



GCE AS MARKING SCHEME

SUMMER 2019

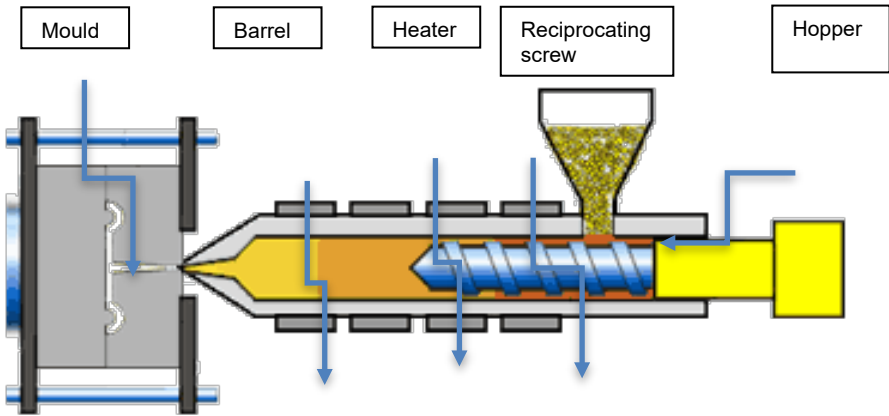
**AS (NEW)
DESIGN AND TECHNOLOGY - PRODUCT DESIGN
2603U10-1**

INTRODUCTION

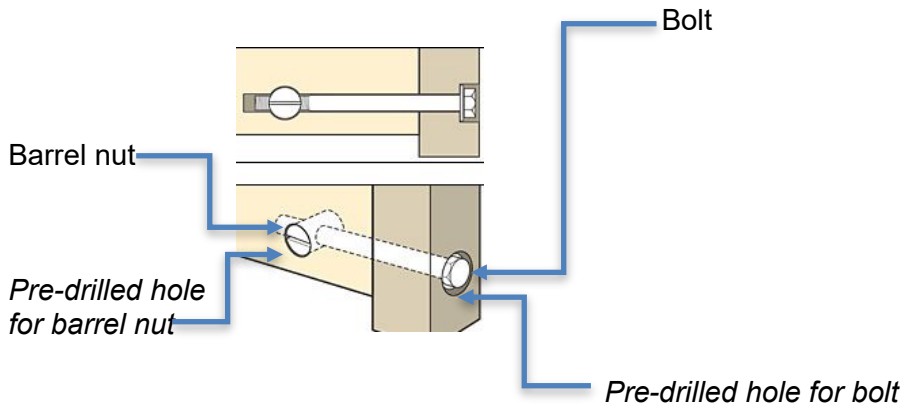
This marking scheme was used by WJEC for the 2019 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

| | | AO3 | AO4 | Mark |
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| (b) | <p>Using notes and sketches describe the injection moulding process used to manufacture the pen lid.</p> <p><i>Candidates will be required to demonstrate an understanding of the process of injection moulding. A candidate must describe the process of injection moulding.</i></p> <p>Injection moulding process is a method of forming thermoplastics using heaters, reciprocating screw and a mould. Polymer granules are loaded into a hopper, which feeds a heated barrel. Inside the barrel is a reciprocation screw will transfer the polymer granules along the barrel. The action of friction and the heating elements around the barrel will cause the polymer to become plastic. Once it is plasticised it can then be injected into the appropriate mould.</p> <p>This process that will allow for a range of complex shapes to be produced quickly and in large quantities, the quality and surface finish of the mould means that each piece produced will need little or no surface finishing. The colour of the pen top can be changed by using different dyes.</p> <p>https://www.toolcraft.co.uk/plastic-injection-moulding/images/injection-moulding-process-stage1-356x141.gif</p>  | | ✓ | 6 |

| | | AO3 | AO4 | Mark |
|-----|---|-----|-----|--|
| (b) | The product pictured below utilises a composite material in the frame. State a possible composite material and justify the reasons for its use. | | ✓ | 5 |
| | <p><i>The response must explain justify the identification of an appropriate composite material.</i></p> <p><i>Incorrect/ no response</i></p> <p><i>Identification of suitable material.</i></p> <p><i>Example: Carbon Fibre</i></p> <p>1 Mark for each detailed reason. Maximum 4 Marks</p> <p>Based on:</p> <ul style="list-style-type: none"> • <i>Very strong and light material (Good strength to weight ratio) this property is useful for a cyclist reducing the weight of the bike.</i> • <i>Resistant to corrosion, allows the bike to be used in all weather conditions and reduces the need for a weather proof coating.</i> • <i>Can be formed using a mould allowing for a range of aerodynamic frame shapes.</i> • <i>Good resistance to fatigue allows the frame to withstand the impacts of general road cycling.</i> • <i>Provides a rigid frame which allows for the effective transfer of energy from the cyclist through the frame and wheels to the road.</i> <p>Accept any other appropriate response</p> | | | <p>0 Marks</p> <p>1 Mark</p> <p>4 Marks</p> |

| | | AO3 | AO4 | Mark |
|-----|--|-----|-----|--|
| (b) | Using notes and sketches describe an example of a semi-permanent fixing method that could be used to join the storage system together. | | ✓ | 4 |
| | <p><i>The response must identify and describe the basic elements of a suitable Knock Down Fitting.</i></p> <p><i>Incorrect/ no response</i></p> <p><i>Diagram with no explanation maximum 2 Marks.</i></p> <p><i>Explanation with no diagram maximum 2Marks.</i></p> <p><i>Identification of suitable fitting;</i> <i>Barrel nut and Bolt,</i> <i>Cam fitting,</i> <i>T-Nut and bolt,</i> <i>Corner Plate,</i> <i>Screw socket,</i> <i>Screw connector,</i> <i>Chipboard Fastener,</i> <i>Block connector.</i></p> <p><i>Supporting diagram with relevant details/ information identified.</i></p>  | | | <p>0 Marks</p> <p>1 Mark</p> <p>3 Marks</p> |

| Question 4 | Studying the Scaoiattolo Squirrel Nutcracker below and answer the following questions. | | | |
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| | | AO3 | AO4 | Mark |
| (a) | Evaluate the selection of each material used in the nutcracker. | | ✓ | 4 |
| <p><i>The response must justify the identified relevant material properties.</i></p> <p><i>Properties are the distinguishing features of the materials</i></p> <p><i>Incorrect/ no response</i></p> <p><i>1 Mark for reason of selection. Maximum 2 Marks</i></p> <p><i>2 Marks for each justified reason for selection. Maximum 4 Marks</i></p> <p>Examples.</p> <p>Beech base material.</p> <ul style="list-style-type: none"> • It is very hard and tough, is ideal to be used where it is being bashed around and used often. • It has good strength properties and high abrasion resistance. • A straight-grained hardwood with a fine texture making it easy to work. • Light in colour. <p>Nut Cracker Handle.</p> <ul style="list-style-type: none"> • Higher corrosion resistance, necessary for any tool or utensil used in contact with food. • High ductility, can be shaped and formed. • High strength and hardness, • A more attractive appearance, can be polished to achieve a high shine giving the appearance of a high quality product • Lower maintenance, easy to keep clean in the household environment. <p><i>Accept any other appropriate response</i></p> | | 0 Marks | | |

| | | AO3 | AO4 | Mark |
|-----|--|-----|-----|------|
| (b) | Evaluate the importance of applying appropriate surface finishes to the materials. | | | 4 |
| | <p><i>Incorrect/ no response 0 Mark</i></p> <p><i>1 Mark for stating a finish. Maximum 2 Marks</i> <i>2 Marks for evaluating the suitability of each finish. Maximum 4 Marks</i></p> <p>Examples.</p> <p>Beech finishes</p> <ul style="list-style-type: none"> • Sanded or planed to a smooth finish, giving a 'high quality' feel and pleasant to touch. • Wax, Oils, Varnishes & Stains. • All the finishes protect the beech from moisture, this could cause splitting or staining of the beech. <p>All the finishes allow: The natural grain of the beech to be seen giving it a natural appearance. The quality of the surface finish of the beech to be appreciated.</p> <p>Stainless Steel</p> <ul style="list-style-type: none"> • Polishing Polished to a smooth finish, giving a 'high quality' feel and pleasant to touch. Mirror finish gives the impression of an exclusive/ expensive product. Polished/smooth finish allows for easy cleaning and is very hygienic. <p>Accept any other appropriate response</p> | | | |

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| Question 5 | Many products achieve the status of a 'design classic'. | | |
| | | AO3 | AO4 |
| | Explain the meaning of the term 'design classic' and describe the key features of a named design classic. | ✓ | 8 |
| | <p>Guidance to markers</p> <p><i>Incorrect/ no response</i></p> <p>Response could be based on:</p> <p><i>The original Mini</i> <i>Fiat 500</i> <i>Dieter Rams T3 transistor radio</i> <i>Apples first ipod</i> <i>London underground map</i> <i>Road signs</i></p> <p>A Design Classic is a manufactured product that has:</p> <ul style="list-style-type: none"> • Timeless aesthetic appeal. Regardless of the year or time period it was produced. • Remained desirable regardless of the year of its design. • Attained its status over time. • Innovation and has lasting impact on society, together with influence on later designs. • Instantly recognisable features and will provoke different emotional responses. <p>Level 1</p> <ul style="list-style-type: none"> • The candidate has a simplistic knowledge of the issues associated with the question. • Limited use of terminology and technical language. • The candidate has limited knowledge of the aesthetic qualities of the product and/ or consideration for the user in their design. • The candidate will express basic ideas clearly, if not always fluently. Answers may deviate from the question or not be relevant. • Grammar, punctuation and spelling may be weak impacting on effective communication. <p>Level 2</p> <ul style="list-style-type: none"> • The candidate has a basic understanding of the issues associated with the question. • Satisfactory use of terminology and technical language. • The candidate has some general knowledge of the aesthetic qualities and consideration for the user in the design aspects, but they are not always considered in detail. • The candidate will express straightforward ideas clearly, if not always fluently. Answers may deviate from the question or be weakly presented. • There may be some errors of grammar, punctuation and spelling but is still able to communicate the issues | <p>0 Marks</p> <p>1-2 Marks</p> <p>3-4 Marks</p> | |

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| Question 6 | <p><i>“Bethan Gray has a bright future-she has an exquisite appreciation of the materials that she works with and a fine attention to detail”</i></p> <p>Sir Terence Conran, The Times June 2012.</p> | | | |
| | AO3 | AO4 | Mark | |
| (a) | With reference to the statement above and the images shown, analyse how the work of Bethan Gray could influence you when designing and making new products. | ✓ | | 8 |
| <p>Guidance to markers</p> <p><i>The response must focus the work of Bethan Gary</i></p> <p><i>Response should be based on:</i></p> <p><i>A discussion of Bethan Gray’s:</i></p> <ul style="list-style-type: none"> • <i>Use of materials in her furniture/products.</i> • <i>Detailing of furniture/products.</i> • <i>Finish of products.</i> • <i>Attention to the market for her products.</i> • <i>Cost of her products for the purchaser.</i> <p><i>5-6 mark response will be expected to link some/all the above aspects to the design of wearable/ portable technology.</i></p> <p><i>7/8 mark response will name and identify specific products Bethan Gray has designed.</i></p> <p><i>Incorrect/no response</i></p> <p>The candidate has very little knowledge of Bethan Gray’s work</p> <ul style="list-style-type: none"> • Candidate does not discuss any of her products. <p>The candidate has a basic knowledge of Bethan and her work</p> <ul style="list-style-type: none"> • The candidate will make reference to some of Bethan Gray’s work, highlighting some key features. • The candidate will make few links between the work of Bethan Gray a design task <p>The candidate demonstrates an understanding of the work of Bethan Gray.</p> <ul style="list-style-type: none"> • The candidate has discussed some of Bethan Gray’s products. • The candidate will make relevant reference to Bethan Gray’s work, highlighting many key features. • The candidate will link the ideas displayed in Bethan Gray’s work and a design task. <p>The candidate demonstrates a sound understanding of the work of Bethan Gray.</p> <ul style="list-style-type: none"> • The candidate has discussed some of Bethan Gray’s products fluently. • The candidate will make relevant reference to Bethan Gray’s work, highlighting relevant key features. • The candidate will suitable and relevant comments linking the principles demonstrated in Bethan Gray’s work and a design task. | | | | |
| | | | | 0 Marks |
| | | | | 1-2 Marks |
| | | | | 3-4 Marks |
| | | | | 5-6 Marks |
| | | | | 7-8 Marks |

| | | A03 | A04 | Mark |
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| (b) | <p>Taking inspiration from Bethan Gray's work design a Bluetooth music speaker.</p> <p>Your design proposal must:</p> <ul style="list-style-type: none"> • reflect the work of Bethan Gray • be no bigger than 100mm x 100mm x 200mm • be freestanding and stable when in use. <p>In the space below, use the specification points to produce a design proposal for the Bluetooth music speaker.</p> <p><i>You are required to use a mixture of 2D and 3D freehand drawings.</i></p> | | ✓ | 16 |
| (i) | <p>An inspirational design that reflects the form, style and work of Bethan Gray.</p> <p><i>The response must contain a possible design for a Bluetooth speaker. You are required to use a combination of 2D and 3D freehand drawings. Together with evidence of consideration of user interface, function and style.</i></p> <p><i>Incorrect/ no response</i></p> <p>2D or 3D images that have very little detail and no reference to the work of Bethan Gray.</p> <p>Idea developed with both 2D and 3D illustrations, some supporting annotation that is relevant and links the proposal to the work of Bethan Gray.</p> <p>Ideas developed with both 2D and 3D illustrations, supporting annotation is relevant to the design and indicates a clear understanding Bethan Gray's design work.</p> <p>Innovative ideas developed with both 2D and 3D illustrations, supporting annotation is relevant to the designs user interface, form, details and materials which demonstrates a detailed understanding, and displays clear links to the work of Bethan Gray.</p> | | | <p>0 marks</p> <p>1-2 marks</p> <p>3-4 marks</p> <p>5-6 marks</p> <p>7-8 marks</p> |
| (ii) | <p>Annotating your design to show how it meets the last two points in the proposal.</p> <p>Guidance to markers No mention of specific specification points.</p> <p>1 mark for identification of each point. 1 mark for justification of each point</p> <p style="text-align: right;">Maximum 4 Marks</p> | | | 0 Marks |

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| (iii) | <p>The quality/presentation and communication of your 2D/3D drawings.</p> <p><i>There MUST be a mixture of 2D and 3D design sketches generated. Sketches should include annotation. Candidates are not expected to render, colour or shade your design work.</i></p> <p>Guidance to markers The emphasis is on the quality of communication and presentation of design ideas.</p> <p>Idea developed with 2D illustrations and limited annotation.</p> <p>Idea developed with both 2D and 3D illustrations, illustrations provide limited information. Some supporting annotation that is relevant to the design.</p> <p>Ideas developed with both 2D and 3D illustrations, illustrations highlight many design details for the design. Supporting annotation is relevant to the design and indicates a detailed understanding of the problem.</p> <p>Creative use of both 2D and 3D illustrations, illustrations demonstrate all details fully explain the design. Supporting annotation is relevant to the designs form, details and materials which demonstrates a detailed understanding of the problem.</p> | <p>1 Mark</p> <p>2 Marks</p> <p>3 Marks</p> <p>4 Marks</p> |
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| (c) | If a prototype of your design was manufactured describe in detail: | | ✓ | 8 |
| (i) | <p>One physical test you could perform to accurately assess impact damage.</p> <p><i>The response must identify an appropriate test that can be carried out on the design to establish its ability to resist impact damage.</i></p> <p>Guidance to markers</p> <p>No mention of specific impact test.</p> <p>Identifying a test.</p> <p>Describing the key elements of the tests.</p> <p>Maximum 4 Marks</p> <p>Examples</p> <p>PENDULUM TESTING</p> <ul style="list-style-type: none"> • A pendulum of a known weight is hoisted to a known height on a swinging arm around a pivot point. • By calculating the acceleration due to gravity, the tester knows that the weight falling from a set height will contain a certain amount of impact energy at the bottom of the swing. • Clamping or supporting a specimen on the bottom, the sample can be released to strike and break/dent the specimen. • Samples don't have to shatter to be considered failures. Failure can be defined by deformation, crack initiation, or complete fracture, depending on the requirements <p>DROP WEIGHT IMPACT TEST</p> <ul style="list-style-type: none"> • A weight is dropped in a vertical direction, with a tube or rails to guide it during the "free fall." • The height and weight known, impact energy can be calculated allowing for acceleration due to gravity. • Falling weight impact has several key advantages over other methods. It is applicable for molded samples, molded parts etc. • Samples don't have to shatter to be considered failures. Failure can be defined by deformation, crack initiation, or complete fracture, depending on the requirements <p>CAD Testing is not an appropriate response in this question. It is stated that the tests will be carried out on a manufactured prototype.</p> <p>Accept any other appropriate response.</p> | | | <p>0 Marks</p> <p>1 mark</p> <p>3 marks</p> |

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| (ii) | <p>How you could accurately assess the aesthetic qualities.</p> <p>Guidance to markers</p> <p>No potential tests identified.</p> <p>Target market identified as subjects for the test.</p> <p>Potential test identified with justified details</p> <p>Maximum of 4 marks.</p> <p><i>The response must identify a range of appropriate method of testing that can be carried out on the design to establish its aesthetic qualities.</i></p> <p><i>Example:</i></p> <ul style="list-style-type: none"> • <i>Prototype given to a sample from the Target Market.</i> • <i>Target market then asked to complete feedback forms to identify the product suitability for the market. The feedback can be in a range of forms;</i> <p>Open-ended preference explanation: <i>Ask users to explain why they like a design. Gives the responder greater freedom but the responses can be difficult to analyse.</i></p> <p>Open word choice: <i>Ask users to list 3 to 5 words that describe the design. Limits the answers from the responder and can provide a wide range of responses.</i></p> <p>Closed word choice: <i>Provide users with a list of terms and ask them to pick the words which best describe the design. Limits the answers that will be received but gives clear defined response to the questions.</i></p> <p>Numerical ratings: <i>Collect numerical ratings about how much the design exhibits aesthetic qualities. Limits the answers that will be received but gives clear defined data that can be mathematically analysed in response to the questions.</i></p> <ul style="list-style-type: none"> • Information analysed <p>Accept any other appropriate response.</p> | <p>0 Marks</p> <p>1 Mark</p> <p>3 Marks</p> |
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| | | AO3 | AO4 | Mark |
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| (d) | Describe and justify a research strategy to gather relevant information on the internal workings of the Bluetooth speaker | | ✓ | 8 |
| | <p>Guidance to markers</p> <p><i>Response should be based on a method of finding detail information on the design and manufacture of the internal elements of a blue tooth speaker:</i></p> <p><i>Methods suitable:</i></p> <p><i>Reverse engineering</i></p> <p><i>Deconstruction</i></p> <p><i>Patent search's</i></p> <p>Example</p> <p>Reverse engineering key points.</p> <ul style="list-style-type: none"> • Legal method of studying the below the line properties (Materials and internal design) of a competitor's blue tooth speaker. • Disassemble an existing blue tooth speaker. • To discover the potential methods involved in manufacture in order to produce a blue tooth speaker. • Identify suitable materials and construction techniques. • Identify internal construction details. • Save time and money, the new product is not being developed from scratch. <p>No research strategy identified.</p> <p><i>1 Mark for each point identified.</i></p> <p><i>2 Marks for each point identified and advantage explained.</i></p> <p>Maximum of 8 marks.</p> <p><i>Accept any other appropriate response.</i></p> | | | 0 Marks |