2013 Product Design

Advanced Higher

Finalised Marking Instructions

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.

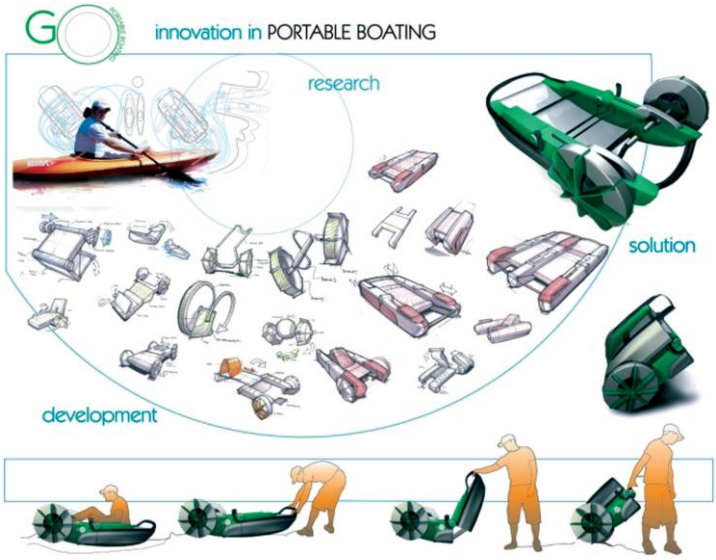
(a) Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you 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
1			The Go portable boat, designed by John Fenno can be folded up and pulled like a luggage trolley.  The designer has used a range of different techniques to explore, develop and present his ideas.	
1	**a**	**i**	Explain the advantages that freehand sketching could have offered during the initial stages of the design of the Go portable boat. **1 mark will be awarded for each <u>clear explanation</u> of the advantages offered by freehand sketching during the initial stages of the design of the Go portable boat**. Answers may include: • Quick • Efficient • Less demand for accuracy • Freedom to experiment • More likely to change • Not limited by software • No need for specialist equipment (low cost) • No need for concrete ideas • Allows designer to be more creative	**2**

Question			Expected Answer/s	Max Mark
1	a	ii	Explain why modelling would have been an essential activity when developing the GO portable boat. **1 mark will be awarded for each <u>clear explanation</u> as to why modelling would have been an essential activity when developing <u>the Go portable boat</u>.** Answers may include: • Effective way to test ergonomics • Effective strategy to gain feedback • Effective method to assess and understand human interactions • Effective method of understanding and experimenting with complex forms, linkages and structures.	**2**
1	b	i	Production costs have a large impact on the success of a product. Describe how computers can be used to reduce the **production** costs of products. **1 mark will be awarded for each clear description of how computers can reduce production costs of products.** Answers may include: • Stock control • Efficient use of materials, time • Efficiency offered by automation • Reduction of labour costs • Increased accuracy creating less waste.	**3**

Question			Expected Answer/s	Max Mark
1	**b**	**ii**	Describe other methods which could be used to reduce the **final** cost of products. **1 mark will be awarded for each piece of valid information leading to clear description as to how the <u>final cost</u> of a product can be reduced**. Answers may include: • Sourcing cheaper materials • Using different materials • Reducing the number of parts • Using different manufacturing processes • Improving quality control • Using an efficient production process such as Just in Time Production • Using standard components • Subcontracting • Reducing development costs • Reducing labour costs • Reduce transport costs • Reduce packaging costs • Recycling materials • Reducing packaging • Flat pack the product – reducing assembly costs.	**2**

Question			Expected Answer/s	Max Mark
1	c	i	The designer's decision to replace traditional oars with paddles powered by the user's legs or arms will have a large impact on the boat's ergonomics. Explain how anthropometric data may have influenced the final dimensions of the Go portable boat. **1 mark will be awarded for each clear explanation as to how anthropometric data (human sizes and range of movement) will have influenced the boat. Answers may include:** Answers may include: • Width of boat influenced by hip width • Peddle sizes influenced foot sizes • Length of boat influenced by leg length • Buoyancy influenced by weight of users • Crank length influenced by range leg movements • Paddle mechanism sizes influenced by range of arm/shoulder movements • Boat has to be used by a wide range of users. Answers must relate to features of the boat.	**2**
1	**c**	**ii**	Describe how physiology may have influenced **two** aspects of the Go portable boat. **1 mark will be awarded for each clear description as to how two aspects of the boat have been influenced by physiology** Answers may include: • Size of paddle influenced by strength of legs/arms • Weight of boat influenced by strength of users • Length of cranks influenced by strength of legs • The force required to activate clips influenced by strength of fingers/hands • Sound of locking components • Force required to push, pull, turn, etc. Answers must relate to **two** features of the boat.	**2** **(13)**

Question			Expected Answer/s	Max Mark
2			The HOC Rescue Power Tool, used by emergency services at road traffic accidents, was designed by Cenk Aytekin.  The cutting jaws could be manufactured by drop forging.	
	a	i	Justify why this manufacturing process would be suitable for the production of the cutting jaws. **1 mark per valid justification, maximum 2 marks, eg** Drop Forging: • high volume production • details/complexity of part • accuracy required by parts • no secondary process required • relatively high quality finish • increased hardness/durability. 0 marks to be awarded for generic reasoning on mass production – must relate directly to the cutters.	2
2	a	ii	Justify a suitable material for the cutting jaws. **0 marks for simply specifying a suitable material and 1 mark allocated for each valid justification, maximum 2 marks** Material: Any suitable material, eg • Carbon steel/tool steel • Stainless steel Suitability: Explanation including properties of material stated above, eg • durable • tough • hard	2

Question			Expected Answer/s	Max Mark
2	**b**		The handle could be manufactured from an aluminium alloy using CNC machining. Discuss the issues that may influence the manufacturer's decision to use CNC machining. **One mark for each description of issues influencing the use of CNC up to a maximum of 4 marks.** Issues: • economy of scale • details/complexity/accuracy of part • no secondary processes required • low operator skill levels required (cutting cost) • run machines 24/7 – increased production • increased flexibility in manufacturing options • High initial set up cost • reduction in strength • inefficiency of material • Training costs • Availability of trained staff	**4**
2	**c**		The designer of the HOC Rescue Power Tool has incorporated many features to ensure it is assembled to the highest standards. With reference to products with which you are familiar, describe features that have been incorporated into the products to ensure ease of assembly. Use sketches to illustrate your answer. **Up to 3 marks for each clear description of features that have been incorporated into products to aid their assembly (max 5 marks), eg** Features may include: • reducing of the number of parts • ways of holding/securing/positioning of moving parts • details of bosses/keys/clips & fittings • order of assembly • fits one way only – ie, computer cables • lining up of parts • ways of holding awkward shapes. Marks will only be awarded to sketch if it adds to description of the feature. Marks may be awarded for ease of assembly for the manufacturer or the consumer.	**5**

Question			Expected Answer/s	Max Mark
2	**d**		Describe how the manufacturer could ensure the product is produced to the highest standards. **1 mark for each valid method up to a maximum of 2 marks.** Points may include: • Quality control • Total Quality Management • Product Testing • Quality of raw materials • Quality checks • Train and monitor staff • Highly skilled labour force • Random sampling • BSI Testing	**2** **(15)**

Question			Expected Answer/s	Max Mark
3			The Bathboard, which folds to save space, is a concept design by Sylwia Ulicka Rivera.  The success of the Bathboard will depend on the designer identifying suitable materials.	
	a		With reference to products with which you are familiar, describe how advances in materials have influenced the evolution of products. **1 mark for each valid point, maximum 3 marks. Answer must make reference to products. Marks will not be awarded for general statements.** Answers will depend on products selected, but may include: • Lighter weight products • Smaller products • Safer products • Environmentally friendly products • More efficient products • Better ergonomics/comfort • Increases aesthetic appeal	**5**

Question			Expected Answer/s	Max Mark
3	**b**		Some products are developed entirely by in-house design teams, while others have elements of the design sub-contracted to consultants. Describe the benefits of each of these approaches. **1 mark for each valid point up to a maximum of 3 per approach.** **Total mark 4.** Answers may include: In-house team**:** • Good funding • Better communication • Clearer understanding • First hand knowledge of company needs, styles, • Team bonding Sub-contract team: • Specialist range of knowledge and experience • High cost for a short period of time to buy in strategic expertise • Contract periods – buy what you need when you need it • Reduced fixed costs (salary costs) • Fresh ideas/outside the box • Professional endorsement/known designer • Additional specialist resources.	**4**

Question			Expected Answer/s	Max Mark
3	c		Changes in lifestyle and the home environment have resulted in a demand for innovative products such as the Bathboard. Explain how changes in society have influenced the following aspects of products. You should refer to examples to illustrate your answer. • Aesthetics • Economics • Life expectancy **Up to 3 marks for explanation of Aesthetics, Economics and Life Expectancy of stated products have been influenced by changes in society. To achieve 6 marks candidates must give answers for all three issues (ie 3,2,1 or 2,2,2 marks).** Answers will depend on products chosen but may include: Aesthetics • More design conscious • More affluent – bling culture • Bigger target market resulting in bland design • Celebrity culture influence Economics • Bigger markets, reducing prices • Throw away society demanding cheaper products • Recession causing consumer to look for value for money • More affluent – consumer paying for "fashion" products Life Expectancy • Throw away society resulting in products which can't be repaired • Rise in consumer expectations • Environmentally conscious	**6** **(15)**

Question			Expected Answer/s	Max Mark
4			The Kranium helmet, designed by Anirudha Rao, looks to create an innovative, lightweight bike helmet that will revolutionise the helmet market.  The Kranium allows custom made helmets to be manufactured by scanning the user's head. The scan is used to create a helmet, where elements such as shape and fit are tailored to the user.	
	a		Describe how the use of new technology has influenced the **design and manufacture** of a product with which you are familiar. **Answer must make reference to products. Marks will not be awarded for general statements.** **1 mark for each valid point, maximum 3 marks for each area. Maximum 4 marks.** Answers will depend on products selected, but may include: Design (note that this can be taken to mean the "process" or the product) • CAD/CAM • Rapid prototyping • Computer simulation/testing • 3D mapping • Miniaturisation Manufacture : • CNC machining • Automation • Quality control	4

Question			Expected Answer/s	Max Mark
4	b		The designer may have evaluated the Kranium at various stages of the design process. Describe an evaluative activity that may have been used during the development stage of the helmet's design. **1 mark for each point made in the description of the activity described, up to a maximum of 2 marks.** Activities may include: • Meeting focus groups • User tests/trials • Testing to destruction • Testing/referencing appropriate regulations • Comparison to specification	**2**
4	c		The design of the Kranium was heavily influenced by a number of issues. With reference to products with which you are familiar, explain how each of the following issues may have influenced their design. • Performance • Recycling • Safety **Up to 4 marks each for valid points detailing how Performance, Function & Safety have influenced the design of stated products, up to a maximum of 9 marks.** Answers will depend on products chosen but may include: Performance • Ergonomics • Comfort • Aerodynamics • Visibility • Efficiency Recycling • Materials used • Number of materials • Assembly Safety • Increase in costs • Changes to materials	**9** **(15)**

Question			Expected Answer/s	Max Mark
5			Two fire extinguishers are shown. The Chubb Hydrospray Elite is one of the most powerful extinguishers in the world. The Home Hero designed by Jonas Damon has won awards for its contribution to home safety.  **Chubb Hydrospray Elite**  **Home Hero**	
	a		Discuss how the different balance between aesthetics and ergonomics may have influenced consumer reaction to the extinguishers. **1 mark will be awarded for knowledge of ergonomics <u>or</u> aesthetics of <u>both</u> extinguishers.** **1 mark will be awarded for knowledge of ergonomics <u>and</u> aesthetics of <u>one</u> extinguisher.** **1 mark will be awarded for knowledge of ergonomics of one extinguisher and aesthetics of other extinguisher.** **2 marks will be awarded for knowledge of ergonomics and aesthetics of both extinguishers.** **3 marks will be awarded for knowledge of ergonomics and aesthetics of both extinguishers and discussion of balance.** **Answers may include:** Chubb Hydrospray Elite • Functional, easy to use and understand • Recognisable • Stands out in any environment • Familiarity • Associated with fire and danger • Consumer trust • May not want to buy it for the home environment Home Hero • Unfamiliar • Not recognisable • Uncertainty of how it should be used • Lack of visual impact • Aesthetics land themselves to the home environment.	**3**

Question			Expected Answer/s	Max Mark
5	**b**	**i**	Describe a strategy designers could use to resolve conflict between: Aesthetics and Function; **1 mark will be awarded for each piece of valid information as to how a designer could resolve the conflict between aesthetics and function**. Answers may include: • User trip/trial • Form follows function	**2**
5	**b**	**ii**	Environment and Production. **1 mark will be awarded for each piece of valid information as to how a designer could resolve the conflict between environment and production.** Answers may include: • Materials selection/Sustainability • Choice of manufacturing processes • Reduce transport • Increase life expectancy	**2**

Question			Expected Answer/s	Max Mark
5	c		A wide range of activities can be used to research, develop and evaluate products. Describe how the information gained from each of the following may have influenced the design of the Home Hero. • Survey • User trip • Expert appraisal **1 mark will be awarded for each piece of valid information as to how information from surveys, user trips and expert appraisal will have influenced the design of the Home hero. Maximum of 3 marks can be awarded for each activity and how the information will have influenced the Home hero. To achieve 6 marks candidates must give answers for all three research methods (ie 3,2,1 or 2,2,2 marks).** Answers may include: Survey • Demand –volume of production, price • Common faults- new features • Buying trends- production runs • Reasons for purchase • Aesthetics User trip • Difficulty in use • Comfort of use • Position of buttons and handles • Visual impact • Ease of use Expert appraisal • Technical information • Safety requirements • Manufacturing considerations • Ergonomics	6 **(13)**

Question			Expected Answer/s	Max Mark
6			Industrial designer Yves Behar's design team generated over two thousand ideas when developing the Clever Little Bag, an innovative solution to the problems created by traditional packaging.  Innovation often results in radical change being made to a product and/or its manufacture.	
	a	i	Explain the advantages a company gains from developing an innovative product. **1 mark will be awarded for each piece of valid information as to the advantages of developing innovative products.** Answers may include: • New product for a new market • Commercial opportunity • Lack of competition • Publicity • Competitive edge • Possible to charge higher price	**3**
6	a	ii	Describe the problems associated with **producing** an innovative product. **1 mark will be awarded for each piece of valid information associated with the production of innovative products.** Answers may include: • Unknown production processes • Tooling and set up costs • Quality control • Training of staff • Changes to existing production systems • New materials • Possible new technology incorporated • Potentially high initial cost • High cost of testing	**3**

Question			Expected Answer/s	Max Mark
6			Environmental principles have influenced the design and development of the Clever Little Bag.	
	b	i	Describe the steps a company could take to reduce their product's impact on the environment. Refer to products with which you are familiar to illustrate your answer. **1 mark will be awarded for each piece of valid information as to how a company can reduce their products impact on the environment.** Answers may include: • Reduce waste • Reduce materials • Use recycled materials	**3**
6	**b**	**ii**	Explain why an environmentally friendly product may not necessarily be a sustainable product. **1 mark will be awarded for each piece of valid information as to why environmentally product may not necessarily be sustainable products.** Answers may include: • Continued demand • Manufacturing costs • Saturation • Balance between perceived environmental savings and actual savings • Products not meeting market expectations • Availability of materials	**2**

Question			Expected Answer/s	Max Mark
6	c		Branding has been used extensively on the innovative Clever Little Bag project. Describe the advantages and disadvantages offered to a company from branding innovative designs. **1 mark will be awarded for each piece of valid information leading to a clear description of the advantages and disadvantages offered to a company from branding innovative products.** Answers may include: Advantages • Consumer confidence • Customer loyalty • Reputation • Recognition Disadvantages • Reputation • Association with poor quality product • Affect to other products made by the company	**4**
6	d		Describe a marketing strategy that would help a new company break into an established market. **1 mark will be awarded for each piece of valid information leading to a clear description of a strategy that would help a new company break into an established market.** Answers may include: • Advertising • Marketing • Endorsements • Promotions • Promotional pricing • Launch events • Design conventions	**2** **(17)**

Question			Expected Answer/s	Max Mark
7			Answer ***either*** Question **7(*a*) or 7(*b*)**.	
	a		"*Great designers seldom make great advertising men, because they get overcome by the beauty of the picture—and forget that merchandise must be sold*." James Randolph Adams Discuss the importance of correctly marketing products, how it could be done and the consequences of poor marketing. You should use examples to support your answer.	**(12)**
			OR	
	b		"*Most people make the mistake of thinking design is what it looks like. People think it's this veneer—that the designers are handed this box and told, "Make it look good!" That's not what we think design is. It's not just what it looks like and feels like. Design is how it works*." Steve Jobs Discuss this statement. You should illustrate your answer with examples of products which have evolved through restyling and others which have evolved due to changes in the way they work.	**(12)**

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
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.	• 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.	• 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.	• Detailed knowledge of the subject matter and a secure understanding of all 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 (even a single product) 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]