### 4.4.4.1 Section A: Identifying and investigating design possibilities (10 marks)

By analysing the contextual challenge students will identify design possibilities, investigate client needs and wants and factors including economic and social challenges. Students should also use the work of others (past and/or present) to help them form ideas. Research should be concise and relate to their contextual challenge. Students are also advised to use a range of research techniques (primary/secondary) in order to draw accurate conclusions. Students should be encouraged to investigate throughout their project to help inform decisions.

| Mark band | Description |
|---|---|
| 9–10 | Design possibilities identified and thoroughly explored, directly linked to a contextual challenge demonstrating excellent understanding of the problems/opportunities.<br>A user/client has been clearly identified and is entirely relevant in all aspects to the contextual challenge and student has undertaken a comprehensive investigation of their needs and wants, with a clear explanation and justification of all aspects of these.<br>Comprehensive investigation into the work of others that clearly informs ideas.<br>Excellent design focus and full understanding of the impact on society including; economic and social effects.<br>Extensive evidence that investigation of design possibilities has taken place throughout the project with excellent justification and understanding of possibilities identified. |
| 6–8 | Design possibilities identified and explored, linked to a contextual challenge demonstrating a good understanding of the problems/opportunities.<br>A user/client has been identified that is mostly relevant to the contextual challenge and student has undertaken an investigation of their needs and wants, with a good explanation and justification of most aspects of these.<br>Detailed investigation into the work of others that has influenced ideas.<br>Good design focus and understanding of the impact on society including; economic and social effects.<br>Evidence of investigation of design possibilities at various stages in the project with good justification and understanding of possibilities identified. |
| 3–5 | Design possibilities identified and explored with some link to a contextual challenge demonstrating adequate understanding of the problems/ opportunities.<br>A user/client has been identified that is partially relevant to the contextual challenge. Student has undertaken an investigation of their needs and wants, with some explanation and justification of some aspects of these.<br>Some investigation into the work of others that has had some influence on their ideas.<br>Some design focus and understanding of the impact on society including; economic and social effects.<br>Investigation of design possibilities goes beyond the initial stages of the project but only some justification and understanding of possibilities identified. |
| 1–2 | Basic design possibilities identified. Link to a contextual challenge is unclear and student demonstrates only a limited understanding of the problems/ opportunities.<br>An attempt has been made to identify a user/client but is not be relevant to the contextual challenge. Student has undertaken a basic investigation of their needs and wants, but given little explanation and justification of these.<br>Basic investigation into the work of others that has not been used to inform their ideas.<br>Limited design focus and understanding of the impact on society including; economic and social effects.<br>Investigation of design possibilities only takes place in the initial stages of the project and there is very little justification and understanding of possibilities identified. |
| 0 | Nothing worthy of credit. |

### 4.4.4.2 Section B: Producing a design brief and specification (10 marks)

Based on conclusions from their investigations students will outline design possibilities by producing a design brief and design specification. Students should review both throughout the project.

| Mark band | Description |
|---|---|
| 9–10 | Comprehensive design brief which clearly justifies how they have considered their user/client's needs and wants and links directly to the context selected.<br><br>Comprehensive design specification with very high level of justification linking to the needs and wants of the client/user. Fully informs subsequent design stages. |
| 6–8 | Good design brief with an attempt to justify how they have considered most of their client's needs and wants and has clear links to the context selected.<br><br>Detailed design specification with good justification linking to the needs and wants of the client/user. Largely informs subsequent design stages. |
| 3–5 | Adequate design brief with some consideration of their client's needs and wants is evident, as is the relevance to the context selected.<br><br>Adequate design specification lacking some detail. Some justification linking to the needs and wants of the client/user. Informs subsequent design stages to some extent. |
| 1–2 | Basic design brief that contains only limited consideration of their client's needs and wants and has little or no relevance to the context selected.<br><br>Basic design specification has minimal detail. Limited justification linking to the needs and wants of the client/user. Very little influence on subsequent design stages. |

### 4.4.4.3 Section C: Generating design ideas (20 marks)

Students should explore a range of possible ideas linking to the contextual challenge selected. These design ideas should demonstrate flair and originality and students are encouraged to take risks with their designs. Students may wish to use a variety of techniques to communicate.

Students will not be awarded for the quantity of design ideas but how well their ideas address the contextual challenge selected. Students are encouraged to be imaginative in their approach by experimenting with different ideas and possibilities that avoid design fixation.

In the highest band students are expected to show some innovation by generating ideas that are different to the work of the majority of their peers or demonstrate new ways of improving existing solutions.

| Mark band | Description |
|---|---|
| 16–20 | Imaginative, creative and innovative ideas have been generated, fully avoiding design fixation and with full consideration of functionality, aesthetics and innovation.<br>Ideas have been generated, that take full account of on-going investigation that is both fully relevant and focused.<br>Extensive experimentation and excellent communication is evident, using a wide range of techniques.<br>Imaginative use of different design strategies for different purposes and as part of a fully integrated approach to designing. |
| 11–15 | Imaginative and creative ideas have been generated which mainly avoid design fixation and have adequate consideration of functionality, aesthetics and innovation.<br>Ideas have been generated, taking into account on-going investigation that is relevant and focused.<br>Good experimentation and communication is evident, using a wide range of techniques.<br>Effective use of different design strategies for different purposes as an approach to designing. |
| 6–10 | Imaginative ideas have been generated with a degree of design fixation and having some consideration of functionality, aesthetics and innovation.<br>Ideas have been generated that take some account of investigations carried out but may lack relevance and/or focus.<br>Experimentation is sufficient to generate a range of ideas. Communication is evident, using a range of techniques.<br>Different design strategies explored but only at a superficial level with the approach tending to be fairly narrow. |
| 1–5 | Basic ideas have been generated with clear design fixation and limited consideration of functionality, aesthetics and innovation.<br>Ideas generated taking little or no account of investigations carried out.<br>Basic experimentation and communication is evident, using a limited number of techniques.<br>Basic use of a single design strategy. |
| 0 | Nothing worthy of credit. |

### 4.4.4.4 Section D: Developing design ideas (20 marks)

Students will develop and refine design ideas. This may include, formal and informal 2D/3D drawing including CAD, systems and schematic diagrams, models and schedules. Students will develop at least one model, however marks will be awarded for the suitability of the model(s) and not the quantity produced.

Students will also select suitable materials and components communicating their decisions throughout the development process. Students are encouraged to reflect on their developed ideas by looking at their requirements; including how their designs meet the design specification. Part of this work will then feed into the development of a manufacturing specification providing sufficient accurate information for third party manufacture, using a range of appropriate methods, such as measured drawings, control programs, circuit diagrams, patterns, cutting or parts lists.

| Mark band | Description |
|---|---|
| 16–20 | Very detailed development work is evident, using a wide range of 2D/3D techniques (including CAD where appropriate) in order to develop a prototype.<br>Excellent modelling, using a wide variety of methods to test their design ideas, fully meeting all requirements.<br>Fully appropriate materials/components selected with extensive research into their working properties and availability.<br>Fully detailed manufacturing specification is produced with comprehensive justification to inform manufacture. |
| 11–15 | Good development work is evident, using a range of 2D/3D techniques (including CAD where appropriate) in order to develop a prototype.<br>Good modelling which uses a variety of methods to test their design ideas, largely meeting requirements.<br>Materials/components selected are mostly appropriate with good research into their working properties and availability.<br>Largely detailed manufacturing specification is produced with good justification to inform manufacture. |
| 6–10 | Development work is sufficient, using some 2D/3D techniques (including CAD where appropriate) in order to develop a prototype.<br>Modelling is sufficient, using a variety of methods to test their design ideas, meeting some requirements.<br>Materials/components selected with some research into their working properties and availability. Some of these may not be fully appropriate for purpose.<br>Adequate manufacturing specification contains sufficient detail with some justification to inform manufacture. |
| 1–5 | Basic development work is evident, using a limited range of 2D/3D techniques (including CAD where appropriate) in order to develop a prototype.<br>Modelling is basic, using a limited number of methods to test their design ideas meeting requirements only superficially.<br>Materials/components selected with minimal research into their working properties or availability and may not be fully fit for purpose.<br>Basic manufacturing specification that lacks detail and has minimal justification to inform manufacture. |
| 0 | Nothing worthy of credit. |

### 4.4.4.5 Section E: Realising design ideas (20 marks)

Students will work with a range of appropriate materials/components to produce prototypes that are accurate and within close tolerances. This will involve using specialist tools and equipment, which may include hand tools, machines or CAM/CNC. The prototypes will be constructed through a range of techniques, which may involve shaping, fabrication, construction and assembly. The prototypes will have suitable finish with functional and aesthetic qualities, where appropriate. Students will be awarded marks for the quality of their prototype(s) and how it addresses the design brief and design specification based on a contextual challenge.

| Mark band | Description |
|---|---|
| 16–20 | The correct tools, materials and equipment (including CAM where appropriate) have been consistently used or operated safely with an exceptionally high level of skill.<br>A high level of quality control is evident to ensure the prototype is accurate by consistently applying very close tolerances.<br>Prototype shows an exceptionally high level of making/finishing skills that are fully consistent and appropriate to the desired outcome.<br>An exceptionally high quality prototype that has the potential to be commercially viable has been produced and fully meets the needs of the client/user. |
| 11–15 | The correct tools, materials and equipment (including CAM where appropriate) have been used or operated safely with a good level, of skill.<br>Detailed quality control is evident to ensure the prototype is mostly accurate through partial application of tolerances.<br>Prototype shows a good level of making/finishing skills that are largely consistent and appropriate to the desired outcome.<br>A good quality prototype that may have potential to be commercially viable has been produced which mostly meets the needs of the client/user. |
| 6–10 | The correct tools, materials and equipment (including CAM where appropriate) have been used or operated safely with an adequate level of skill.<br>Some quality control is evident through measurement and testing.<br>Prototype shows an adequate level of making/finishing skills that are mostly appropriate to the desired outcome.<br>A prototype of sufficient quality has been produced that may have potential to be commercially viable, although further developments would be required, and only partially meets the needs of the client/user. |
| 1–5 | Tools, materials and equipment (including CAM where appropriate) have been used or operated safely at a basic level.<br>Basic quality control is evident through measurement only.<br>Prototype shows a basic level of making/finishing skills which may not be appropriate for the desired outcome.<br>A prototype of basic quality has been produced with little or no potential to be commercially viable and does not meet the needs of the client/user. |
| 0 | Nothing worthy of credit. |

### 4.4.4.6 Section F: Analysing and evaluating (20 marks)

Within this iterative design process students are expected to continuously analyse and evaluate their work, using their decisions to improve outcomes. This should include defining requirements, analysing the design brief and specifications along with the testing and evaluating of ideas produced during the generation and development stages. Their final prototype(s) will also undergo a range of tests on which the final evaluation will be formulated. This should include market testing and a detailed analysis of the prototype(s).

| Mark band | Description |
|---|---|
| 16–20 | Extensive evidence that various iterations are as a direct result of considerations linked to testing, analysis and evaluation of the prototype, including well considered feedback from third parties.<br><br>Comprehensive testing of all aspects of the final prototype against the design brief and specification. Fully detailed and justified reference is made to any modifications both proposed and undertaken.<br><br>Excellent ongoing analysis and evaluation evident throughout the project that clearly influences the design brief and the design and manufacturing specifications. |
| 11–15 | Good evidence that various iterations are as a result of considerations linked to testing, analysis and evaluation of the prototype, including some consideration of feedback from third parties.<br><br>Good testing of most aspects of the final prototype against the design brief and specification. Detailed reference is made to any modifications either proposed or undertaken.<br><br>Good analysis and evaluation at most stages of the project that influences the design brief and the design and manufacturing specifications. |
| 6–10 | Some evidence that various iterations are as a result of considerations linked to testing, analysis and evaluation of the prototype, including basic consideration of feedback from third parties.<br><br>Adequate testing of some aspects of the final prototype against the design brief and specification. Some reference is made to modifications either proposed or undertaken.<br><br>Adequate analysis and evaluation is present at some stages of the project but does not have sufficient influence on the design brief and the design and manufacturing specifications. |
| 1–5 | Limited evidence that various iterations are as a result of considerations linked to testing, analysis and evaluation of the prototype.<br><br>Basic testing of some aspects of the final prototype against the design brief and specification. Little reference is made to any modifications either proposed or undertaken.<br><br>Superficial analysis and evaluation. Little influence on the design brief and the design and manufacturing specifications. |
| 0 | Nothing worthy of credit. |