



National
Qualifications
2024

2024 Design and Manufacture

Advanced Higher

Question Paper 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 describe method(s) they used to evaluate the product(s) and the conclusions reached.</p> <p>They should make reference to:</p> <ul style="list-style-type: none"> the actions or activities that took place the findings from each method. <p>Typical answers are likely to include:</p> <ul style="list-style-type: none"> user trip, user trials, testing, surveys/questionnaires, comparisons, relation to relevant design factors. 	6	<p>Candidates may refer to more than one product in their answer.</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>Note that the answer must refer to product(s): general comments will not address the question and should be awarded 0 marks.</p> <p>Award marks using the best fit characteristics shown below.</p>
<p>An answer which falls into these categories may do so for a number of reasons. It is likely that:</p>				
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"> limited reference is made to product(s) limited description of the methods used limited knowledge and understanding of the subject matter limited reference to their conclusions few valid points are made. 		<p>Candidate demonstrates knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> reference is made to product(s) detailed description of the methods used knowledge of the subject matter is demonstrated reference to their conclusions reached the points made are relevant to the question and demonstrate a good level of comprehension. 		<p>Candidate demonstrates sound knowledge of the subject matter and a secure understanding of the main aspects.</p> <ul style="list-style-type: none"> clear reference is made to product(s) detailed description of the methods used sound knowledge of the subject matter is demonstrated 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
1.	(b)	<p>The candidate is expected to discuss the suitability of the materials used to manufacture the product(s) they analysed.</p> <p>Typical answers are likely to refer to some of the following:</p> <ul style="list-style-type: none"> • a product(s) • product features (complexity, form, aesthetics, ergonomics, assembly) • performance requirements of product or component parts • conditions of use • scale of production • expected life span • cost effectiveness. 	4	<p>Candidates may refer to more than one product in their answer.</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>Note that the answer must refer to product(s): general comments about materials 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	4
<p>Candidate demonstrates a limited knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • reference is made to product(s) • limited reference has been drawn on the suitability of materials • limited knowledge and understanding of the subject matter is demonstrated • limited reference is made to product(s) • few valid points are made • 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"> • reference is made to product(s) • reference has been drawn on the suitability of materials • knowledge of the subject matter is demonstrated • a number of valid points are made • 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"> • clear reference is made to product(s) • clear reference has been made to the suitability of materials • sound knowledge of the subject matter is demonstrated • a good number of valid points are made • clearly addresses the question.

Question		Expected response	Max mark	Additional guidance
1.	(c)	<p>The candidate is expected to discuss the suitability of the processes used to manufacture the product(s) they analysed.</p> <p>Typical answers are likely to include reference to:</p> <ul style="list-style-type: none"> • materials selected • volume/scale of production/economies of scale • complexity of components • size of components • speed of production required • tooling costs • accuracy requirement • surface finish/quality • environmental issues • relevance of process to design • materials related to processes. 	4	<p>Candidates may refer to more than one product in their answer.</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>Note that the answer must refer to product(s): general comments about processes 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	4
<p>Candidate demonstrates a limited knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • limited reference has been made to the suitability of the processes • limited knowledge and understanding of the subject matter is demonstrated • limited reference is made to product(s) • few valid points are made • 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"> • reference has been made to the suitability of the processes • knowledge of the subject matter is demonstrated • reference made to product(s) • a number of valid points are made • 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"> • clear reference has been made to the suitability of the processes • sound knowledge of the subject matter is demonstrated • clear reference is made to product(s) • a good number of valid points are made • clearly addresses the question.

Question		Expected response	Max mark	Additional guidance
1.	(d)	<p>The candidate is expected to describe the assembly method(s) used in the product(s) and describe how the impact they may have on the environment.</p> <p>Typical answers are likely to refer to:</p> <ul style="list-style-type: none"> • permanent, semi-permanent, temporary, adhesive bonding methods • number of parts in product • ease of disassembly • ease of maintenance • expected life span • less processes, less pollution • user self-assembly (flatpack) versus manufacturer assembly-transportation pollution. 	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 assembly methods and their impact on the environment will not address the question and should be awarded 0 marks.</p> <p>A maximum of 1 mark may be awarded for a description of methods that does not refer to the impact on environment.</p> <p>A maximum of 1 mark may be awarded for describing the impact on environment without providing specific description of assembly methods.</p> <p>1 mark awarded per valid statement.</p>

Question		Expected response	Max mark	Additional guidance
2.	(a)	<p>The candidate is expected to describe the evolution of the product(s) they researched, identifying reasons for changes in the product.</p> <p>Responses are likely to include reference to a range of factors such as:</p> <ul style="list-style-type: none"> • external factors • designers • advances in technology • changes in society • design issues • changes in materials and manufacturing. 	6	<p>Candidates may refer to more than one product in their answer.</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>Note that the answer must refer to their product(s).</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 – 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 evolution of the product(s) • there is little reference to reasons for changes • there is little reference to product(s) • generic statements are made • few valid points are made • does not address the question – in this case 0 marks should be awarded. 	<p>Candidate demonstrates knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • there is a description of the evolution of the product(s) • there is reference to reasons for changes • there is reference to product(s) • valid points are made • generally addresses the question. 	<p>Candidate demonstrates clear knowledge of the subject matter and an understanding of the main aspects.</p> <ul style="list-style-type: none"> • there is a detailed description of the evolution of the product(s) • there is good reference to reasons for changes • there is detailed reference to product(s) • many valid points are made • fully addresses the question.

Question		Expected response	Max mark	Additional guidance
2.	(b)	<p>The candidate is expected to explain why a change(s) to the product(s) they researched was a success or failure.</p> <p>Responses are likely to include reference to a range of reasons such as:</p> <ul style="list-style-type: none"> • no demand • too radical • too expensive • didn't perform as well • durability issues • poor marketing/research • fashion/style/fad • change in consumer demand • more economical • better performance • more durable • better aesthetics. 	3	<p>Candidates may refer to more than one product in their answer.</p> <p>Responses must be specific to the product(s) they researched.</p> <p>1 mark per valid point.</p>

Question		Expected response	Max mark	Additional guidance
2.	(c)	<p>The candidate is expected to describe the impact the product(s) they researched may have had on society, economy and environment.</p> <p>Responses are likely to include reference to a range of reasons such as:</p> <ul style="list-style-type: none"> • communication • transportation • social media • consumerism • accessibility • affordability • creating trends/fashions • peer pressure. 	2	<p>Candidates may refer to more than one product in their answer.</p> <p>Responses must be specific to the product(s) they researched.</p> <p>1 mark per valid point.</p>
	(d)	<p>The candidate is expected to describe how future developments in materials and technologies may influence the evolution of the product(s) they researched.</p> <p>Responses are likely to include reference to:</p> <ul style="list-style-type: none"> • a new material or technology • its characteristics • a description of how it may support the evolution of the product. 	2	<p>Candidates may refer to more than one product in their answer.</p> <p>Responses must be specific to the product(s) they researched.</p> <p>1 mark per valid point.</p>

Section 2

Question		Expected response	Max mark	Additional guidance
3.	(a)	<p>Candidates are expected to have described how the design of the E-YES may have been influenced by information gained by:</p> <ul style="list-style-type: none"> • medical professionals • children with visual impairments. <p>Responses are likely to include reference to:</p> <p>Medical professionals</p> <ul style="list-style-type: none"> • best exercises to develop muscles in the eyes • technical information relating to size, contrast, distance, colour for sight development etc • methods to test results. <p>Children with visual impairments</p> <ul style="list-style-type: none"> • aesthetics of the product • fun aspect of the product • comfort and ease of use of the product • feedback on function • ergonomics/fit. 	4	<p>It is expected that candidates will demonstrate an understanding of specific information that could be gained from each technique to aid the development of the E-YES.</p> <p>1 mark per valid point (max 3 per method).</p>

Question		Expected response	Max mark	Additional guidance
3.	(b)	<p>The candidate is expected to have described how modelling may have been used during the design of the E-YES.</p> <p>Candidates should refer to the types and purpose of models used in their response.</p> <p>Responses are likely to include reference to:</p> <ul style="list-style-type: none"> • sketch models to quickly communicate concept • block models to test ergo, comfort • part models to test functional aspects • CAD/CAM models to test accuracy/fit • CAD model to test aesthetics, stress analysis, assembly. 	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 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 models during the design of the E-YES • limited knowledge and understanding of the subject matter is demonstrated • there is little reference to types of models or their uses • few valid points are made • 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 use of models during the design of the E-YES • knowledge and understanding of the subject matter is demonstrated • there is reference to types of models or their uses • 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 use of models during the design of the E-YES • sound knowledge and understanding of the subject matter is demonstrated • there is clear reference to types of models and their uses • a good number of valid points are made • clearly addresses the question.

Question		Expected response	Max mark	Additional guidance
3.	(c)	<p>The candidate is expected to have described two suitable marketing techniques that could be used to promote the E-YES to the target market. (Children with visual impairments, parents and carers, and medical professionals.)</p> <p>Responses are likely to include reference to:</p> <ul style="list-style-type: none"> • advertisement in medical journals/via professional associations • demonstrations • targeted marketing – social media. 	3	<p>Candidates should refer to two techniques in their answer to be awarded marks in the top band.</p> <p>Note that the answer must refer to the product(s) general comments about marketing will not address the question and should be awarded 0 marks.</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>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 marketing techniques suitable for promoting E-YES • it demonstrates a limited knowledge and understanding of the subject matter • there is little reference to marketing techniques • generic statements about marketing are made • few valid points are made • 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 marketing techniques suitable for promoting E-YES • it demonstrates knowledge and understanding of the subject matter • there is reference to suitable marketing technique (s) • valid points are made about marketing E-YES • a number of valid points are made • 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 marketing techniques suitable for promoting E-YES • it demonstrates sound knowledge and understanding of the subject matter • there is clear reference to 2 suitable marketing techniques • clear points are made about marketing E-YES • a good number of valid points are made • clearly addresses the question.

Question		Expected response	Max mark	Additional guidance
4.	(a)	<p>The candidate is expected to have described how physiology has influenced the design of the WaterRower.</p> <p>Responses are likely to include reference to:</p> <ul style="list-style-type: none"> • force/effort required • range of movement of various parts • moving the WaterRower. 	4	<p>It is expected that candidates make reference to the WaterRower in their response. Generic statements about physiology will not attract marks.</p> <p>Answers must describe how the design of the WaterRower was influenced.</p> <p>1 mark per valid point.</p>
	(b)	<p>The candidate is expected to have outlined other benefits of a strong brand image to companies and their customers.</p> <p>Responses are likely to include reference to:</p> <ul style="list-style-type: none"> • loyalty, repeat sales • word of mouth • reputation • confidence • status. 	3	<p>1 mark per valid point (max 2 per company/consumer).</p> <p>Benefit to both companies and their customers must be outlined to gain 3 marks.</p>
	(c)	<p>The candidate is expected to have described how a company can reduce the negative impact of a product recall.</p> <p>Responses are likely to include reference to:</p> <ul style="list-style-type: none"> • accepting responsibility • dealing with recall efficiently • ensure supply chain are aware of process • replacement/refund fast and clear. 	3	<p>1 mark per valid point.</p>

Question		Expected response	Max mark	Additional guidance
5.	(a)	<p>The candidate is expected to have described other ways that design opportunities may occur.</p> <p>Candidates may refer to products they are familiar with.</p> <p>Responses are likely to include reference to:</p> <ul style="list-style-type: none"> • new technology • use trip/trials • global events • issues with existing products. 	3	<p>0 marks to be awarded for answers relating to changes in lifestyle.</p> <p>1 mark per valid point.</p>
	(b)	<p>The candidate is expected to have described the potential benefits and risks of diversification to a company.</p> <p>Responses are likely to include reference to:</p> <ul style="list-style-type: none"> • lack of expertise in area • requires capital investment (staff and equipment) • difficulty in breaking into market • widens product base, increased sales opportunities. 	3	<p>1 mark per valid point (max 2 for either risks/benefits).</p> <p>Candidate must describe risks and benefits to be able to gain 3 marks.</p>
	(c)	<p>The candidate is expected to have described how Philips would ensure high quality during the manufacture of the Airfryer.</p> <p>Responses are likely to include reference to:</p> <ul style="list-style-type: none"> • regular checks on production line • maintenance of machinery • quality checks of materials • training of staff. 	4	<p>1 mark per valid point.</p>

Question		Expected response	Max mark	Additional guidance
6.	(a)	<p>The candidate is expected to discuss how the design of the Dragonfly may have been influenced by safety.</p> <p>Responses are likely to include reference to:</p> <ul style="list-style-type: none"> • stability of Dragonfly (4 wheels) • meeting legal requirements (speed limits) • ergonomic considerations • electrical safety. 	4	<p>1 mark per valid statement.</p> <p>Any other suitable statements.</p>
	(b)	<p>The candidate is expected to explain the benefits and drawbacks of using sub-contractors when manufacturing products such as the Dragonfly.</p> <p>Typical answers are likely to refer to some of the following:</p> <p>Benefits</p> <ul style="list-style-type: none"> • expertise compared to the in-house design team • may be more cost effective • widens range of ideas input. <p>Drawbacks</p> <ul style="list-style-type: none"> • may take time to start their contract delaying product development • company loses control of product development • quality control issues • confidentiality issues. 	4	<p>1 mark for each valid explanation.</p> <p>Candidates must refer to benefits and drawbacks. Award a maximum of 3 marks to be awarded for valid descriptions if only one is referred to.</p>

Question		Expected response	Max mark	Additional guidance
6.	(c)	<p>The candidate is expected to outline two reasons why drop forging would be selected to manufacture components.</p> <p>Typical answers are likely to refer to some of the following:</p> <ul style="list-style-type: none"> • component of shape and form • repeatability of the mould • material flow in the forging for strength • suitable for aluminium and steel • high volume production possible. 	2	1 mark for each valid reason.

Question		Expected response	Max mark	Additional guidance
7.	(a)	<p>Candidates are expected to explain why the materials above are suitable for the components of the lead.</p> <p>Typical answers are likely to refer to some of the following:</p> <ul style="list-style-type: none"> • product features (complexity, form, aesthetics, ergonomics, assembly) • performance requirements of product or component parts in plastic • plastic processes • plastic lifespan in conditions of use • scale of production of plastics • expected life span of then plastic • cost effectiveness of processes. 	4	<p>Note that the answer must refer to the UFO Retractable Lead; general comments about materials and processes 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	4
<p>Candidate demonstrates a limited knowledge and understanding of the subject matter.</p> <ul style="list-style-type: none"> • vague conclusions have been drawn on the suitability of materials • Limited knowledge of the subject matter is demonstrated • limited reference is made to product(s) few valid points are made • 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"> • conclusions have been drawn on the suitability of materials • knowledge of the subject matter is demonstrated • a number of valid points are made • 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"> • clear conclusions have been drawn on the suitability of materials • sound knowledge of the subject matter is demonstrated • clear reference is made to product(s) • a good number of valid points are made • clearly addresses the question.

Question		Expected response	Max mark	Additional guidance
7.	(b)	<p>Candidates are expected to explain why the designer chose two-shot injection moulding to manufacture the handle.</p> <ul style="list-style-type: none"> • different colours • different properties/materials required • no need for assembly. 	2	1 mark per valid point.
	(c)	<p>Candidates are expected to outline the features that should be considered in mould design.</p> <p>Typical answers are likely to refer to some of the following:</p> <ul style="list-style-type: none"> • wall thickness • 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 • any other suitable response. 	3	1 mark per valid point.

[END OF MARKING INSTRUCTIONS]