



National
Qualifications
2022

2022 Design and Manufacture

Advanced Higher

Finalised Marking Instructions

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General marking principles for Advanced 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) 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.
- (d) 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.

Marking instructions for each question

Section 1

Question		Expected response	Max mark	Additional guidance
1.	(a)	<p>Candidates will be expected to outline the features on the components that enabled them to identify the processes that had been used in their manufacture and explain why they are suitable.</p> <p>Typical answers may include processes such as:</p> <ul style="list-style-type: none"> • die cast/injection moulding – split lines, injection/ejection points, complexity, surface detail etc • pierced – sheet material, shear marks material removed from the centre. <p>And reasons for suitability such as:</p> <ul style="list-style-type: none"> • complexity of shape, form and number produced. 	6	<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>

An answer which falls into these categories may do so for a number of reasons. It is likely that:		
0 – 2	3 – 4	5 – 6
<p>Candidate demonstrates limited knowledge and understanding of the subject matter in identifying specific processes.</p> <ul style="list-style-type: none"> • limited outline of identifying features • limited reasons for suitability of processes • general reference is made to product(s) • few valid points are made • it does not address the question – in this case 0 marks should be awarded. 	<p>Candidate demonstrates knowledge and understanding of the subject matter in identifying specific processes.</p> <ul style="list-style-type: none"> • outline of identifying features • reasons for suitability of processes • reference is made to product(s) • a number of valid points are made. 	<p>Candidate demonstrates sound knowledge and understanding of the subject matter in identifying specific processes.</p> <ul style="list-style-type: none"> • clear outline of identifying features • clear reasons for suitability of processes • clear reference is made to product(s) • a good number of valid points are made.

Question		Expected response	Max mark	Additional guidance
	(b)	<p>Candidates will be expected to describe a method they used to evaluate the performance of the product and how these informed their conclusions.</p> <p>They should make reference to:</p> <ul style="list-style-type: none"> the reasons for selecting each method the actions or activities that took place the findings from each method. <p>Typical answers are likely to include: user trip, user trials, testing, surveys/questionnaires, comparisons.</p>	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. It is likely that:

0 – 1	2 – 3	4 – 5
<p>Candidate demonstrates limited knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> limited reference to reasons for selection limited description of the methods used limited reference to their conclusions few points are made. 	<p>Candidate demonstrates knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> reference to reasons for selection description of the methods used reference to their conclusions the points made are relevant to the question and demonstrate a good level of comprehension. 	<p>Candidate demonstrates sound knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> clear reference to reasons for selection detailed description of the methods used clear reference to their conclusions. 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 discuss how value for money influenced the design and manufacture of the product(s) they analysed.</p> <p>Typical answers likely to include reference to:</p> <ul style="list-style-type: none"> • build quality • assembly types • ease of maintenance • number of parts • manufacturing processes/material • function • price. <p>Any other relevant aspect.</p>	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>Candidate demonstrates limited knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • limited reference to aspects relating to value for money • limited reference to specific product(s) they have analysed • few points are made. 	<p>Candidate demonstrates knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • reference to aspects relating to value for money • reference to specific product(s) they have analysed • the points made are relevant to the question and demonstrate a good level of comprehension. 	<p>Candidate demonstrates sound knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • clear reference to aspects relating to value for money • clear reference to specific product(s) they have analysed • the points made are relevant to the question and demonstrate a high level of comprehension.

Question		Expected response	Max mark	Additional guidance
2.	(a)	<p>The candidate is expected to have described how following have changed in a product(s), they have identified, during their evolution:</p> <ul style="list-style-type: none"> • function • safety. <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>	6	<p>Marks should be awarded using the best fit characteristics shown below.</p> <p>Candidates cannot be awarded marks in the top band where only one factor has been described.</p>

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

0 – 2	3 – 4	5 – 6
<p>Candidate demonstrates a limited knowledge and understanding of the subject matter</p> <p>There is limited consideration of how the following have changed during a product(s) evolution:</p> <ul style="list-style-type: none"> • function AND/OR • safety. <p>Limited description of evolution.</p> <p>Few points are made.</p> <p>Does not address the question.</p> <p>Simply too thin.</p>	<p>Candidate demonstrates a general knowledge and understanding of the subject matter.</p> <p>There is general consideration of how the following have changed during a product(s) evolution:</p> <ul style="list-style-type: none"> • function AND/OR • safety. <p>General description of evolution.</p> <p>Clear points are made in reference to the product(s) evolution.</p>	<p>Candidate demonstrates a sound knowledge and understanding of the subject matter.</p> <p>There is detailed consideration of how the following have changed during a product(s) evolution:</p> <ul style="list-style-type: none"> • function AND/OR • safety. <p>Detailed description of evolution.</p> <p>Detailed points are made in reference to the product(s) evolution.</p>

Question		Expected response	Max mark	Additional guidance
	(b)	<p>The candidate is expected to have described how the evolution of a product(s) was influenced by two of the following:</p> <ul style="list-style-type: none"> • society • external factors • designers • technology. <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>	6	<p>Marks should be awarded using the best fit characteristics shown below.</p> <p>Candidates must consider two aspects to achieve marks in the top band.</p>

An answer which falls into these categories may do so for a number of reasons. It is likely that:		
0 – 2	3 – 4	5 – 6
<p>Candidate demonstrates a limited knowledge and understanding of the subject matter.</p> <p>There is limited consideration of two aspects from:</p> <ul style="list-style-type: none"> • society • external factors • designers • technology. <p>Limited description of how the above aspects influenced the evolution.</p> <p>Few points are made.</p> <p>Does not address the question.</p>	<p>Candidate demonstrates a general knowledge and understanding of the subject matter.</p> <p>There is general consideration of two aspects from:</p> <ul style="list-style-type: none"> • society • external factors • designers • technology. <p>General description of how the above aspects influenced the evolution.</p> <p>A number of points are made.</p>	<p>Candidate demonstrates a sound knowledge and understanding of the subject matter.</p> <p>There is detailed consideration of two aspects from:</p> <ul style="list-style-type: none"> • society • external factors • designers • technology. <p>Detailed description of how the above aspects influenced the evolution.</p> <p>A good number of points are made.</p>

Question	Expected response	Max mark	Additional guidance
(c)	<p>Candidates are expected to describe and give reasons for possible future developments in the product(s) they have studied.</p> <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>Typical answers are likely to include future developments such as:</p> <ul style="list-style-type: none"> • functional, aesthetic and ergonomic improvements • improvements to performance, safety, maintenance, and durability • changes in economics • environmental impact and sustainability <p>and reasons such as:</p> <ul style="list-style-type: none"> • advances in materials, manufacturing, and technology • artificial intelligence • communication between products • advances in computing • changes in society and attitudes. 	3	<p>Candidates may refer to more than one product in their answer.</p> <p>Note that the answer must refer to the product(s); general comments about future developments will not address the question and should be awarded 0 marks.</p> <p>Award marks 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		
0 – 1	2	3
<p>Candidate demonstrates a limited knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • there is a limited description of the possible future developments in products(s) and reasons for them • it demonstrates a limited knowledge and understanding of the subject matter • there is little reference to their research • general reference is made to product(s) • few valid points are made • it does not address the question – in this case 0 marks should be awarded. 	<p>Candidate demonstrates knowledge of the subject matter and an understanding of the main aspects.</p> <ul style="list-style-type: none"> • there is a description of the possible future developments in products(s) and reasons for them • it demonstrates knowledge and understanding of the subject matter • there is reference to their research • reference is made to product(s) • a number of valid points are made • it generally addresses the question. 	<p>Candidate demonstrates sound knowledge of the subject matter and a secure understanding of the main aspects.</p> <ul style="list-style-type: none"> • there is a clear description of the possible future developments in products(s) and reasons for them • it demonstrates sound knowledge and understanding of the subject matter • there is clear reference to their research • clear reference is made to product(s) • a good number of valid points are made • it clearly addresses the question.

Section 2

Question		Expected response	Max mark	Additional guidance
3.	(a)	<p>Candidates are expected to discuss the issues that may have influenced the selection of materials used in the 'Snoweel'.</p> <p>Responses are likely to include reference to:</p> <ul style="list-style-type: none"> • comfort (sitting/contact points for pushing or carrying) • durability/resistance to friction • toughness/impact resistance • reaction to temperature change/resistance to low temperatures • resistance to corrosion/fatigue • lightweight. 	4	<p>It is expected that candidates will have discussed the issues that may have influence the selection of materials used in parts of the 'Snoweel'.</p> <p>1 mark for each valid outline of the issues that may have influenced the selection of materials.</p>

Question		Expected response	Max mark	Additional guidance
	(b)	<p>Candidates are expected to discuss issues that may have influenced the selection of manufacturing and assembly processes for parts of the 'Snoweel'.</p> <p>Although there is an underlying body of design knowledge required to answer it, there is a wide range of possible answers. 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>Typical answers are likely to include reference to:</p> <ul style="list-style-type: none"> • materials selected • volume of production/economies of scale • complexity of components • size of components • speed of production required • tooling costs • accuracy requirement • surface finish/quality • environmental issues. 	4	<p>It is expected that candidates will have discussed the issues that may have influence the selection of manufacturing and assembly processes used for parts of the 'Snoweel'.</p> <p>1 mark for each valid outline of the issues that may have influenced the selection of manufacturing and assembly processes for parts of the 'Snoweel'.</p>

Question		Expected response	Max mark	Additional guidance
	(c)	<p>Candidates are expected to describe possible benefits of using composite materials for the wheels.</p> <p>Typical answers are likely to include reference to:</p> <ul style="list-style-type: none"> • improved functional characteristics • improvements to performance/durability • improvements to strength to weight ratio • corrosion resistance • dimensional stability. 	2	<p>It is expected that candidates will have described possible benefits of using composite materials for the wheels.</p> <p>1 mark for each valid point.</p>

Question	Expected response	Max mark	Additional guidance
(d)	<p>Candidates will be expected to describe how modelling could have been used to develop the 'Snoweel'.</p> <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.</p> <p>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>Typical answers likely to include use of modelling to:</p> <ul style="list-style-type: none"> • explore and refine aspects such as safety, balance, comfort, fit, grip, sizes of specific parts • test aspects such as performance of materials, assembly of parts, use in different conditions. 	6	<p>Marks should be awarded using the best fit characteristics shown below.</p> <p>Responses that do not reference the product will not achieve above 3 marks.</p>

An answer which falls into these categories may do so for a number of reasons. It is likely that:		
0 – 2	3 – 4	5 – 6
<p>Candidate demonstrates a limited knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • there is a limited description of the use of modelling to develop the Snoweel • there is limited reference to the Snoweel • it demonstrates a limited knowledge and understanding of the subject matter • there are limited examples of the use of modelling • few valid points are made • it does not address the question – in this case 0 marks should be awarded. 	<p>Candidate demonstrates general knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • there is a general description of the use of modelling to develop the Snoweel • there is general reference to the Snoweel • it demonstrates a general knowledge and understanding of the subject matter • there are general examples of the use of modelling • a number valid points are made • it generally addresses the question. 	<p>Candidate demonstrates sound knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • there is a clear description of the use of modelling to develop the Snoweel • there is clear reference to the Snoweel • it demonstrates a clear knowledge and understanding of the subject matter • there are clear examples of the use of modelling • a good number of valid points are made • it clearly addresses the question.

Question		Expected response	Max mark	Additional guidance
4.	(a)	<p>Candidates are expected to have outlined the key features of one suitable method of IPR that could be used to protect the intellectual property of the designers of the 'IVY radiator'.</p> <p>Correct answers are one of the following:</p> <ul style="list-style-type: none"> • patents • design rights • registering the design. <p>and the following key features:</p> <ul style="list-style-type: none"> • cost of protection • length of protection • aspect covered • process to acquire • transferability. <p>Any other suitable response.</p>	4	<p>It is expected that candidates will have outlined the key features of one suitable method of IPR that could be used to protect the intellectual property of the designers of the 'IVY radiator'.</p> <p>1 mark for selecting a correct method of protecting IPR.</p> <p>1 mark for each outline of key features to a maximum of 3 marks.</p>

Question	Expected response	Max mark	Additional guidance
(b)	<p>Candidates are expected to outline the features designers need to consider to ensure components can be successfully die-cast.</p> <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>Typical answers are likely to include:</p> <ul style="list-style-type: none"> • wall thicknesses • placement of split lines, injection and ejector points • draft angles, location pins, fillets and radiused corners • transitions between thick and thin wall thicknesses, undercuts, shrinkage of material around joining areas • possible Integrated assembly features • any potential bosses, webs or ribs. <p>Any other suitable response.</p>	4	<p>It is expected that candidates will have outlined the features designers need to consider to ensure components can be successfully die-cast.</p> <p>4 marks for outlining of four correct features.</p>

Question			Expected response	Max mark	Additional guidance
5.	(a)	(i)	<p>Candidates are expected to describe why achieving a balance between function and aesthetics would have been a challenge for the designer.</p> <p>Typical answers are likely to include references to:</p> <ul style="list-style-type: none"> • functional improvements impacting aesthetic aspects (proportion, balance etc.). • moving to a new hour/5 min system • telling the time through touch and visual cues • retaining familiar size and form. 	2	<p>This question is set to assess the candidates' knowledge and understanding of resolving conflicting issues when designing products.</p> <p>Up to 2 marks for a description.</p>
		(ii)	<p>Candidates are expected to describe methods which could be used to achieve balance between function and aesthetics.</p> <p>Typical answers are likely to include references to:</p> <ul style="list-style-type: none"> • modelling • user trials. 	2	<p>This question is set to assess the candidates' knowledge methods which could be used to achieve balance between function and aesthetics.</p> <p>Up to 2 marks for a description.</p>

Question		Expected response	Max mark	Additional guidance
	(b)	<p>Candidates are expected to discuss how other everyday products or spaces you are familiar with have been designed to be more inclusive.</p> <p>Typical answers are likely to include references to:</p> <ul style="list-style-type: none"> • access to buildings and spaces • adaptations for less able bodied • adaptations for elderly. 	4	<p>This question is set to assess the candidates' knowledge and understanding of inclusive design.</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. It is likely that:

0 – 1	2 – 3	4
<p>Candidate demonstrates limited knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • limited understanding of inclusive design • limited reference to everyday products • limited discussion. 	<p>Candidate demonstrates general knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • general understanding of inclusive design • generic reference to everyday products • the points made are relevant to the question and demonstrate a good level of comprehension. 	<p>Candidate demonstrates sound knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • sound understanding of inclusive design • reference to specific everyday products • the points made are relevant to the question and demonstrate a high level of comprehension.

Question		Expected response	Max mark	Additional guidance
6.	(a)	<p>Candidates are expected to describe how physiology and psychology may have influenced the design of the 'Pod'.</p> <p>Typical answers are likely to refer to the following:</p> <p>Physiology:</p> <ul style="list-style-type: none"> • strength to lift influenced material choice • user stress in emergency influenced selection of familiar clips for securing pod • user reaction, combination, limit of movement informing simple pull and flip design. <p>Psychology:</p> <ul style="list-style-type: none"> • user emotions in emergency may have influenced choice of green calming colour and different coloured inside for easy recognition of change in mode • feeling of safety may have influenced the position of the straps in boat mode as the user could hold them. 	4	<p>This question is set to assess the candidates' knowledge and understanding of how physiology and psychology may have influenced the design of the Pod.</p> <p>1 mark per valid description up to a maximum of 4. A maximum of 3 marks for physiology and psychology.</p>

Question		Expected response	Max mark	Additional guidance
	(b)	<p>Candidates are expected to outline information that should have been obtained during the development of the 'Pod' and explain how it would be used.</p> <p>Typical answers are likely to include references to:</p> <ul style="list-style-type: none"> • material properties – to ensure light weight, low fatigue, durability of weather and environment • fixtures and fittings – standard components to secure the pod and keep costs down 	4	<p>This question is set to assess the candidates' knowledge and understanding of the purpose of research during the development of a product.</p> <p>Up to 2 marks for each explanation of how a piece of information would be used to develop the 'Pod'.</p> <p>0 marks for generic statement about research.</p> <p>Accept explanations that reference anthropometrics.</p> <p>Accept research from any stage in the design process.</p>

Question		Expected response	Max mark	Additional guidance
7.	(a)	<p>Candidates are expected describe two ways in which design opportunities may be created.</p> <p>Typical answers are likely to include references to:</p> <ul style="list-style-type: none"> • new materials • new technologies • product spin offs • changes in society • changes in legislation. 	4	<p>This question is set to assess the candidates' knowledge and understanding of how design opportunities may be created.</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. It is likely that:		
0 – 1	2 – 3	4
<p>Candidate demonstrates limited knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • generic/limited reference to ways of creating design opportunities • limited reference to products. 	<p>Candidate demonstrates knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • reference to ways of creating design opportunities • reference to products • the points made are relevant to the question and demonstrate a good level of comprehension. 	<p>Candidate demonstrates sound knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • reference to specific ways of creating design opportunities • clear 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
	(b)	<p>Candidates are expected to describe how a company can reduce the negative impact of a product recall.</p> <p>Typical answers are likely to include references to:</p> <ul style="list-style-type: none"> • issuing recall notices – taking responsibility • offering repairs, alternatives and replacements • minimising inconvenience to customers with quick response • rebranding on relaunch • good communication/value customers. 	3	<p>This question is set to assess the candidates' knowledge and understanding of strategies to launch products.</p> <p>A maximum of 2 marks for each valid description of how a company can reduce the negative impact of a product recall.</p>
	(c)	<p>Candidates are expected to describe steps a company could take to successfully relaunch a product.</p> <p>Typical answers are likely to include references to:</p> <ul style="list-style-type: none"> • targeted marketing • in app advertising • celebrity endorsements • launch events • point of sale. 	3	<p>This question is set to assess the candidates' knowledge and understanding of steps companies can take to relaunch products.</p> <p>A maximum of 2 marks for each valid description of the steps a company can take to successfully launch a product.</p> <p>The candidate must refer to more than one step to be awarded 3 marks.</p>

[END OF MARKING INSTRUCTIONS]