



National
Qualifications
2017

2017 Design and Manufacture

Advanced Higher

Finalised Marking Instructions

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General marking principles for Advanced Higher 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 detailed marking instructions, which identify the key features required in candidate responses.

- (a) Marks for each candidate response must always be assigned in line with these general marking principles and the detailed marking instructions for this assessment.
- (b) Marking should always be positive. This means that, for each candidate response, marks are accumulated for the demonstration of relevant skills, knowledge and understanding: they are not deducted from a maximum on the basis of errors or omissions.
- (c) If a specific 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.
- (d) For each candidate response, the following provides an overview of the marking principles. Refer to the detailed marking instructions for further guidance on how these principles should be applied.
 - (i) Questions that ask candidates to **describe**
Candidates must provide a statement or structure of characteristics and/or features. This should be more than an outline or a list. Candidates may refer to, for instance, a concept, experiment, situation, or facts in the context of and appropriate to the question. Candidates will normally be required to make the same number of factual/appropriate points as are awarded in the question.
 - (ii) Questions that ask candidates to **explain**
Candidates must generally relate cause and effect and/or make relationships between things clear. This will be related to the context of the question or a specific area within a question.

Detailed marking instructions for each question

Section 1

Question		Expected response	Max mark	Additional guidance
1.	(a)	<p>Responses are likely to make reference to:</p> <ul style="list-style-type: none"> • Changes to aesthetics • Improvements to function • Improved ergonomics • Miniaturisation • Environmental impact • Availability • Affordability • Life expectancy • Economic changes • Success or failure of the product • The impact the product had on society 	10	<p>Marks should be given using the best fit characteristics shown below.</p> <p>To gain marks in the top banding candidates must describe how both advances in technology and materials have led to notable turning points.</p>
<p>An answer which falls into these categories may do so for a number of reasons. It is likely that:</p>				
		0-4 Marks	5-7 Marks	8-10 Marks
		<p>It demonstrates a limited knowledge and understanding of the subject matter. The points made are not all relevant to or do not answer the question. Few points are made. There is limited reference to technology and materials. Reference to technology and materials is generic. No clear turning points have been identified. Changes identified make little reference to materials or technology. Answer is simply too thin.</p>	<p>It demonstrates a fair knowledge and understanding of the subject matter. The points made are relevant to the question and demonstrate a good level of comprehension. There is reference to specific technology and materials. Notable turning points have been identified. Changes to product have been described with links to changes in materials and technology. Examples have been provided.</p>	<p>It demonstrates detailed knowledge and understanding of the subject matter. The points made are relevant to the question and demonstrate a high level of comprehension. There is detailed reference to specific technologies and materials. Notable turning points have been identified and described. Changes to product as clearly referenced to changes in materials and technology. Considered examples have been used.</p>

Question		Expected response	Max mark	Additional guidance
	(b)	<p>Responses are likely to make reference to:</p> <ul style="list-style-type: none"> • Poor market research • Changes too radical • High costs • Product superseded by competition • Changes in consumer demand • Changes in fashion and trends • Poor marketing • Faults • Reputation 	4	Marks should be given using the best fit characteristics shown below.
<p>An answer which falls into these categories may do so for a number of reasons. It is likely that:</p>				
0-1 marks		2-3 marks		4 marks
<p>It demonstrates a limited knowledge and understanding of the subject matter. Limited reasons for lack of commercial success. Generic reference to products. The points made are not all relevant to or do not answer the question. Generic reference to products. Few points are made.</p>		<p>It demonstrates knowledge and understanding of the subject matter. Clear reasons for lack of commercial success. Reference to products. The points made are relevant to the question and demonstrate a good level of comprehension.</p>		<p>It demonstrates detailed knowledge and understanding of the subject matter. Detailed reasons for lack of commercial success. Considered reference to products. The points made are relevant to the question and demonstrate a high level of comprehension.</p>

Question		Expected response	Max mark	Additional guidance
	(c)	Responses are likely to make reference to: <ul style="list-style-type: none"> • Specific designer • Range of aesthetic characteristics 	4	Marks should be given using the best fit characteristics shown below.
An answer which falls into these categories may do so for a number of reasons. It is likely that:				
0-1 marks		2-3 marks		4 marks
It demonstrates a limited knowledge and understanding of the subject matter. Vague reference to a designer and their products. Limited reference to aesthetics characteristics. Vague description of the aesthetic characteristics of the designer. The points made are not all relevant to or do not answer the question. Few points are made.		It demonstrates knowledge and understanding of the subject matter. Clear reference to a designer and their products. Reference to a range of aesthetics characteristics. Clear description of aesthetic characteristics. The points made are relevant to the question and demonstrate a good level of comprehension.		It demonstrates detailed knowledge and understanding of the subject matter. Detailed reference to a designer and their products. Reference to a range of aesthetics characteristics. Detailed description of aesthetics characteristics. The points made are relevant to the question and demonstrate a high level of comprehension.

Question		Expected response	Max mark	Additional guidance
	(d)	Responses are likely to make reference to: <ul style="list-style-type: none"> • Standardisation • Similarity • Lack of personalisation • Popularity • Affordability • Environmental impact • Use of materials • Aesthetics • Assembly • Volume of production • Quality 	4	Marks should be given using the best fit characteristics shown below.
An answer which falls into these categories may do so for a number of reasons. It is likely that:				
0-1 marks		2-3 marks		4 marks
It demonstrates a limited understanding of how modern production systems have impacted on products. Limited reference to products. The points made are not all relevant to or do not answer the question. Few points are made.		It demonstrates an understanding of how modern production systems have impacted on products. Reference to products. The points made are relevant to the question and demonstrate a good level of comprehension.		It demonstrates detailed understanding of how modern production systems have impacted on products. Considered reference to products. The points made are relevant to the question and demonstrate a high level of comprehension.

Question		Expected response	Max mark	Additional guidance
	(e)	Responses are likely to make reference to: <ul style="list-style-type: none"> • Pricing • Safety • Changing incomes • Labour saving products • Environmental concerns 	4	Marks should be given using the best fit characteristics shown below.
An answer which falls into these categories may do so for a number of reasons. It is likely that:				
		0-1 marks	2-3 marks	4 marks
		It demonstrates a limited knowledge and understanding of changes in society and their impact on products. Limited reference to social changes. Limited reference to products. The points made are not all relevant to or do not answer the question. Few points are made.	It demonstrates knowledge and understanding of changes in society and their impact on products. Reference to social changes. Changes in a products evolution identified. Reference to products. The points made are relevant to the question and demonstrate a good level of comprehension.	It demonstrates detailed knowledge and understanding of changes in society and their impact on products. Considered reference to social changes. Clear changes in a products evolution identified. Considered reference to products. The points made are relevant to the question and demonstrate a high level of comprehension.

Question		Expected response	Max mark	Additional guidance
	(f)	<p>Responses are likely to make reference to:</p> <ul style="list-style-type: none"> • Flexible manufacturing systems • Smart materials • Improved recyclability • Cleaner production • Efficient production • Biodegradable materials • Durability • Like expectancy • More efficient use of materials 	4	Marks should be given using the best fit characteristics shown below.
<p>An answer which falls into these categories may do so for a number of reasons. It is likely that:</p>				
		0-1 marks	2-3 marks	4 marks
		<p>It demonstrates a limited knowledge and understanding of the emerging technologies and materials. Limited knowledge and understanding of sustainability. The points made are not all relevant to or do not answer the question. Few points are made.</p>	<p>It demonstrates knowledge and understanding of emerging technologies and materials. Knowledge and understanding of sustainability. The points made are relevant to the question and demonstrate a good level of comprehension.</p>	<p>It demonstrates detailed knowledge and understanding of emerging technologies and emerging materials. Detailed knowledge and understanding of sustainability. The points made are relevant to the question and demonstrate a high level of comprehension.</p>

Section 2

Question		Expected response	Max mark	Additional guidance
2.	(a)	<p>Answers are likely to include references to:</p> <ul style="list-style-type: none"> • Economics - funding, transportation, market, testing, running costs, prototyping, IPR • Ergonomics - length/width of baby, access, weight to transport, simple to use, global communication/user interface • Performance - obsolescence, onsite repair/maintenance, durability, easy to clean/keep sterile, portability, power source • Function - hygiene, portable, inflatable, air circulation, temperature regulation, power supply • Safety - sterile, air flow, temperature, see and hear baby • Materials • Manufacture <p>Or any other valid point.</p>	6	The answer should be marked as described below.

An answer which falls into these categories may do so for a number of reasons. In explanations given it is likely that for:

0-2 marks	3-4 marks	5-6 marks
<p>Limited understanding of</p> <ul style="list-style-type: none"> • Issues that may have been considered during the development of the Mom incubator • How the issues may have influenced the design <p>Generic issues have been identified. Generic influences to design provided. The answer is simply too thin(lacking detail).</p>	<p>Good understanding of</p> <ul style="list-style-type: none"> • Issues that may have been considered during the development of the Mom incubator • How the issues may have influenced the design <p>Issues relating to the Mom Incubator have been identified. Reference is made to the Mom incubator.</p>	<p>Clear understanding of</p> <ul style="list-style-type: none"> • Issues that may have been considered during the development of the Mom incubator • How the issues may have influenced the design <p>Key issues relating to the Mom Incubator have been identified. Clear reference is made to the Mom incubator.</p>

Question		Expected response	Max mark	Additional guidance
	(b)	<p>Answers are likely to include:</p> <p>Consideration of how the four P's (product, price, promotion and placement) would differ in the developed and developing world.</p> <p>References to differences are likely to include:</p> <p>Economic factors, use of social and commercial media, access, word of mouth, communication, profit/non-profit, commercial/financial backing endorsement, branding.</p> <p>Any other valid point.</p>	4	<p>The answer should be marked as described below.</p> <p>Candidates must describe differences no marks should be awarded for listing marketing techniques.</p>
<p>An answer which falls into these categories may do so for a number of reasons. In explanations given it is likely that for:</p>				
<p>0-2 marks</p>			<p>3-4 marks</p>	
<p>Limited understanding of</p> <ul style="list-style-type: none"> • Marketing in the developing world • Marketing in the developed world • Limited reference to differences <p>The answer is simply too thin (lacking detail).</p>			<p>Clear understanding of</p> <ul style="list-style-type: none"> • Marketing in the developing world • Marketing in the developed world • Clear reference to differences <p>The answer is detailed and relevant points are made.</p>	

Question		Expected response	Max mark	Additional guidance
3.	(a)	<p>Answers are likely to include reference to:</p> <ul style="list-style-type: none"> • Advances in technologies such as: • 3D printing • Computerization/automation • 3D scanning • Miniaturisation <p>Or any other valid point.</p>	6	The answer should be marked as described below:
An answer which falls into these categories may do so for a number of reasons. In explanations given it is likely that for:				
0-2 marks		3-4 marks		5-6 marks
<p>Limited reference to advances in technology. Limited knowledge of advances in technology. Limited reference to the production of products. Limited/vague descriptions are given. The answer is lacking detail.</p>		<p>Reference to advances in technology. Understanding of how advances in technology impact on production. Reference to the production of products. Reference to products.</p>		<p>Clear reference of advances in technology. Clear understanding of the advances impact on production. Clear reference to the production of products. Considered reference to products. The answer is detailed and relevant.</p>

Question		Expected response	Max mark	Additional guidance
	(b)	Descriptions are likely to include reference to: <ul style="list-style-type: none"> • Training • Testing • Random sampling • Investing in/maintaining equipment • Empowering/involving employees in QC • Cell system • Employee incentives • Engaged/motivated employees • TQM or JIT strategies 	4	The answer should be marked as described below: No marks should be awarded for listing quality assurance methods.
An answer which falls into these categories may do so for a number of reasons. In explanations given it is likely that for:				
0-2 marks			3-4 marks	
Vague description displaying: <ul style="list-style-type: none"> • Limited understanding of Quality control procedures • Limited understanding of the methods a company can use The answer is lacking detail.			Detailed description displaying: <ul style="list-style-type: none"> • Clear understanding of Quality control procedures • Clear understanding of the methods a company can use The answer is detailed and relevant to the question.	

Question			Expected response	Max mark	Additional guidance
4.	(a)	(i)	Answers are likely to include reference to: <ul style="list-style-type: none"> • Absorbing impact • Non porous • Flexible • Semi rigid • Light weight • Resistant to wear • Comfort • Easy to clean and maintain • Supporting • Flexibility • Reduce fatigue or strain • Durability • Manufacturing and assembly 	4	The answer should be marked as described below: Both the replaceable sole and the outer shell must have been considered to achieve 4 marks in the top band.
An answer which falls into these categories may do so for a number of reasons. In explanations given it is likely that for:					
			0-2 marks	3-4 marks	
Vague explanation displaying: <ul style="list-style-type: none"> • Limited understanding of the issues associated with material selection • Limited reference to the replaceable sole and outer shell The answer is thin and lacking detail.			Detailed explanation displaying: <ul style="list-style-type: none"> • Clear understanding of the issues associated with material selection • Clear reference to the replaceable sole and outer shell The answer is detailed and relevant to the question.		

Question		Expected response	Max mark	Additional guidance
	(ii)	Descriptions are likely to include reference to: <ul style="list-style-type: none"> • Tooling/set up costs • Economy of scale • Price and market • Flexible manufacturing • Expertise/training/staffing • Number of operations • Jigs/fixtures 	4	The answer should be marked as described below:
An answer which falls into these categories may do so for a number of reasons. In descriptions given it is likely that for:				
0-2 marks			3-4 marks	
Vague description displaying: <ul style="list-style-type: none"> • Limited understanding of how volume of production could influence production methods • Limited reference to the Vacoped boot The answer is lacking detail.			Clear description displaying: <ul style="list-style-type: none"> • Clear understanding of how volume of production could influence production methods • Clear reference to the Vacoped boot The answer is detailed and relevant.	

Question	Expected response	Max mark	Additional guidance
(b)	<p>Answers are likely to include reference to:</p> <p>Physiology such as:</p> <ul style="list-style-type: none"> • Easy to access, straps, clips and simple ratchet locks to reduce strength required to operate/adjust fasteners- • Low friction materials or clearance to allow easy movement to reduce force required to move boot from upright to leaning position • Light-weight materials to reduce the effort required to walk with the boot (fatigue) • Stiff or semi rigid materials to reduce the unwanted movement to allow the limb to heal <p>Psychology such as:</p> <ul style="list-style-type: none"> • Colour to indicate functional parts • Open design to appear lightweight/fresh/breathable/comfortable • Silver grey colour - suggests strong • Open design - comfort in being able to access limb • Use of cool colours <p>Or any other valid answer.</p>	4	<p>The answer should be marked as described below:</p> <p>Both physiology and psychology must be considered to achieve 4 marks in the top band.</p>

An answer which falls into these categories may do so for a number of reasons. In explanations given it is likely that for:

0-2 marks	3-4 marks
<p>Vague description displaying:</p> <ul style="list-style-type: none"><li>• Limited understanding of the influence of Physiology<li>• Limited understanding of the influence of Psychology<li>• Limited reference to the boot <p>The answer is thin and lacks detail.</p>	<p>Detailed description displaying:</p> <ul style="list-style-type: none"><li>• Clear understanding of the influence of Physiology<li>• Clear understanding of the influence of Psychology<li>• Clear reference to the boot <p>The answer is detailed and relevant points are made.</p>

Question		Expected response	Max mark	Additional guidance
5.	(a)	<p>Answers are likely to refer to:</p> <ul style="list-style-type: none"> • Use of effective market research • Evaluating existing products • Situation analysis • Recognising potentials for use of new materials or technologies • Spin off from new products • New and emerging markets • Changes in the economy • Legislation • Approach from a potential client <p>Any other suitable response.</p>	4	<p>The answer should be marked as described below:</p> <p>Marks should not be awarded for social change identified in the question.</p>
<p>An answer which falls into these categories may do so for a number of reasons. In descriptions given it is likely that for:</p>				
0-1 marks		2-3 marks		4 marks
<ul style="list-style-type: none"> • Limited understanding of design opportunities • One opportunity identified • Vague description <p>The answer is thin and lacking detail.</p>		<ul style="list-style-type: none"> • Understanding of how design opportunities may arise • Two opportunities described 		<ul style="list-style-type: none"> • Clear understanding of how design opportunities may arise • Two or more opportunities described in detail.

Question		Expected response	Max mark	Additional guidance
	(b)	<p>Answers are likely to make reference to:</p> <ul style="list-style-type: none"> • Reduce transportation • Reduce packaging • Design efficient products • Design products to be maintained • Avoid redundant features • Increase the product's life span <p>Any other suitable response.</p>	4	<p>The answer should be marked as described below:</p> <p>No marks to be awarded for answers relating to materials or manufacturing processes.</p>
<p>An answer which falls into these categories may do so for a number of reasons. In descriptions given it is likely that for:</p>				
0-1 marks		2-3 marks		4 marks
<p>Vague description displaying:</p> <ul style="list-style-type: none"> • Limited understanding of the environmental impact of products • Limited understanding of how companies can reduce the environmental impact of products • One method to reduce the environmental impact is included in description 		<p>Good description displaying:</p> <ul style="list-style-type: none"> • Understanding of the environmental impact of products • Understanding of how companies can reduce the environmental impact of products • Two method to reduce the environmental impact is included in description 		<p>Detailed description displaying:</p> <ul style="list-style-type: none"> • Clear understanding of the environmental impact of products • Clear understanding of how companies can reduce the environmental impact of products • Two or more method to reduce the environmental impact is included in description

Question		Expected response	Max mark	Additional guidance
	(c)	<p>Answers are likely to refer to:</p> <p>Difficulties including:</p> <ul style="list-style-type: none"> • Reluctance to invest • Unfamiliar/breaking customer habits • selling the benefits • Initial high cost • No prior experience • Retail - product placement/price <p>Strategies including:</p> <ul style="list-style-type: none"> • Celebrity endorsement • Branding • Demonstrations/trials • Special offers/discounts • Guarantees • User trial reports/TV or other review/promotion • Limited editions <p>Any other suitable response.</p>	4	The answer should be marked as described below:

An answer which falls into these categories may do so for a number of reasons. In descriptions given it is likely that for:		
0-1 marks	2-3 marks	4 marks
<p>Vague description displaying:</p> <ul style="list-style-type: none"> Limited understanding of the difficulties of launching a radically different product Limited understanding of the marketing strategies companies can use to help launch products One difficulty identified One method to overcome difficulty <p>The answer is thin and lacking detail.</p>	<p>Description displaying:</p> <ul style="list-style-type: none"> Understanding of the difficulties of launching a radically different product Understanding of the marketing strategies companies can use to help launch products Two difficulties identified Two suitable marketing activities to overcome difficulties 	<p>Good description displaying:</p> <ul style="list-style-type: none"> Clear understanding of the difficulties of launching a radically different product Clear understanding of the marketing strategies companies can use to help launch products Two difficulties identified Considered marketing activities to overcome difficulties <p>The answer is detailed and relevant.</p>

Question		Expected response	Max mark	Additional guidance
6.		<p>Answers are likely to include reference to CAD, block, part, rapid prototyping or prototype models in relation to:</p> <p>Function - Use models to test moving parts, test working parts, for user trials, evaluating</p> <p>Safety - Use models to test to destruction, use with test jigs, test stability, impact, resistance to extreme conditions,</p> <p>Ergonomics- Use models to determine scale/size, to test adjustment, fit, support, stability, weight, clearance, range of movement, strength, effort, psychological aspects, ease of use.</p>	6	The answer should be marked as described below:

An answer which falls into these categories may do so for a number of reasons. In explanations given it is likely that for:

0 -2 marks	3-4 marks	5-6 marks
<p>Limited understanding of a range of modelling techniques.</p> <p>Limited understanding of the application of modelling techniques to resolve issues with Function, Safety and Ergonomics.</p> <p>Limited reference to modelling types.</p> <p>Generic reference to resolving issues.</p> <p>Limited reference to products or own design work.</p> <p>The answer is lacking detail. The choice of model lacks relevance to the product and/or issue.</p>	<p>Understanding of a range of modelling techniques.</p> <p>Understanding of the application of modelling techniques to resolve issues with Function, Safety and Ergonomics.</p> <p>Reference to different modelling types.</p> <p>Reference to resolving issues.</p> <p>Reference to products or own design work.</p> <p>There is some good detail in the answer and the choice of model is relevant to the product and issue.</p>	<p>Clear understanding of a range of modelling techniques.</p> <p>Clear understanding of the application of modelling techniques to resolve issues with Function, Safety and Ergonomics.</p> <p>Reference to appropriate modelling types.</p> <p>Clear reference to resolving issues.</p> <p>Considered reference to products or own design work.</p> <p>The answer is detailed and the choice of model is relevant to the product and issue.</p>

[END OF MARKING INSTRUCTIONS]