



2015 Product Design

Advanced Higher

Finalised Marking Instructions

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Part One: General Marking Principles for Product Design Advanced Higher

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 specific Marking Instructions for each question.

- (a)** Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. 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/Principal Assessor.
- (b)** Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

GENERAL MARKING ADVICE: Product Design Advanced Higher

The marking schemes are written to assist in determining the “minimal acceptable answer” rather than listing every possible correct and incorrect answer. The following notes are offered to support Markers in making judgements on candidates’ evidence, and apply to marking both end of unit assessments and course assessments.

Part Two: Marking Instructions for each Question

Question			Expected Answer(s)	Max Mark	Additional Guidance
1.	(a)	(i)	<p>In answering this question the candidate must discuss the issues associated with the manufacture of the shoes.</p> <p>Responses are likely to make reference to:</p> <p>The difficulties associated with the moulding of the shoes – complexity of form and negative spaces.</p> <p>The difficulties associated with the removal of the shoe from the mould after moulding.</p> <p>The difficulties in assembling the shoes – tolerance of component parts.</p> <p>The difficulties in combining and joining materials with very different properties.</p>	4	<p>Marks will be awarded for each valid point made within the answer.</p> <p>To be awarded full marks the response must demonstrate detailed knowledge and understanding of the subject matter.</p> <p>The points made must be relevant to the question and demonstrate a high level of comprehension.</p>
1	(a)	(ii)	<p>In answering this question the candidate must name and justify two manufacturing processes suitable for the manufacture of the fixing plate.</p> <p>Possible answers (+ Justifications) :</p> <p>CNC Milling Highly accurate & automated Easily adjusted to suit different sizes Low set up costs (other than initial machine costs)</p> <p>Piercing & blanking</p> <p>Highly accurate low running cost plate is manufactured from a flat sheet waste can easily be recycled</p> <p>Hydro/Water jet Cutting no tooling costs Highly accurate low running cost no need for deburring (unlike CNC milling or plasma cutting)</p> <p>Any other suitable process + justifications</p>	4	<p>Marks are not awarded for naming process.</p> <p>Candidates must name two different manufacturing processes and provide 4 justifications in total; these could be 2 x 2 or 3 + 1.</p> <p>NB Candidates may assume that plate has complex detail on unseen side and suggest other processes, e.g. die casting. Marks should be awarded if justification is correct.</p>

Question			Expected Answer(s)	Max Mark	Additional Guidance
1	(a)	(iii)	<p>In answering this question the candidate must state and justify a suitable material the fixing plate.</p> <p>Possible answers (+ Justifications) :</p> <ul style="list-style-type: none"> • Aluminium • Light weight & will not rust • Stainless Steel • Will not rust & durable • Titanium • Will not rust, durable & lightweight 	1	The mark will be awarded for the correct justification of the material – simply stating the material will not be awarded the mark.

Question		Expected Answer(s)	Max Mark	Additional Guidance		
1	(b)	Responses are likely to make reference to: The key points in the products development. The impact the new materials and manufacturing technologies had on the development of the product.	4	In answering this question the candidate must describe how the use of new materials and manufacturing technologies influenced the development of a product or products.		
		1 Mark			2 – 3 marks	4 marks
		An answer which falls into these categories may do so for a number of reasons. It is likely that:				
		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. Limited reference the influence of materials on products Limited reference the influence of manufacturing technologies on products	It demonstrates a sound knowledge and understanding of the subject matter. The points made are relevant to the question and demonstrate a good level of comprehension. Clear reference the influence of materials on products Clear reference the influence of manufacturing technologies on products	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. Clear reference the influence of materials on products and technologies on products		

Question			Expected Answer(s)	Max Mark	Additional Guidance
2	(a)		<p>In answering this question the candidate must describe ways in which a company can reduce the risk associated with launching radically new products to the market.</p> <p>Responses are likely to include:</p> <ul style="list-style-type: none"> • Carrying out thorough market research prior to launch, identifying the correct retail price and the best time to launch • Extensive marketing campaigns highlighting: improvements over existing products/ technologies • Carrying out thorough testing during development and prior to launch to make sure the product performs well • Offering extended warranties 	3	One mark per valid description.
2	(b)	(i)	<p>In answering this question the candidate must describe how products have evolved as a result of problems with existing products.</p> <p>Responses must include references to:</p> <ul style="list-style-type: none"> • Identification of problems with original product • Description of changes to product to overcome problems 	3	<p>The candidate must make reference to a product or products within the answer.</p> <p>One mark per valid point.</p>
2	(b)	(ii)	<p>In answering this question the candidate must describe how products have evolved as a result of Government legislation.</p> <p>Responses are likely to include references to:</p> <ul style="list-style-type: none"> • Identification of legislation • Description of changes to product as a result of legislation 	3	<p>The candidate must make reference to a product or products within the answer.</p> <p>One mark per valid description (this may include identification of specific legislation).</p>

Question			Expected Answer(s)	Max Mark	Additional Guidance
2	(b)	(iii)	<p>In answering this question the candidate must describe how products have evolved as a result of economics.</p> <p>Responses are likely to include references to:</p> <ul style="list-style-type: none"> • Identification of economic issues • Description of changes to product as a result of economics 	3	<p>The candidate must make reference to a product or products within the answer.</p> <p>One mark per valid description.</p>
2	(b)	(iv)	<p>In answering this question the candidate must describe how products have evolved as a result of companies attempting to maintain market share.</p> <p>Responses are likely to include references to:</p> <ul style="list-style-type: none"> • Identification of issues related to market share • Description of changes to product as a result of attempting to maintain market share. 	3	<p>The candidate must make reference to a product or products within the answer.</p> <p>One mark per valid description.</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
3	(a)	<p>In answering this question the candidate must describe how information generated from questionnaires, test rigs and desk research influenced the development of the iron.</p> <p>Responses must describe influence on iron and are likely to include:</p> <p>Questionnaire</p> <ul style="list-style-type: none"> • Consumer opinions on colour influencing the final colour choice • Input from consumers on what they think the important features of a travel iron are, influencing the features built into the iron • Feedback from consumers on the ease of use of the product, influencing elements such as the folding mechanism, and ease of use of the handle. <p>Test rigs</p> <ul style="list-style-type: none"> • Info gathered from heating element tests influencing the choice of materials for the sole plate and the layout of the heating element • Results from tests on the hinge mechanism influencing the design of the hinge/folding handle • Testing of temperatures required to iron press various materials influencing the power rating of the heating element. <p>Desk research</p> <ul style="list-style-type: none"> • Anthropometrics info on hand sizes influencing the dimensions of the handle • Research into available standard components (heating elements, switches and fixings) influencing how the iron is assembled, what elements and switches are fitted • Power requirements in different countries influencing the design of the electronics within the iron. 	6	<p>Marks will be awarded for each valid description of how the information from each research method may have influenced the iron.</p> <p>For candidates to be awarded full marks they must consider all three methods in their answer.</p> <p>Marks can be awarded as 3 × 2 or 4 + 1 + 1 or 3 + 2 + 1</p>

Question			Expected Answer(s)	Max Mark	Additional Guidance		
3	(b)	(i)	In answering this question the candidate must discuss the balance between aesthetics and function for each of the two irons.	4	<p>To be awarded full marks the response must demonstrate detailed knowledge and understanding of the subject matter.</p> <p>The points made must be relevant to the question and demonstrate a high level of comprehension.</p>		
			1 Mark			2 – 3 marks	4 marks
			An answer which falls into these categories may do so for a number of reasons. It is likely that:				
			<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. There is an understanding of aesthetics and function</p>			<p>It demonstrates a sound knowledge and understanding of the subject matter. The points made are relevant to the question and demonstrate a good level of comprehension. There are valid comments on the balance of aesthetics and function for the irons</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 are valid comments on the balance of aesthetics and function for the irons</p>

Question			Expected Answer(s)	Max Mark	Additional Guidance
3	(b)	(ii)	<p>In answering this question the candidate must describe how the designer could resolve the balance between aesthetics and function when designing products.</p> <p>Candidates may respond in two ways: Design the product to function first & foremost then focus on developing the aesthetics of the product or vice versa. Approach the design like an entertainer “Spinning plates” where each plate is a design factor that needs to be focussed on, failure to keep an eye on all factors will result in the product being weak in certain areas.</p> <p>AND/OR</p> <p>Use of modelling Users trips Test Rigs</p>	3	Marks will be awarded for each valid description of how the designer could have resolved the balance between aesthetics and function.

Question			Expected Answer(s)	Max Mark	Additional Guidance
4	(a)	(i)	<p>In addition to general design issues, answers could include:</p> <ul style="list-style-type: none"> • Funding • Cost • Distribution • Awareness • Location • Local need • Disposal 	3	1 mark for valid justification of 3 appropriate issues. No marks for identifying issues.
4	(a)	(ii)	<p>Candidates will be expected to describe how the issues identified in question 4(a)(i) could have influenced the design and development of the LifeStraw.</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.</p>	6	Marks should be awarded using the best fit characteristics shown below.
			0-2	3-4	5-6
An answer which falls into these categories may do so for a number of reasons. It is likely that:					
		<p>It demonstrates a limited knowledge and understanding of the subject matter.</p> <p>Limited description of how the research identified will have influenced the design and development of the LifeStraw</p> <p>Influence to design and development vaguely linked to research identified.</p> <p>Candidates will have considered at least one of the issues identified.</p> <p>Few points are made. Does not address the question. Simply too thin</p>	<p>It demonstrates knowledge of the subject matter and a secure understanding of the main aspects are demonstrated.</p> <p>Good description of how the research identified will have influenced the design and development of the LifeStraw</p> <p>Influence to design and development will be linked to research identified.</p> <p>Candidates will have considered more than one of the identified issues.</p>	<p>It demonstrates knowledge of the subject matter and a secure understanding of the main aspects are demonstrated.</p> <p>Detailed description of how the research identified will have influenced the design and development of the LifeStraw</p> <p>Influence to design and development will be clearly linked to research identified.</p> <p>Candidates will have considered all 3 of the identified issues.</p>	

Question		Expected Answer(s)	Max Mark	Additional Guidance
4	(b)	<p>Typical answers are likely to include:</p> <p>Profit versus non-profit approach</p> <p>Advertising versus education</p> <p>Pricing strategies</p> <p>Product placement versus distribution</p> <p>Communication</p>	4	1 mark for each relevant point leading to a clear description identifying the differences between marketing the LifeStraw for the developing world and the commercial world.
4	(c)	<p>Possible answers could include:</p> <ul style="list-style-type: none"> • Quality of materials • Choice of materials • Assembly method used • Production methods used • Styling and fashion • Aesthetics • Impact on the environment 	3	1 mark for each relevant point made leading to a clear explanation as to how obsolescence influenced the design of a product.

Question		Expected Answer(s)	Max Mark	Additional Guidance	
5	(a)	<p>Candidates will be expected to describe how different aspects of ergonomics may have influenced the design of the Green Fox Cart. 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.</p> <p>Typical answers are likely to include:</p> <ul style="list-style-type: none"> • Anthropometrics influence to sizes, forms and features of the cart. • Physiologies influence to the use and movement of the cart. • Psychologies influence on visual cues and features of the cart. 	6	Marks should be awarded using the best fit characteristics shown below.	
		0-2	3-4	5-6	
An answer which falls into these categories may do so for a number of reasons. It is likely that:					
		<p>It demonstrates a limited knowledge and understanding of the subject matter. Limited description of how ergonomics has influenced the design of the Green Fox Cart</p> <p>Influence to design and development vaguely linked to ergonomics.</p> <p>Candidates will have considered at least one aspect of ergonomics.</p> <p>Few points are made.</p> <p>Does not address the question.</p> <p>Simply too thin</p>	<p>It demonstrates knowledge of the subject matter and a secure understanding of the main aspects are demonstrated. Clear description of how ergonomics has influenced the design of the Green Fox Cart</p> <p>Influence to design and development linked to ergonomics.</p> <p>Candidates will have considered at least one aspect of ergonomics.</p>	<p>It demonstrates knowledge of the subject matter and a secure understanding of the main aspects are demonstrated. Detailed description of how ergonomics has influenced the design of the Green Fox Cart</p> <p>Influence to design and development will be clearly linked to ergonomics.</p> <p>Candidates will have considered more than one aspect of ergonomics.</p>	

Question		Expected Answer(s)	Max Mark	Additional Guidance		
5	(b)	<p>Candidates will be expected to describe how; standard components, production methods and assembly methods could have impacted on the cost of the Fox Green Cart.</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.</p> <p>Passible answers could include:</p> <ul style="list-style-type: none"> • Reduced cost due to affordable standard components • Reduction in cost due to reduced labour costs as a result of standard components • Mass production techniques used to produce high volume at low cost • Snap fixings and adhesives reduce assembly time and costs 	6	Marks should be awarded using the best fit characteristics shown below.		
		0-2			3-4	5-6
		<p>An answer which falls into these categories may do so for a number of reasons. It is likely that:</p>				
		<p>It demonstrates a limited knowledge and understanding of the subject matter.</p> <p>It has limited description of how some of the following could impact on the costs of the Green Fox Cart:</p> <ul style="list-style-type: none"> • Standard components • Production methods • Assembly methods <p>Few points are made.</p> <p>It does not address the question.</p>			<p>It demonstrates knowledge of the subject matter and a secure understanding of the main aspects are demonstrated.</p> <p>It has a good description of how some of the following could impact on the costs of the Green Fox Cart:</p> <ul style="list-style-type: none"> • Standard components • Production methods • Assembly methods 	<p>It demonstrates knowledge of the subject matter and a secure understanding of the main aspects are demonstrated.</p> <p>It has a detailed description of how all of the following could impact on the costs of the Green Fox Cart:</p> <ul style="list-style-type: none"> • Standard components • Production methods • Assembly methods

Question		Expected Answer(s)	Max Mark	Additional Guidance
5	(c)	<p>Possible answers could include:</p> <ul style="list-style-type: none"> • Choice of materials • Choice of production method • Redundancy • Planned obsolescence • Pollution created • Power source • Energy consumption 	4	1 mark should be awarded for each valid point leading to a clear description of how environmental issues have created conflict in the design of a product.

Question		Expected Answer(s)	Max Mark	Additional Guidance	
6	(a)	<p>Candidates will be expected to explain the opportunities and challenges radical change presents to the manufacturer. 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.</p> <p>Passible answers could include:</p> <ul style="list-style-type: none"> • Opportunities: • Increased market share • Market leader • Increased consumer interest • Creating a gap in the market • Reduced competition <p>Challenges:</p> <ul style="list-style-type: none"> • Increased risk of failure • Unknown sales • Retooling • Retraining staff • Risk of rejection 	4		
		0-2			3-4
		An answer which falls into these categories may do so for a number of reasons.			
		<p>Explanation of opportunities created by radical change for the manufacturer.</p> <p>OR</p> <p>Explanation of challenges created by radical change for the manufacturer.</p> <p>OR</p> <p>General explanation of challenges and opportunities offer to the manufacturer through radical change.</p>			<p>Detailed explanation of opportunities created by radical change for the manufacturer.</p> <p>AND</p> <p>Explanation of challenges created by radical change for the manufacturer.</p> <p>OR</p> <p>Explanation of opportunities created by radical change for the manufacturer.</p> <p>AND</p> <p>Detailed explanation of challenges created by radical change for the manufacturer.</p>

Question			Expected Answer(s)	Max Mark	Additional Guidance
6	(b)	(i)	<p>Possible answers could include:</p> <ul style="list-style-type: none"> • Better understanding of form • Accuracy • Animation to check linkages • Link to 3D printing • Improved communication 	3	1 mark for each valid point leading to a clear explanation of the advantages of CAD during the design and development of the Folding Plug. No marks should be awarded for generic statements unrelated to the Folding Plug.
6	(b)	(ii)	<p>Possible answers could include:</p> <ul style="list-style-type: none"> • Testing • Accuracy • Convenience • Feedback • Interaction • Less need for craft skills • Less waste • Quick turnaround 	3	1 mark for each valid point leading to a clear explanation of the advantages of rapid prototyping offered to the designer during the development of the Folding Plug. NB To gain full marks specific references must be made about the Folding Plug.
6	(c)		<p>Possible answers could include:</p> <ul style="list-style-type: none"> • Aesthetic changes • Improved safety • Better efficiency • Reduced impact on the environment • Pricing strategies • Changes to design features 	3	1 mark for each valid point leading to a clear description of the impact recent changes in society has had on a product with which you are familiar.
6	(d)		<p>Possible answers could include:</p> <p>Explanation of the steps and procedures required to obtain a:</p> <ul style="list-style-type: none"> • Patent • Design rights • Copyright • Trademark 	2	1 mark for each valid point leading to a clear explanation of how a designer can protect their intellectual property rights. No marks should be awarded for stating different IPR methods.

Question 7

This question is set to test the candidate's ability to present a reasoned discussion about a design issue. Although there is an underlying body of design knowledge required to answer it there is a very wide range of possible answers. Therefore the question is 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.

The table below is designed to assist with the placing of answers within the full mark range.

0-3	4-6	7-9	10-12
<ul style="list-style-type: none">• An answer which falls into this category may do so for a number of reasons.• It could be that it demonstrates very little knowledge or understanding of the subject matter.• There is little or no reference to products.• Very few points are made.• Much of it does not answer the question.• The answer is simply too thin.	<ul style="list-style-type: none">• Knowledge of the subject matter and a secure understanding of the main aspects will be demonstrated.• The answer will be relevant to the question.• Reference to at least one product.• Although examples are used points made are unclear.	<ul style="list-style-type: none">• Knowledge of the subject matter and a secure understanding of the main aspects will be demonstrated.• The answer will be relevant to the question and demonstrate a good level of comprehension.• Reference to a few products or selected references to a number of products.• Several clear points are made and examples are used to support them.	<ul style="list-style-type: none">• Detailed knowledge of the subject matter and a secure understanding of all the aspects will be demonstrated.• The answer will be relevant to the question demonstrating a high level of comprehension.• Very detailed reference to a few products or selected references to a wide range of products.• Examples are clearly used to illustrate and support points

(TOTAL 12 marks)

[END OF MARKING INSTRUCTIONS]