



GCSE MARKING SCHEME

SUMMER 2018

**DESIGN & TECHNOLOGY - PRODUCT DESIGN
4141/01**

INTRODUCTION

This marking scheme was used by WJEC for the 2018 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.

GCSE DESIGN & TECHNOLOGY - PRODUCT DESIGN

SUMMER 2018 MARK SCHEME

Section A

| Question | | | | On paper | Question Totals | Overall TOTAL |
|----------|-----|--|--|----------|-----------------|---------------|
| 1 | (a) | (i) | One word responses or any explanation that is not related to Size . | 0 | 2 | |
| | | | Limited answer. e.g. The phone has become much slimmer. | 1 | | |
| | | | Full answer should explain in detail and be related to Size , e.g. due to the size of components getting smaller, the phone is now able to be much slimmer/smaller making it easier to carry in your pocket. | 2 | | |
| | | | | | | |
| | | (ii) | One word responses or any explanation that is not related to Function . | 0 | 2 | |
| | | Limited answer e.g. the phone has many more functions such as a camera, etc. | 1 | | | |
| | | Full answer should explain in detail and be related to Function , e.g. The introduction of touch screen technology has made the phone much easier to operate and allowed the screen size to be larger making it better for viewing photos/films etc. | 2 | | | |
| | | | | | | |
| | | (iii) | One word responses or any explanation that is not related to Aesthetics . | 0 | 2 | |
| | | Limited answer, e.g. The phone has a nice glossy finish. | 1 | | | |
| | | Full answer should explain in detail and be related to Aesthetics . e.g. the phone is much more sleek and minimalistic giving it a more sophisticated appearance. | 2 | | | |
| | | | | | | |
| | (b) | | No answer or the answer is not related to the materials used. | 0 | 2 | |
| | | | A simple answer can be awarded 1 mark. e.g. ABS is used for the casing because it is hard wearing | 1 | | |
| | | | An elaborated answer that explains can be awarded 2 marks. e.g. ABS is used for the casing because it is hard wearing and durable and if it is dropped it is less likely to break. | 2 | | |
| | | | | | | |

| Question | | | On paper | Question Totals | Overall TOTAL | |
|----------|-----|--|---|----------------------------|---------------|----|
| | (c) | <p>No answer or the answer does not give a reason that is appropriate.</p> <p>Example 1: Wireless Connectivity Influence: The advancements in Wi-fi and mobile internet now allows users to be able to search the internet, receive and send emails, stream videos and music wherever they may be using their phone.</p> <p>Example 2: Touch Screen Influence: Allows the user to easily navigate their way around the phone without having to go through multiple menus. Enhanced usability – swiping to move on through photos, zoom in and out. Increased screen size as no keypad needed, better quality screen.</p> | <p>0</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> | 4 | | |
| | (d) | (i) | DECEMBER | 1 | 1 | |
| | | (ii) | <p>No answer or an answer that does not state 8800</p> <p>$10000 + 8000 + 6000 + 8000 + 12000 = 44,000$</p> <p>$44,000 \div 5 = 8800$</p> <p>Mean Average Sales Aug to Dec = 8800</p> | <p>0</p> <p>1</p> <p>1</p> | 2 | |
| | | | | | 15 | 15 |

| Question | | | | On paper | Question Totals | Overall TOTAL |
|----------|-----|------|--|----------|-----------------|---------------|
| 2 | (a) | (i) | RETHINK | 1 | 1 | |
| | | (ii) | RECYCLE | 1 | 1 | |
| | (b) | | No answer or the answer is not appropriate. | 0 | 4 | |
| | | | Winner: The consumer as less energy will be used reducing bills. | 1 | | |
| | | | Loser: The energy companies as less energy will be consumed reducing profit. | 1 | | |
| | (c) | | A clear and detailed response. | 0 | 4 | |
| | | | The energy and materials required to manufacture / transport the product. | 1 | | |
| | | | Impact of packaging on the product. | 1 | | |
| | | | The effects the product has on the environment during its use. | 1 | | |
| | | | Effects on the environment when the product has reached the end of its life. | 1 | | |
| | | | Note: There could be some extended responses covering many areas – credit needs to be awarded for ‘strands’ covered in responses. (4 x 1) One strand with some depth, up to 2 marks. | | | |
| | | | | | | |
| | | | | | 10 | 25 |

| Question | | | On paper | Question Totals | Overall TOTAL |
|----------|-----|---|--------------|-----------------|---------------|
| 3 | (a) | Axor Vortex tap – Philippe Starck. AirBlade – James Dyson. | 1 1 | 2 | |
| | (b) | No answer or no relevant issues described or discussed – | 0 | 8 | |
| | | Some description of the work of each designer. Little understanding of its main features. A little understanding of the innovative features of their products. Quality of Written Communication is basic, presenting occasionally appropriate material with some coherence, some errors of grammar, punctuation and spelling. | 1 or 2 | | |
| | | Description of the work of each designer. Some understanding of its main features. Some understanding of the innovative features of their products. Quality of Written Communication is good, presenting mainly appropriate material in a coherent manner, few errors of grammar, punctuation and spelling. | 3 or 4 | | |
| | | Description and comparison of the work of each designer. Understanding shown of its main features with respect to form and function. Discussion of the innovative features of their products. With some appropriate examples provided. Quality of Written Communication is very good, presenting appropriate material in a coherent and logical manner, very few errors of grammar, punctuation and spelling. | 5 or 6 | | |
| | | Description and comparison of the work of each designer. Clear understanding shown of its main features with respect to form and function. Discussion of the innovative features of their products with fully appropriate examples provided. Quality of Written Communication is excellent, presenting wholly appropriate material in a coherent and logical manner, hardly any errors of grammar, punctuation and spelling. | 7 or 8 | | |
| | | | | 10 | 35 |

James Dyson:

Work:

- Known for his Vacuum Cleaner designs, Wheelbarrow and Sea Truck.
- The cyclonic action leads to the bag less vacuum cleaner.
- Still a designer today the AirBlade his latest concept.
- One of his first designers to use the ball as a form of wheel.

Main Features:

- Unique products in the market place today; transparent and bright coloured plastic a trade mark of his work.
- Product's 'technology/engineering' is not hidden from user.
- Not afraid to develop an existing/traditional idea or product and look at it from a different angle.

Innovation:

- Cyclone vacuum technology.
- Ball wheel barrow – and vacuum.
- Air blade hand dryers.
- Bladeless fans.
- The idea is as important as technology. The concept of the ball as an idea used in the vacuum cleaner Dyson Ball.

Philippe Starck:

- Starck works independently as a designer – works in collaboration with a number of firms.
- Extensive range of products: Everyday items, furniture, lemon juicer, interiors, vehicles, yachts, hotels, turbines.
- Iconic design – Sleek lemon juicer 'Juicy Salif' – become an affordable cult item.
- Pushes the limits of contemporary design.
- Creative and imaginative designs – Bold, stand out, flamboyant.
- Uses metallic finishes.
- High gloss finishes.
- Use of transparent materials.
- Form of his products were often inspired by natural and everyday objects.
- Organised elegantly and rigorously.
- Believes creation must improve the lives of as many people as possible.
- Ecological implications very important to him – 'The green'.

| Question | | | On paper | Question Totals | Overall TOTAL | | |
|----------|-----|------|--|------------------------------------|---------------|--|--|
| 4 | (a) | | SPECIFICATION RESEARCH EVALUATION | 1 1 1 | 3 | | |
| | (b) | (i) | <p>Technical Detail 1: Working drawing presenting detailed dimensions for the product.</p> <p>Technical Detail 2: Machining speeds and feeds required to make individual parts.</p> <p>Other Technical details that could be considered are: Parts list, quality control checks, exploded views.</p> | 1 1 | 2 | | |
| | | (ii) | <p>No answer or inappropriate answer, e.g. find out information.</p> <p>A weaker / less clear response, e.g. to show how a product is made.</p> <p>A clear and detailed response, e.g. to consider how parts of a product will be made and / or constructed, with specific tools, equipment and time estimates. Could include risk assessment / H&S issues.</p> <p>Plan for manufacture should include:</p> <ul style="list-style-type: none"> • Detailed description of the tasks to be undertaken. • Timing predictions for each task. • Quality control checks / decisions. • Health and safety considerations. • Risk assessments. • Tools, equipment and materials needed. | 0 1 2 | 2 | | |
| | (c) | (i) | <p>No attempt made to reflect the modern and fun style.</p> <p>A simple attempt at creating salt and pepper shakers. Some reflection of the style and colours of Alessi. Poor communication/ no colour.</p> <p>A suitable design for the salt and pepper shakers with clear reflection of the style and colours of Alessi and presented with Colour and annotation.</p> <p>A detailed, innovative and aesthetically pleasing design for the salt and pepper shakers with excellent reflection of the style and colours of Alessi, presented to a high standard with colour and annotations.</p> | 0 1-2 3-4 4-5 | 5 | | |

| Question | | | On paper | Question Totals | Overall TOTAL |
|----------|-------|--|---------------------------------------|-----------------|---------------|
| | (ii) | No attempt to show a suitable way to dispense the salt. A simple design presented for how the the salt and pepper will be dispensed, lacks innovation. A good design presented for how the salt and pepper will be refilled with some innovative features. | 0 1 2 | 2 | |
| | (iii) | No attempt to show a suitable way to refilling the salt and pepper. A simple design presented for how the the salt and pepper will be refilled, lacks innovation. A good design presented for how the salt and pepper will be refilled with some innovative features. An innovative and creative design solution. | 1 2 3 | 3 | |
| | (iv) | Material No answer or the answer is not an appropriate material (plastic, wood, metal) A correct answer can be awarded 1 mark for each suitable material up to a total of 2. Suitable material identified – Stainless steel, ABS, Acrylic, polypropylene. | 0 1 1 | 2 | |
| | (v) | No answer or the answer is not an appropriate size A simple answer can be awarded 1 mark for each appropriate size up to a maximum of 2 marks. (Sizes must be appropriate to design). | 1 1 | 2 | |
| | (vi) | No answer or the answer cannot be understood, no annotation. Poor quality graphic skills, hard to understand, annotation unclear. Graphic skills are adequate, understandable, limited annotation of important details. Good graphic details and image, appropriate styling, understandable, good annotation of important details. Excellent graphic details and image, highly appropriate styling, with correct annotation of important details and techniques. | 0 1 2 3 4 | 4 | |
| | | | | 25 | 60 |

Section B

| Question | | | On paper | Question Totals | Overall TOTAL |
|----------|-----|--|------------------------------|-----------------|---------------|
| 5 | (a) | ROTATIONAL MOULDING BLOW MOULDING VACUUM FORMING INJECTION MOULDING | 1 1 1 1 | 4 | |
| | | | | | |
| | (b) | No answer or the answer does not give a reason that is appropriate. A simple answer can be awarded 1 mark. You can make many products in a short space of time. An elaborated answer that explains in less detail can be awarded 2 marks. You can produce multiple numbers of chairs using the same mould to achieve consistency in a short space of time. A detailed answer that explains in detail can be awarded 3 marks. Press moulding is a very quick and accurate method to produce multiple chairs that are identical in a short space of time. It also saves the manufacturer money as only one material is used with no fabrication required. <ul style="list-style-type: none"> • Repeatability for large scale production. • Consistency, as all products are made using the same mould. • Reduced manufacturing time as no assembly is needed. • Automation can be used reducing human error, time and labour costs. • Only one material needed. • Minimal waste. | 0 1 2 3 | 3 | |
| | | | | | |

| Question | | | On paper | Question Totals | Overall TOTAL |
|----------|-----|---|-------------------------------------|-----------------|---------------|
| | (c) | <p>No answer or the answer does not give a reason that is appropriate.</p> <p>A simple answer can be awarded 1 mark. It produces 3D models quickly.</p> <p>An elaborated answer that explains can be awarded 2 marks.</p> <p>Produces detailed and sophisticated models of virtually any shape from a 3D computer model.</p> <p>A detailed answer that explains can be awarded 3 marks.</p> <p>3D Rapid Prototyping produces detailed and sophisticated models of virtually any shape from a 3D computer model. Models are produced quickly and they are ready for testing. Changes can be made easily to the design and further prototypes created.</p> <ul style="list-style-type: none"> • Produces detailed and sophisticated models of virtually any shape from a 3D computer model. • Much quicker than modelling by hand or using other CAM processes • Model is completed ready for finishing. • The model can be tested in its intended form. • Changes can be made quickly to aid development. • The virtual and physical models are almost identical. | <p>0</p> <p>1</p> <p>2</p> <p>3</p> | 3 | |
| | | | | | |
| | | | | 10 | 10 |

| Question | | | | On paper | Question Totals | Overall TOTAL | | | | | | | | |
|----------------------|---|------|--|------------------|----------------------|----------------------|--|-------------|---|-------------|---|-------------|---|--|
| 6 | a | (i) | <table border="0"> <tr> <td>RENEWABLE</td> <td>NON-RENEWABLE</td> </tr> <tr> <td>Corrugated Cardboard</td> <td>Acrylic</td> </tr> <tr> <td>Parana Pine</td> <td></td> </tr> </table> | RENEWABLE | NON-RENEWABLE | Corrugated Cardboard | Acrylic | Parana Pine | | 1 1 1 | 3 | | | |
| RENEWABLE | NON-RENEWABLE | | | | | | | | | | | | | |
| Corrugated Cardboard | Acrylic | | | | | | | | | | | | | |
| Parana Pine | | | | | | | | | | | | | | |
| | | (i)j | <p>No answer or the answer does not give a reason that is appropriate.</p> <p>A simple answer – an assertion – can be awarded 1 mark. To reduce the amount of non-renewable materials that are used.</p> <p>An elaborated answer that explains can be awarded 2 marks. Our non-renewable resources such as oil will soon run out. By using more renewable materials we will extend the life of our non-renewable resources.</p> | 0 1 2 | 2 | | | | | | | | | |
| | (b) | | <table border="0"> <thead> <tr> <th>Property</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Malleability</td> <td>The ability to be moulded without breaking</td> </tr> <tr> <td>Ductility</td> <td>The ability to withstand indentation and scratching</td> </tr> <tr> <td>Hardness</td> <td>The ability to bend or deform when a force is applied</td> </tr> </tbody> </table> | Property | Description | Malleability | The ability to be moulded without breaking | Ductility | The ability to withstand indentation and scratching | Hardness | The ability to bend or deform when a force is applied | 1 1 1 | 3 | |
| Property | Description | | | | | | | | | | | | | |
| Malleability | The ability to be moulded without breaking | | | | | | | | | | | | | |
| Ductility | The ability to withstand indentation and scratching | | | | | | | | | | | | | |
| Hardness | The ability to bend or deform when a force is applied | | | | | | | | | | | | | |
| | (c) | | <p>0 marks - Thermosets can be bent.</p> <p>Basic answer - 1 mark: Thermoplastics can be bent/formed by heating.</p> <p>2 marks - some understanding: Thermoplastics can be bent then reheated again and return to original shape. Thermoset plastics cannot.</p> <p>3 marks - clear understanding: Thermoplastics can be formed then reheated again and return to original shape. Thermoset plastics cannot as they have much stronger covalent bonds.</p> <ul style="list-style-type: none"> • Plastic memory. • Covalent bonds. <p>Thermosets more resistant to heat.</p> | 1 2 3 | 3 | | | | | | | | | |

| Question | | | On paper | Question Totals | Overall TOTAL |
|----------|-----|--|--|-----------------|---------------|
| | (d) | <p>No answer or the answer does not give an explanation that is appropriate.</p> <p>An explanation of what standard components are can be awarded 1 mark.</p> <p>Standard components are parts that are manufactured in mass by a third party and then bought in to be used in the manufacture of a product.</p> <p>Award up to 3 marks for any of the following advantages: The use of Standard components provides many advantages for manufacturers:</p> <ul style="list-style-type: none"> • Save time manufacturing. • Cheaper as bought in bulk (mass produced). • Cheaper than producing the part themselves. • Continuous supply available (nuts, bolts, fixings). • High quality parts as manufactured by specialists. | <p>0</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> | 4 | |
| | | | | 15 | 25 |

| Question | | | | On paper | Question Totals | Overall TOTAL |
|----------|-----|-------|--|---------------------|-----------------|---------------|
| 7 | (a) | (i) | Picture A - Hot Glue Gun Picture B – Safety Ruler/Rule Picture C – Cutting Mat. | 1 1 1 | 3 | |
| | | (ii) | No answer or the answer does not give an answer that is appropriate. A simple answer can be awarded 1 mark. Do not touch the hot glue until it is set. An elaborated answer that explains can be awarded 2 marks. Do not touch the hot glue until it is set as it is extremely hot and could cause serious burns. | 0 1 2 | 2 | |
| | | (ii)i | No answer or the answer does not give an answer that is appropriate. A simple answer can be awarded 1 mark. The cutting mat is used when cutting a paper based material with a scalpel. An elaborated answer that explains can be awarded 2 marks. When cutting a paper based material with a scalpel the cutting mat is used to avoid damaging the surface underneath and to help achieve a smooth cut. | 0 1 2 | 2 | |
| | (b) | (i) | Award 1 mark for each stage of the modelling process: <ul style="list-style-type: none"> • Mark out the shape of the alarm clock on the top face of the foam. • Cut out the shape using band saw/scroll saw/hot wire cutter. • Shape the curved sides using a file, sandpaper or sander. • Cut out the recess in the front using a scalpel and metal safety rule. | 1 1 1 1 | 4 | |

| Question | | | On paper | Question Totals | Overall TOTAL |
|----------|------|--|--------------------------------------|-----------------|---------------|
| | (ii) | <p>No answer or the answer does not describe and advantage or disadvantage 0 marks.</p> <p>A simple answer for advantages can be awarded 1 mark. Blue foam is easy to cut and shape</p> <p>An elaborated answer that explains can be awarded 2 marks. Blue foam is very easy cut and shape into the required shape so that it can then be tested.</p> <p>A detailed answer that explains can be awarded 3 marks. Blue foam is very easy cut and shape into the required shape so that it can then be tested and modified until the ideal has been achieved. You can also apply a spray painted finish to the model to give it a realistic appearance.</p> <p>Advantages:</p> <ul style="list-style-type: none"> • Cheap material. • Available in large cross-sections. • Easily cut and shaped. • Quicker to cut. • Easy to work with. • Easy to test. • Rigid. • Easy to apply a finish to. | 0 1 2 3 | 3 | |
| | (c) | <p>No answer or the answer that is not appropriate</p> <p>1 mark awarded for each stage of the process that is explained, up to a maximum of 5 marks.</p> <ul style="list-style-type: none"> • Draw the design for the external (front and back) and internal (hollow section) layers using 2D design tools or other CAD package (accept mark by hand and cut by bandsaw, etc.). • Export the design to a laser cutter, set the height of the laser, the correct power and speed settings for the material and cut the layers including multiple internal layers. Different settings will be required for the Ply and Acrylic layers. • Glue the layers together and clamp until dry. • Sand down any rough edges using belt sander, bobbing sander and glass paper. • Solder the Circuit together and assemble into the casing. • Attach acrylic face plate using epoxy resin or impact adhesive and apply finish. <p>Graphic Communication</p> <ul style="list-style-type: none"> • Very basic attempt and lacking in a majority of detail. • Adequate attempt to illustrate the process. <p>A maximum of 5 marks can be achieved if there are no sketches.</p> | 0 1 1 1 1 1 0 1 | 6 | |
| | | | | | 20 |
| | | | | | 45 |

| Question | | | | On paper | Question Totals | Overall TOTAL |
|----------|-----|---|--|----------|-----------------|---------------|
| 8 | (a) | (i) | | 1 | 3 | |
| | | | | 1 | | |
| | | | | 1 | | |
| | | | | 1 | | |
| | | (ii) | <p>No answer or an incorrect answer.</p> <p>Award up to two marks for answers based on knowledge of desk top publishing: inserting tables/charts from spread sheets and pictures from a range of sources, bringing them together and inserting them into text or columns easily; being able to adjust the layout of the report -changing font styles and sizes to suit a style; ability to move images around the text with ease; it provides a more professional looking document.</p> <p>No marks to be awarded for unqualified assertions, e.g. quicker, easier, faster, etc.</p> <p>Award one mark for a basic answer for example: you can fit pictures and charts in between text and move them around to improve the layout with ease.</p> <p>Award two marks for a more developed response for example: you can fit pictures and charts in between or alongside text and move them around, resize them to improve the overall layout of the report.</p> | 0 | 2 | |
| | 1 | | | | | |
| | 2 | | | | | |
| | 2 | | | | | |
| | (b) | <p>No answer or an incorrect answer is awarded 0 marks</p> <p>A simple answer for advantages can be awarded 1 mark. e.g. can produce a realistic 3D drawing of the product.</p> <p>An elaborated answer that explains can be awarded 2 marks. e.g. can produce a detailed and realistic 3D drawing of the product that can be rotated and viewed from different angles to evaluate effectively.</p> <p>A detailed answer that explains can be awarded 3 marks. e.g. can produce a detailed and realistic 3D drawing of the product that can be rotated and viewed from different angles and have different finishes applied to be able evaluate effectively. Designs can then be modified easily without making a physical model.</p> <p>Advantages of 3D CAD modelling:</p> <ul style="list-style-type: none"> • Can produce a detailed and realistic 3D drawing of the product. • The drawings can be rotated to view the product from different angles. • The drawing can be easily and quickly amended and modified. • Different material finishes can be applied and tested. • Designs can be easily emailed to colleagues for feedback/collaborative working. | 0 | 3 | | |
| | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |

| Question | | | On paper | Question Totals | Overall TOTAL |
|----------|-------|---|------------------|-----------------|---------------|
| (c) | (i) | 1 Mark awarded for any suitable CAD package named. 2D design tools, Corel draw, Serif Draw. | 1 | 1 | |
| | (ii) | Award 1 mark for any of the following stages mentioned up to a total of 3 marks. <ul style="list-style-type: none"> Use grid lock and draw lines to identify the centre point of the design then create the first of the repeated shapes on one of the centre lines. Select the shape and then choose the 'rotate selected objects' tool and choose to repeat the shape 11 times at an angle of 30 degrees. Select the centre point around which it is to repeat and the shapes will duplicate. Use the delete segment tool to remove any unwanted lines. | 1 1 1 | 3 | |
| | (iii) | No answer or the answer does not give a reason that is appropriate. A simple answer can be awarded 1 mark. The clock can be duplicated as many times as needed. An elaborated answer that explains can be awarded 2 marks. Laser cutting is extremely accurate meaning the clock can be duplicated as many times as needed and they will all be identical. A detailed answer that explains can be awarded 3 marks. Laser cutting is extremely accurate meaning the clock can be duplicated as many times as needed and they will all be identical. It is also much quicker than manufacturer by hand saving time and costs. <ul style="list-style-type: none"> The clock can be duplicated as many times as needed. Much quicker manufacturing time compared to if they were made by hand. Self-finishing process – high quality finish on the edges of the acrylic. Highly accurate process – all clocks will be identical. | 0 1 2 3 | 3 | |
| | | | | 15 | 60 |