



National
Qualifications
2019

2019 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.

Marking instructions for each question

Section 1

Question		Expected response	Max mark	Additional guidance
1.	(a)	<p>Candidates are expected to describe how developments in materials and manufacturing, and the impact of external factors have influenced the evolution of a product(s) with which they are familiar.</p> <p>Responses are likely to have made reference to</p> <ul style="list-style-type: none"> • the influence of materials <ul style="list-style-type: none"> — changes to aesthetics — improved performance — changes to lifespan — durability — improved ergonomics — impact on the environment • the influence of manufacturing <ul style="list-style-type: none"> — changes to form — affordability — accessibility — impact on the environment • the influence of external factors <ul style="list-style-type: none"> — aesthetics (fashion and style) — popularity — safety — impact on the environment. 	10	<p>This question is set to test the candidates' knowledge and understanding of how the developments in materials and manufacturing, and the impact of external factors have influenced the evolution of products.</p> <p>Although there is an underlying body of design knowledge required to answer it there is a range of possible answers. The question is therefore marked holistically. The features looked for are knowledge of the subject matter, ability to comprehend the question and to construct an answer which uses clear examples to support the points made.</p> <p>Marks should be given using the best fit to the characteristics shown below.</p>

An answer which falls into these categories may do so for a number of reasons.		
0-4	5-7	8-10
<p>Answer demonstrates limited knowledge and understanding of the subject matter.</p> <p>Limited and generic reference to (materials and manufacturing) or external factors.</p> <p>Limited description of the changes to product(s).</p> <p>The points made are not all relevant to or do not answer the question.</p> <p>Answer is simply too thin.</p>	<p>Answer demonstrates knowledge and understanding of the subject matter.</p> <p>References to (materials and manufacturing) and/or external factors.</p> <p>Description of the changes to product(s).</p> <p>The points made are relevant to the question and demonstrate a good level of comprehension.</p>	<p>Answer demonstrates sound knowledge and understanding of the subject matter.</p> <p>References to (materials and manufacturing), and external factors.</p> <p>Detailed description of the changes to product(s).</p> <p>The points made are relevant to the question and demonstrate a high level of comprehension.</p>

Question		Expected response	Max mark	Additional guidance
	(b)	<p>Candidates are expected to describe how new and emerging technologies may impact on the evolution of the design and manufacture of products.</p> <p>Answers are likely to include references to</p> <ul style="list-style-type: none"> • customisation of products • inclusive design • improved user interface • greater efficiency • miniaturisation • improved functions • affordability • improved safety • impact on the environment. 	4	<p>This question is set to assess the candidates' knowledge and understanding of how new and emerging technologies may impact on the evolution of the design and manufacture of products.</p> <p>Although there is an underlying body of design knowledge required to answer it there is a range of possible answers. The question is therefore marked holistically. The features looked for are knowledge of the subject matter, ability to comprehend the question and to construct an answer which uses clear examples to support the points made.</p> <p>Marks should be given using the best fit to the characteristics shown below.</p>
An answer which falls into these categories may do so for a number of reasons.				
		0-1	2-3	4
		<p>It demonstrates limited knowledge and understanding of new and emerging technologies.</p> <p>Limited/no reference to specific technologies.</p> <p>Limited description of the impact on the evolution of the design and/or manufacture of product(s).</p> <p>Few points are made.</p>	<p>It demonstrates knowledge and understanding of new and emerging technologies.</p> <p>Reference to specific technologies.</p> <p>Description of the impact on the evolution of the design and/or manufacture of product(s).</p> <p>The points made are relevant to the question and demonstrate a good level of comprehension.</p>	<p>It demonstrates sound knowledge and understanding of new and emerging technologies.</p> <p>Good reference to specific technologies.</p> <p>Detailed description of the impact on the evolution of the design and manufacture of product(s).</p> <p>The points made are relevant to the question and demonstrate a high level of comprehension.</p>

Question		Expected response	Max mark	Additional guidance
	(c)	<p>Candidates are expected to explain why changes made to products are not always a commercial success.</p> <p>Responses are likely to have made reference to</p> <ul style="list-style-type: none"> • changes to the economy • changes in fashion • changes in society • consumers not ready for change • research and development time • Competition too strong. 	4	<p>1 mark to be awarded for each valid point made up to a total of 4 marks.</p> <p>Marks should not be awarded for generic answers relating to why products fail in the market.</p>

Question		Expected response	Max mark	Additional guidance
	(d)	<p>Candidates are expected to describe how a product with which they are familiar has had both a positive and negative impact on society.</p> <p>Answers are likely to include references to</p> <ul style="list-style-type: none"> • positive impact <ul style="list-style-type: none"> — improvement to health — increased safety — improved transport — improved communication — more flexible working — better education • negative impact <ul style="list-style-type: none"> — less social interaction — less time — more stress — increased pressure to keep up to date — social expectations — reduction in workforce — greater dependency on technology. 	4	<p>This question is set to assess the candidates' knowledge and understanding how a product has had both a positive and negative impact on society.</p> <p>Although there is an underlying body of design knowledge required to answer it there is a range of possible answers. The question is therefore marked holistically. The features looked for are knowledge of the subject matter, ability to comprehend the question and to construct an answer which uses clear examples to support the points made.</p> <p>Marks should be given using the best fit to the characteristics shown below.</p>

An answer which falls into these categories may do so for a number of reasons.		
0-1	2-3	4
<p>Demonstrates limited knowledge and understanding of the subject matter.</p> <p>Limited reference to products.</p> <p>Little or no description of the product's impact on society.</p> <p>Few points are made.</p>	<p>Demonstrates knowledge and understanding of the subject matter.</p> <p>Reference to a product(s) impact on society.</p> <p>Descriptions of positive and/or negative impacts on society.</p>	<p>Demonstrates sound knowledge and understanding of the subject matter.</p> <p>Good reference to a product(s) impact on society.</p> <p>Good descriptions of both positive and negative impacts on society.</p>

Question		Expected response	Max mark	Additional guidance
	(e)	<p>Candidates are expected to describe the features and characteristics that could be used to identify the work of a design movement or designer with which they are familiar.</p> <p>Typical answers are likely to include references to</p> <ul style="list-style-type: none"> • aesthetics • use of materials • use of manufacturing techniques • functionality • sustainability. 	4	<p>This question is set to assess the candidates' knowledge and understanding of the features and characteristics that could be used to identify the work of a design movement or designer.</p> <p>Although there is an underlying body of design knowledge required to answer it there a range of possible answers. The question is therefore marked holistically. The features looked for are knowledge of the subject matter, ability to comprehend the question and to construct an answer which uses clear examples to support the points made.</p> <p>Marks should be given using the best fit to the characteristics shown below.</p>
An answer which falls into these categories may do so for a number of reasons.				
		0-1	2-3	4
		<p>Demonstrates limited knowledge and understanding of the subject matter.</p> <p>Generic reference to a designer or design movement.</p> <p>Limited reference to features or characteristics.</p> <p>Limited description of the features or characteristics of the designer.</p>	<p>Demonstrates knowledge and understanding of the subject matter.</p> <p>Reference to a designer or design movement.</p> <p>Description of the features or characteristics of the designer or design movement work.</p> <p>The points made are relevant to the question and demonstrate a good level of comprehension.</p>	<p>Demonstrates sound knowledge and understanding of the subject matter.</p> <p>Reference to a designer or design movement.</p> <p>Detailed description of the features or characteristics of the designer or design movement work.</p> <p>The points made are relevant to the question and demonstrate a high level of comprehension.</p>

Question		Expected response	Max mark	Additional guidance
	(f)	<p>Candidates are expected to describe how ergonomics has influenced the design and manufacture of a product(s) with which they are familiar.</p> <p>Possible answers could reference how ergonomics has influenced</p> <ul style="list-style-type: none"> • design <ul style="list-style-type: none"> — shape and form — size and position of products and components — intuitive design — accessibility — inclusive design — ease of use — improved safety • manufacture <ul style="list-style-type: none"> — greater efficiency — accuracy — safety. 	4	<p>This question is set to assess the candidates' knowledge and understanding of how ergonomics has influenced the design and manufacture of a product(s).</p> <p>Although there is an underlying body of design knowledge required to answer it there is a range of possible answers. The question is therefore marked holistically. The features looked for are knowledge of the subject matter, ability to comprehend the question and to construct an answer which uses clear examples to support the points made.</p> <p>Marks should be given using the best fit to the characteristics shown below.</p>

An answer which falls into these categories may do so for a number of reasons.		
0-1	2-3	4
Demonstrates limited knowledge and understanding of the subject matter.	Demonstrates knowledge and understanding of the subject matter.	Demonstrates sound knowledge and understanding of the subject matter.
Generic reference to product(s).	Reference to products(s).	Good reference to product(s).
Generic reference to ergonomics.	Reference to ergonomics.	Considered reference to ergonomics.
Limited description of the impact on a product(s) design and/or manufacture.	Description of the impact on a product(s) design and/or manufacture.	Detailed description of the impact on a product(s) design and manufacture.
Few points are made.	The points made are relevant to the question and demonstrate a good level of comprehension.	The points made are relevant to the question and demonstrate a high level of comprehension.

Section 2

Question		Expected response	Max mark	Additional guidance
2.	(a)	<p>Candidates will be expected to outline the issues that would have influenced the designer's choice of material for any two components of the Sled Legs.</p> <p>Typical answers are likely to refer to the following issues</p> <ul style="list-style-type: none"> • impact resistant • comfort • elasticity • durability • reacts well to changes in temperature (extreme cold) • strength to weight ratio • low/high friction • corrosion resistant • fatigue resistant. 	4	<p>It is expected that candidates will provide an outline of issues that would have influenced the designer's choice of material for any two components of the Sled Legs.</p> <p>1 mark for each valid outline of the issues that would have influenced the designers' choice of material.</p>
	(b)	<p>Candidates will be expected to explain why the designer chose vacuum forming instead of injection moulding.</p> <p>Typical answers are likely to include</p> <ul style="list-style-type: none"> • volume of production • cost • shell-like structure • no undercuts • low cost tooling • sheet process. 	3	<p>It is expected that candidates give detailed explanations of why the designer chose vacuum forming instead of injection moulding.</p> <p>1 mark for each valid point explaining why vacuum forming was chosen over injection moulding.</p>

Question		Expected response	Max mark	Additional guidance
	(c)	<p>Candidates will be expected to describe how modelling may have been used to develop the Sled Legs.</p> <p>Typical answers likely to include</p> <ul style="list-style-type: none"> • models used with user trials to test ideas • mock ups to test friction/turning capabilities • part models to test durability of repeated use of strap • 1:1 model to test secure fit of straps for safety. 	5	Although there is an underlying body of design knowledge required to answer it, there is a wide range of possible answers. The question is therefore marked holistically. The features which are looked for are knowledge of the subject matter, ability to comprehend the question and to construct an answer which uses clear examples to support the points made.
An answer which falls into these categories may do so for a number of reasons.				
0–2		3–4		5
<p>Demonstrates limited knowledge and understanding of the subject matter.</p> <p>Limited reference to types of model(s)</p> <p>Limited understanding/reference to the use of models.</p> <p>Limited reference to development of the Sled Legs.</p> <p>Few points are made</p>		<p>Demonstrates knowledge and understanding of the subject matter.</p> <p>Reference to the type of model(s).</p> <p>Reference to the purpose of model(s).</p> <p>Description of how models may have been used to develop the sled legs.</p> <p>The points made are relevant to the question and demonstrate a good level of comprehension.</p>		<p>Demonstrates sound knowledge and understanding of the subject matter.</p> <p>Clear reference to the type of model(s).</p> <p>Clear reference to the purpose of model(s).</p> <p>Detailed description of how models may have been used to develop the sled legs.</p> <p>The points made are relevant to the question and demonstrate a high level of comprehension.</p>

Question		Expected response	Max mark	Additional guidance
3.	(a)	<p>Candidates will be expected to describe how information gained from expert appraisals and user trips may have influenced the design of the Sea Voice headset.</p> <p>Typical answers are likely to include reference to how information from</p> <ul style="list-style-type: none"> • expert appraisals would have influenced the Sea Voice headset <ul style="list-style-type: none"> — technical information linked to function(sound/volume/adjustments) and performance (quality/value/specific requirements/maintenance/durability) — ergonomic information linked to user interface and ease of use materials information linked to use, performance • a user trip would have influenced the Sea Voice headset <ul style="list-style-type: none"> — ease of use – size, position shape of controls and component parts — difficulties in use – change to shape, materials position of parts — comfort in use – change shape, materials position of parts — quality of sound – selection/change of technology areas of strength or weakness. 	4	<p>It is expected that candidates give detailed descriptions of how information gained from expert appraisals and user trips may have influenced the design of the Sea Voice headset.</p> <p>1 mark for each valid point leading to a clear description of how information gained from expert appraisals and user trips influenced the design of the Sea Voice headset.</p>

Question		Expected response	Max mark	Additional guidance
	(b)	<p>Candidates will be expected to describe the issues that influenced the choice of assembly methods for a product(s) with which they are familiar.</p> <p>Answers are likely to refer to</p> <ul style="list-style-type: none"> • volume of production • conditions of use • materials • manufacturing processes • life expectancy • obsolescence • cost of production • end price. 	4	<p>It is expected that candidates give detailed descriptions of the issues that influenced the choice of assembly methods for a product(s) with which they are familiar.</p> <p>1 mark for each valid point leading to a clear description of the issues that influenced the choice of assembly methods use in a product(s).</p> <p>To not award marks for generic descriptions of assembly methods.</p>
	(c)	<p>Candidates will be expected to describe a suitable marketing strategy for the Sea Voice headset.</p> <p>Answers are likely to refer to</p> <ul style="list-style-type: none"> • pricing strategies • product endorsements • targeted advertising. 	4	<p>It is expected that candidates will describe a suitable marketing strategy for the Sea Voice headset.</p> <p>Although there is an underlying body of design knowledge required to answer it there a range of possible answers. The question is therefore marked holistically. The features looked for are knowledge of the subject matter, ability to comprehend the question and to construct an answer which uses clear examples to support the points made.</p> <p>Marks should be given using the best fit to the characteristics shown below.</p>

An answer which falls into these categories may do so for a number of reasons.		
0-1	2-3	4
<p>Demonstrates limited knowledge and understanding of the subject matter.</p> <p>Limited reference to the Sea Voice headset/niche market.</p> <p>Limited reference to marketing techniques.</p> <p>Limited description of a marketing strategy suitable for the Sea Voice headset.</p> <p>Answer limited to one method such as advertising.</p> <p>Few points are made.</p>	<p>Demonstrates knowledge and understanding of the subject matter.</p> <p>Reference to the Sea Voice headset/niche market.</p> <p>Reference to marketing techniques.</p> <p>Description of a marketing strategy suitable for the Sea Voice headset.</p> <p>The points made are relevant to the question and demonstrate a good level of comprehension.</p>	<p>Demonstrates sound knowledge and understanding of the subject matter.</p> <p>Reference to Sea Voice headset/niche market.</p> <p>Good reference to marketing techniques.</p> <p>Detailed description of a marketing strategy suitable for the Sea Voice headset.</p> <p>The points made are relevant to the question and demonstrate a high level of comprehension.</p>

Question		Expected response	Max mark	Additional guidance
4.	(a)	<p>Candidates will be expected to describe how the target market and location of use may have influenced the design of the GravityLight.</p> <p>Typical answers likely to include</p> <ul style="list-style-type: none"> • target market <ul style="list-style-type: none"> — low income – affordable — language barrier easy to understand/semantics — aesthetics symbols/diagrams for ease of use, colour – white reflects light coloured parts help understand function — function flexibility – bag can be filled with anything/hook for easy hanging. Use – can adjust light intensity maintenance bag inexpensive to replace/repair/easy clean smooth surface • location of use <ul style="list-style-type: none"> — running time – use of LEDs — quality of light — sand/rocks to fill pouch – readily available — easy to hang up and adjust — low maintenance – easy to repair — no technical knowledge required — repaired with no specialist tools. 	6	Although there is an underlying body of design knowledge required to answer it, there is a wide range of possible answers. The question is therefore marked holistically. The features which are looked for are knowledge of the subject matter, ability to comprehend the question and to construct an answer which uses clear examples to support the points made.

An answer which falls into these categories may do so for a number of reasons.

0-2	3-4	5-6
<p>Demonstrates limited knowledge and understanding of the subject matter.</p> <p>Limited reference to design of the GravityLight.</p> <p>Limited reference to the target market and/or location.</p> <p>Limited descriptions of how the target market and/or conditions of use influenced the design of the GravityLight.</p> <p>Few points are made.</p>	<p>Demonstrates knowledge and understanding of the subject matter.</p> <p>Reference to design of the GravityLight.</p> <p>Referenced the target market and/or location.</p> <p>Descriptions of how the target market and/or conditions of use influenced the design of the GravityLight.</p> <p>The points made are relevant to the question and demonstrate a good level of comprehension.</p>	<p>Demonstrates sound knowledge and understanding of the subject matter</p> <p>Clear reference to design of the GravityLight.</p> <p>Referenced the target market and location.</p> <p>Detailed descriptions of how the target market and/or conditions of use influenced the design of the GravityLight.</p> <p>The points made are relevant to the question and demonstrate a high level of comprehension.</p>

Question		Expected response	Max mark	Additional guidance
	(b)	<p>Candidates will be expected to explain why 'Just In Time' production reduces the costs of products.</p> <p>Typical answers likely to make reference to</p> <ul style="list-style-type: none"> • zero defects • zero storage • zero set up time • zero down time/breakdowns • zero lead time • zero waste. 	4	Although there is an underlying body of design knowledge required to answer it, there is a wide range of possible answers. The question is therefore marked holistically. The features which are looked for are knowledge of the subject matter, ability to comprehend the question and to construct an answer which uses clear examples to support the points made.
An answer which falls into these categories may do so for a number of reasons. It is likely that				
0-1		2-3		4
<p>Demonstrates little knowledge and understanding of the subject matter.</p> <p>Limited and/or generic reference to JIT.</p> <p>Limited reference to cost reduction.</p> <p>The points made are not all relevant to or do not answer the question.</p> <p>Few points are made.</p>		<p>Demonstrates knowledge and understanding of the subject matter.</p> <p>Reference to JIT.</p> <p>Reference to cost reduction.</p> <p>Clear explanation of reasons for cost reduction.</p> <p>The points made are relevant to the question and demonstrate a good level of comprehension.</p>		<p>Demonstrates sound knowledge and understanding of the subject matter.</p> <p>Detailed reference to JIT.</p> <p>Detailed reference to cost reduction.</p> <p>Sound explanation of reasons for cost reduction.</p> <p>The points made are relevant to the question and demonstrate a high level of comprehension.</p>

Question		Expected response	Max mark	Additional guidance
	(c)	<p>Candidates will be expected to outline steps which could be taken to ensure products such as the GravityLight are manufactured to a high standard.</p> <p>Typical answers likely to include use of modelling for</p> <ul style="list-style-type: none"> • spot checks • jigs/fixtures • training staff • machine/mould maintenance • quality of materials. 	4	<p>It is expected that candidates will outline steps which could have been taken to ensure products such as the GravityLight are manufactured to a high standard.</p> <p>1 mark for each outlined step to ensure a product is manufactured to a high standard.</p> <p>Maximum of 2 marks for any one method.</p>

Question		Expected response	Max mark	Additional guidance
5.	(a)	<p>Candidates will be expected to outline the reasons 3D printing was used to manufacture this prototype.</p> <p>Typical answers likely to include</p> <ul style="list-style-type: none"> • linked to computer model • freedom to design highly complex forms • no assembly required • create form that can't be produced manually • printed from actual material • can be manufactured anywhere with a 3D printer. 	4	<p>It is expected that candidates will have outlined the reasons 3D printing was used to manufacture this prototype.</p> <p>1 mark for each valid reason for manufacturing the prototype using 3D printing.</p> <p>Do not award marks for generic statements about 3D printing. The answer must make reference to Lilian van Daal's chair.</p>
	(b)	<p>Candidates will be expected to describe how products are being designed to be more sustainable.</p> <p>Typical answers are likely to include reference to a product and</p> <ul style="list-style-type: none"> • reducing material through part design • using Bio polymers • design for multi-use, not single use • design for disassembly • modular design. 	4	<p>Although there is an underlying body of design knowledge required to answer it, there is a wide range of possible answers. The question is therefore marked holistically. The features which are looked for are knowledge of the subject matter, ability to comprehend the question and to construct an answer which uses clear examples to support the points made.</p> <p>Generic strategies reduce/recycle will not be awarded marks.</p> <p>Answer must relate to specific product(s).</p>

An answer which falls into these categories may do so for a number of reasons. It is likely that		
0-1	2-3	4
Demonstrates limited knowledge and understanding of the subject matter.	Demonstrates knowledge and understanding of the subject of the subject matter.	Demonstrates sound knowledge and understanding of the subject matter.
Limited reference to product(s).	Reference to product(s).	Clear reference to product(s).
Limited reference to sustainability.	Reference to sustainability.	Clear reference to sustainability.
Limited description of how product(s) have been designed to be more sustainable.	Description of how product(s) have been designed to be more sustainable.	Detailed description of how product(s) have been designed to be more sustainable.
Few points are made.	The points made are relevant to the question and demonstrate a good level of comprehension.	The points made are relevant to the question and demonstrate a high level of comprehension.

Question		Expected response	Max mark	Additional guidance
	(c)	<p>Candidates will be expected to identify a suitable method which could be used to protect the IPR of the chair and outline its key features.</p> <p>Typical answers likely to include</p> <ul style="list-style-type: none"> • design rights • registered design • patents. 	4	<p>It is expected that candidates will identify a suitable method which could be used to protect the IPR of the chair and outline its key features.</p> <p>1 mark selecting a method of protecting IPR.</p> <p>1 mark for each outline of key features to a maximum of 3 marks.</p>

[END OF MARKING INSTRUCTIONS]