriate uses of modelling and information that can be gathered. Or any other valid response. 	8	Award marks according to the band descriptions in the table below. Up to a maximum of 8 marks. Once you have selected the appropriate mark range for a response, if it is close to the band description above, award the higher mark; if it is close to the band description below, award the lower mark. Test models: used when determining functionality to allow accurate components to be manufactured • determining structural suitability • health and safety compliance • gauging functional efficiency • material properties Prototypes: used to physically show or simulate the final design in terms of aesthetics, materials and functionality. They can also be used to: • check for any flaws • test efficiency • identify and/or overcome performance issues • establish public/consumer opinion.	

Question	Expected response	Max mark	Additional guidance
	The description is likely to refer to some of the following aspects, and may include other aspects depending on the product referenced: Scale models: used to quickly communicate ideas/concepts without giving too much detail • checking ergonomic aspects • developing concept ideas • developing aesthetic aspects • aspects of testing • feedback to client		

0-2 marks	3-4 marks	5-6 marks	7-8 marks
Candidate demonstrates limited knowledge or understanding of the use of models and the information that can be gathered.	Candidate demonstrates adequate knowledge and understanding of the use of models and the information that can be gathered.	Candidate demonstrates secure knowledge and understanding of the use of models and the information that can be gathered.	Candidate demonstrates extensive knowledge and understanding of the use of models and the information that can be gathered.
 little or no reference to types of models very few points made much of the response does not answer the question answer is simply too thin 	 answer is relevant to the question reference to different types of models although examples are used, points made are unclear 	 answer is relevant to the question and demonstrates a good level of comprehension clear reference to types of models several clear points made and examples used to support them 	 answer is relevant to the question and demonstrates a high level of comprehension detailed information about different types of models and how they are used to support design