

**GCE**

**Design & Technology**

Advanced GCE **A2 H453**

Advanced Subsidiary GCE **AS H053**

**OCR Report to Centres June 2016**

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

OCR will not enter into any discussion or correspondence in connection with this report.

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# F521 Advanced Innovation Challenge

## General Comments

### Administration

Both examination papers should be dispatched to the appointed examiner in one package as soon as the reflection paper has been completed on the date set by OCR. Candidates must have access to their challenge work booklets during session 2; however, they are not to write in it.

Answers must be completed in the booklets provided, there is additional space in the challenge booklet should candidates require it; however, the use of this space should be labelled carefully with the box number that the work relates to. Additional supplementary sheets should be avoided if possible and additional paper of any kind should not be stuck into the challenge booklet. Where 'non examination board' paper is stuck into the challenge booklet it will not be marked, as stated on the front of the paper.

It is expected that inspirational materials, e.g. photographs of existing products are stuck into the booklet to aid designing; this material is brought in as part of the job bag. Candidates are not allowed to access the internet during this examination.

All materials relating to examinations sent from OCR to centres will be dispatched to the examinations officer. Examination notices must be displayed in the area where the examination is to take place and an invigilator, who is not the teacher should be present. The teacher is there to read the instructions.

Centres are reminded that the role of the teacher is that of a facilitator and not that of a normal classroom teacher. They are there to provide access to modelling materials, monitor health and safety issues and read the teacher script to candidates, elaborating and explaining where this is indicated.

Teachers must not:

- give advice to candidates about the design or manufacture of their product;
- cut materials to the correct shape or dimension for students.

It must be made clear to all candidates that this is an examination to assess their individual designing and modelling capability.

A number of candidates approached the challenge with pre-conceived ideas and failed to respond directly and creatively to the design challenges. A few candidates misinterpreted challenges, either because they did not read them with sufficient care or because they chose to base their work on practiced work to previous design challenges.

The themes for the examination deliberately give little opportunity to prepare specification points or ideas in advance of the examination to prevent over-preparation of candidates. Each challenge has two specific key areas that candidates will need to address fully with fresh innovative thinking to respond to the challenge.

It is the centres responsibility to provide a suitable range of modelling materials for candidates. It is not advisable for candidates to bring their own materials for modelling as this will hamper design thinking. A 'job bag' should contain inspirational materials, images and information about materials, anthropometrics that could be useful when designing. Candidates must not share resources or job bags during this examination.

The quality of photographs is generally good. Photographs must be stuck into the correct boxes in the booklet. It is important that the Centre provides colour images of a good quality, three photographs is the minimum required, although additional photos can be added to the workbook. This is particularly important if it is necessary to show other parts or views of an artefact or mechanisms to fully illustrate the final outcome. Extra photographs can be included in the evaluation or progress report boxes.

#### Security of Workbooks:

Centres are reminded of the importance of appropriate security of all workbooks between the three sessions of the Innovation Challenge.

#### Work of Candidates:

Again some highly creative work has been seen this session from candidates who have shown both design flair and sound technical knowledge. A significant part of the preparation for the exam should include techniques to allow the candidates to present ideas quickly and practice workbook completion under timed conditions. Examiners are aware of the pressure on candidates in this examination and marks are awarded with this in mind.

Areas such as specification, evaluation of ideas and final products and the reflection paper continue to discriminate well between candidates. In order to support centres further with their work on Advanced Innovation Challenge, further support materials have recently been added to the subject webpage.

<http://www.ocr.org.uk/qualifications/as-a-level-gce-design-and-technology-product-design-h053-h453/>

## **The Challenge Assignment Comments on Individual Challenges**

### **Challenge 1**

This was the most popular challenge. A number of candidates missed the need for their solution to be sensitive to the surroundings. Responses were varied and some were very creative, seating and sheltered areas tended to feature in most solutions.

### **Challenge 2**

This was also a popular challenge. A large proportion of candidates didn't fully consider the key aspect 'variety of different devices' in their initial thoughts. Many candidates considered using renewable energy sources.

### **Challenge 3**

There were very few responses to this challenge, some candidates presenting responses that didn't fully address the need for the product to be cooked and prepared on a stall.

### **Challenge 4**

There were a number of innovative responses for this challenge, with the temporary aspect being fully addressed.

### **Challenge 5**

This was also a popular challenge. A number of candidates designed products to store food rather than non-perishable goods.

### **Challenge 6**

This was also a popular challenge. Many candidates considered using renewable energy sources to power lighting or smart materials. Some innovative solutions were seen.

## **Comments on Challenge**

### **Initial Thoughts**

Candidates used a combination of text and drawings to explore the challenges and identified possible design areas/problems. Many candidates explored ideas in depth; thinking creatively, whilst considering the outdoor environment and town centre space they were designing for. A number of candidates did not fully engage with the challenges set, missing one or both of the two key points and so lost marks in this first section. Many candidates covered only one of the two key points in this section with candidates becoming focused very quickly on the one point. Those scoring highly explored the challenge widely, expressing their thoughts and expanding further on them.

Candidates should be encouraged to write clear and precise design briefs that develop the design challenge further and offer scope for creativity. The majority of candidates identified the appropriate user groups for their products.

The more successful specifications were where candidates concentrated on the functional and user needs of the product in the design situation/environment in which the product would be used and ensuring that the relevance of all points are explained.

Specific detail is required for high marks, e.g. weight, size and material properties. Specifications made up of vague or generic points or lacking justification for the points do not allow candidates to access the top mark band. Candidates should be advised to focus on functional aspects and users' needs when writing a specification.

### **Ideas**

This section has seen an encouraging improvement in terms of creativity and candidates are sketching a wide range of ideas. The quality of annotation seen was generally very good, with relevant notes given relating to the specification that offered construction and specific material detail.

There were excellent examples of innovative thinking in line with the ethos of the challenge. Higher performing candidates produced a range of functionally different ideas that clearly related to their specification, situation and the potential users. It was encouraging that fewer candidates just presented one idea in this section.

Higher performing candidates gave different views of objects or parts of objects and included specific detail of materials and manufacture/constructional techniques. This is an area that still needs developing, many candidates do not include details of specific materials and manufacturing techniques that could be used for the actual product.

An improvement was seen in the evaluation section in this session, with good evaluative annotation in the designing section. In many cases strengths of ideas are discussed with no mention of disadvantages.

References to sources of inspiration/job bag were usually given although not always with pictures. The better examples of evidence from job bags were where candidates had collected a very broad range of items and took their inspiration from unrelated inspirational objects.

Many candidates had a clear structure to present their feedback in box 10 showing comments/response/modifications. Clearly this is something that is influenced by good practice in coursework.

### **Development of Ideas**

Most candidates use notes or annotations to show how they are developing and improving their design towards an optimum solution that satisfies the specification and needs of their user.

Again only the most able candidates suggested specific materials and very few considered methods of manufacture for their developed idea. Materials were often generic e.g. wood, plastic or not appropriate for the design. It should be remembered that in this section the materials and construction are those that would be used for the product should it be manufactured commercially.

It is also expected in this section that the size of the product is considered. Dimensions of individual features, components and/or thicknesses of materials should be considered, user and in use sketches are encouraged to communicate size and functionality.

Candidates should be advised against modelling extensively at this stage of the challenge. Usually this is not successful because there is insufficient time in which to consider the practicalities of the real product.

### **Plan for Modelling**

Action plans were mixed, often these were very general and referred to ‘cutting out all pieces from the materials’ and similar vague statements. The best candidates produced detailed flow or block diagrams referring to individual parts of their model and how they will make their model considering equipment needed, some even allocating time to each stage.

### **Recording Progress and Modelling**

Many candidates are meeting the criteria in the middle band of marks – this is mainly due to two reasons; models that do not fully reflect the developed idea and poor reflection and recording sections.

Some candidates gave only brief statements in their progress reports with no real detail to show examiners what modifications/amendments or successes have been made. Candidates that provide little more than a cursory description of what they have done in the modelling are unable to reach the top band of marks for the progress report – reflection of modelling should be illustrated with sketches or photos and consider technical problems they have encountered highlighting how they have overcome these.

Most centres have a better understanding of the type of models required although many candidates concentrate exclusively on the aesthetics of their design ignoring any functional detail (e.g. folding mechanisms). Some candidates produce extra models to show how mechanisms/features work, this is to be encouraged.

There were some excellent examples of models – however, some candidates are still using inappropriate materials, hindering the success of the final model. The main point here is for candidates to use appropriate quick modelling materials to enable them to fully reflect their design. Candidates need to be able to develop their quicker modelling skills using a variety of materials. Colour is not important.

Creative use of common inexpensive materials is probably the easiest way for candidates to score well in this section. Kits should not be used for final models as it restricts the candidate’s ability to model their design accurately and skilfully; as does the use of existing products to form part of, or most of their model.

### **Evaluation**

Some improvement was seen this session for the evaluation section. Candidates who structure the section as ‘strengths and weaknesses’, ‘evaluation’ and ‘modifications’ usually achieve success in this section. However, many candidates fail to record further modifications in sufficient detail and some don’t indicate any possible weaknesses of their product. A very small number of candidates talked about their model and not the product so failed to score any marks. There also can be a tendency to repeat the specification rather than evaluating their product against their specification.

### **Reflection Paper**

It was pleasing to see more candidates producing more focused responses and addressing the bullet points; accessing the full mark range available. It is evident that the more successful candidates are planning their answers ensuring all bullet points are addressed in relation to the topic of the question. Not all candidates support the points fully with specific examples in reference to their product. Both questions were accessible to the majority of candidates and produced some excellent responses, however often the third bullet point on Q1 wasn't addressed fully.

#### **Q1.**

Modifications mostly centred around a change in materials – usually to recycled plastic, though rarely was any specific plastic named. There was very mixed understanding about the relative environmental value of the recycling of different materials, although some candidates discussed this well. Significant numbers of candidates mistakenly took LCA to mean the life-span of the product in terms of demand and decline rather than cradle to grave. Many candidates were able to suggest effective manufacturing processes that could improve the environmental impact of their product but this was the weaker aspect in some responses.

#### **Q2.**

The better responses were where candidates reflected on the built environment for which their product was intended and related it to architecture and materials. Most candidates were able to suggest aesthetic improvements though not then able to suggest suitable manufacturing methods for them; few candidates sketched their suggestion.

On both Q1 and Q2 the third bullet point was the most poorly answered parts. Unfortunately some candidates appeared to answer previous year's questions - responding to how modifications would affect the cost of the product and also how to modify the product to make it more inclusive or ergonomic rather than answering the specific questions set.

# F522 Product Study

## General Comments

As in the 2015 series Moderators found many examples of impressive work contained within the Product Study coursework. This was again seen in candidates submitting work with either e-portfolios or indeed on A3. However, whilst it is possible to achieve higher mark band outcomes with both approaches, most are received via the e-portfolio route due to the flexibility this affords students particularly in terms of interactive dialogue. USB memory sticks are becoming the norm due to their ease of manipulation for centres and moderators alike.

### E-portfolios- Good features/Issues to address

Many centres have embraced the requirement for interactive dialogue with a 'real time' and 'hands on' approach, being particularly evident in the 'product focus', 'strengths and weakness comparison' and 'testing sections'.

This feature however makes the most impact in the 'development of improvement section' where it is a **mandatory requirement** and often used as a feature of 'on-going evaluation', where candidates discuss and crucially respond to comments made by third parties.

Whilst interactive dialogue is a vital component there is absolutely no requirement for a presentation to have upwards of 15/20 videos embedded. We would not expect a centre to have more than ten and it can be counterproductive to have numerous videos on a single slide of a presentation. **They should always be compressed.**

Many centres provided a separate folder containing 'clearly labelled' videos, enabling most moderators to view all video files. It is preferable however that this facility is used as a backup as viewing videos in context is a far more valuable exercise.

Centres should be aware that unless work is required for archiving or awarding purposes then it is our intention to return all work at the end of the moderation series. It is worth noting that the use of a USB drive to send work is by far the preferred option, on behalf of the majority of centres and our moderators. This is quite simply the most time efficient route as well as being far more reliable, we urge centres to utilise these. Each candidate does not necessarily require a separate memory stick; a number can be added onto a single device if the file size is managed sensibly.

### A3 paper portfolios- Good features/ Issues to address

In particular, work in the 'creative and innovative ideas section' often provides free flowing; high quality annotated sketching.

Candidates submitting using paper folios also need to ensure that the **mandatory requirement** for interactive dialogue is met.

Several centres decided to print entire presentations that had obviously been compiled using PowerPoint, there is no need for this to happen as we are very happy having them sent via a USB drive.

## Key Points

The purpose of the moderation process is to ensure that centre assessments are in line with a common national standard. This is achieved by adjusting any centre assessment where the moderation process indicates that this is necessary based on the sample of work viewed. Centres receive a detailed report following moderation which identifies specific areas of the

assessment criteria which need attention, where applicable. In internally assessed units where the assessment contains many sections as in F522, erring on the side of generosity in the assessment of some areas can have a significant cumulative effect and result in overall marks which are over-assessed.

Centres need to remain objective in their internal assessment and assess candidate work against the published criteria, awarding marks as appropriate.

Most centres are now using the interactive CSF form which correctly totals candidate marks (we urge all centres to utilise this form as it avoids clerical errors that take a great deal of time to correct).

Centres of 20 candidates or less should send all candidates work to moderators at this point also.

Submitting this form electronically is efficient but does not remove the necessity for sending a copy of this form to the moderator. There are various versions of electronic MS1 forms used by centres.

Essential information should include:

- Centre name and number
- Candidates full name
- Candidate number
- Raw centre mark

### **Section by section guidance on Product Study requirements for Unit F522**

These comments are common to most series and are added to when moderators raise additional issues for attention.

This Product Study should take candidates 30 hours to earn up to 120 marks.

### **Product focus and analysis (8) (2 x A3/PP)**

Products can be selected from any of 8 different focus areas:

- Built Environment and construction, Engineering, Food, Graphic Products, Manufacturing, Resistant Materials, Systems and Control, Textiles.

For marks in the top band all of the following should be addressed:

- Detailed description of the intended purpose of one single selected named product (not a range).
- Key Criteria used in the design of the product.
- The needs of the manufacturer.
- The needs of the consumer.

Where all four of the above have not been covered the centre should consider awarding marks in the lower bands.

It is really pleasing to see that very few candidates are still considering generic groups of products. The first page of the candidate product study should state quite clearly what **specific, single named product** has been selected for analysis.

Candidates who do not present real time evidence should not be marked in the top band.

**On-going comments from Moderators:**

- A wide range of interesting products chosen.
- The section relating to manufacturers needs is still the weakest area in this section. Points raised are often very generic.
- Many centres are showing the product in use with candidates clearly accessing the product first hand and evidenced with the use of video.

**Strengths and weaknesses comparison (12) (2x A3/PP)**

Candidates should be encouraged to analyse the strengths and weaknesses of their chosen *product in comparison* with similar products. Good responses often include a conclusion or summary, which relates similar products back to the single selected named product. Weaker responses often include charts and tables populated with internet images with no identification of the strengths and weaknesses of the selected product. Candidates should be encouraged to show evidence of actually using a range of products, which are compared with the selected product. For marks in the top band the following should be addressed: function, suitability of materials and manufacturing processes, ergonomics, aesthetics and cost.

**On-going comments from Moderators:**

- Candidates are not comparing a range of products against the original. It is not obvious which one is the best product or indeed which comparative product has superior elements such as ergonomics or function.
- Limited conclusions drawn.
- There is good evidence of a 'hands on' approach to this section including the use of video.
- Candidates simply state the strengths and weaknesses of similar products with no comparison to the original.
- Table format still being used by some centres. Some candidates however had made these interactive by the embedding of videos in the charts. This is an excellent feature to be encouraged.
- Lower achieving candidates are still relying on internet images/information.

**Moral Implications (8) (1 x A3/PP)**

Identify and analyse the moral implications associated with environmental, social and economic issues in the design and use of the product.

Moral implications should be considered in relation to the design and use of the product chosen for study:

The clear emphasis of this section is now on the moral implications associated with three specific issues. Centres need to prepare candidates for this by organising and structuring ethical debates about the environment, social cultures and economic issues.

A wider debate about the effects of the global economy and exploitation of workers is required.

This section has traditionally been poorly addressed in many cases and moderators often find this section to be over-assessed by centres. However we have seen a good number of exceptional approaches from Centres who have clearly used this section as a teaching opportunity to underpin the Core Knowledge taught component. Centres may wish to consider inviting staff from 'critical thinking' or business departments to facilitate discussions, or inviting visiting speakers.

**On-going comments from Moderators:**

- Many centres are not presenting a good response to this section and are content to award marks in the middle band for mediocre work that has little value in terms of learning.
- There are still cases where centres award top band marks for 'middle band thinking'.
- Some Candidates have undertaken research and as a result presented exceptionally well-informed work.
- In some cases where top band marks are inappropriately awarded it can result in an adjustment to centres marks for the whole cohort for the unit.
- The ethical consideration of moral implications needs to be integrated into the AS course – it contributes to other areas of study very well indeed.

**Brief and specification for improving the product (8) (1 x A3/PP)**

The design brief presented should relate to improving the single selected chosen product in some way. Centres should award marks in the lower bands where an improvement is not identified, or where the proposal is to redesign a complete product. Moderators still report that some candidates are still trying to improve too many aspects of their selected product.

- Proposals to redesign a complete new product should always be marked in the lower bands

Specifications need to be detailed and justified, resulting from the objective analysis of the original product. Where there is little or no justification centres should award marks in the lower bands. It can help if the justification for each specification point is clearly identified by using a different font size, style or colour- better candidates often use this technique, and it would help candidates in the middle and lower bands.

**On-going comments from Moderators:**

- The majority of candidates identified an improvement or in many cases a number of improvements.
- The specification is generally well attempted with strong links to their product focus.
- Many focused on ergonomic improvements.
- Colour code, italics and tables were used to good effect.
- This section is generally marked accurately by centres.

**Development of improvement (56) (10 x A3/PP)**

This section relies on the integration of three separate requirements for successful completion. There is a very large allocation of marks for this assessment criterion; this is deliberate as it was considered during the development of this unit that this is where the majority of candidates would choose to spend their time and energies. As there will be varying approaches to this section appropriate to different focus areas, it might be helpful to consider that the expectation in relation the notional guideline of 4 marks per hour means that candidates should devote 14 hours to this section.

**56 marks is a very large allocation to accurately apportion in three mark bands and in the past centres found this difficult.** The 56 marks are broken down into three sections as identified below. Additional advice is also given on CSF F522 form to award marks in different bands within each section. This interactive mark sheet is available on the OCR web site. Please ensure this form is used as it enables marks to be appropriately awarded and cuts down clerical and addition errors. Please note that only the interactive form automatically adds up candidate marks.

**Present a wide range of innovative/creative initial ideas, which demonstrate a high level of development using high quality annotated sketching, real time digital images and interactive dialogue. (14 marks)**

*The expectation here, for marks in the top band, is that a wide range of innovative/creative initial ideas are presented which demonstrate a high level of development using high quality annotated sketching. Simplistic sketches with little or no annotation should be awarded marks in the lower band.*

**Integrate this with real time evidence of a wide range of appropriate prototype models. (36 marks)**

Moderators again reported some very high quality models were presented using a range of modelling materials. Moderators, however pointed out that there are still a limited number of centres concentrating on producing one high quality single prototype. This may produce a high quality outcome but will not access the full range of marks available for the development of a wide range of appropriate prototypes.

**Evaluate ideas against the specification in real time and justify the choice of one idea worthy of being taken forward. (6 marks)**

It is important that Candidates evaluate their ideas against the specification and clearly justify decisions made. Where little reference is made to the specification, centres should award marks in the lower band. No marks at all should be awarded where there is no reference to the specification. Centres should note that it is impossible for candidates to access these marks if the original specification is missing. Zero for the specification automatically results in zero for the evaluation against it.

Where candidates choose to annotate their ideas sheets, they must make it clear which specification points are being cross-referenced. Colour highlighting can help in this respect. Better candidates clearly rationalise the choice of one idea to be further developed. Interactive dialogue is **mandatory** in the development section, and this can be best addressed by on-going evaluation, which seeks the views of others and then provides evidence of responding to points raised.

**On-going comments from Moderators:**

- For this specification, for all focus areas, there is a need for presenting innovative and creative ideas, which are annotated.
- In a small number of submissions there was no evidence at all of any annotated design sketches; where no work is being presented, no marks should be awarded.
- The use of 'interactive dialogue' is **mandatory** in the development section – real time comments from third parties should be an essential feature.
- For this specification centres should encourage the use of on-going evaluation on the candidate ideas sheets.
- CAD is making a significant contribution within this section and is very useful indeed. It is not a substitute for sketching – which remains part of the specification.

- ‘We still need to see developed annotated sketching’ – ‘marking of this is too high.’ ‘Often marks are awarded in the top band for work of limited quality’.
- Many centres clearly use this section to prepare candidates for the Innovation Challenge examination and we are seeing some excellent modelling as a result.
- Some evidence of on-going evaluation through annotation, video and audio.
- Good use of CAM modelling and 3D printing

### **Testing of final developed idea (12) (2 x A3/PP)**

There is no requirement to make a test rig, though candidates can if they want to. Any appropriate method or system to formally test and evaluate the final developed idea will meet this requirement. Testing must be formally planned and implemented. Appropriate tests might include using a product or getting others to use it, wearing it or getting others to wear it or eating it. A scientific or technical test could also be appropriate for some focus areas. Whichever method is thought by the candidate to be appropriate, there must be formally presented results. The results should be presented in real time, clearly and concisely.

### **On-going comments from Moderators**

- Centres should make candidates aware of the need to plan as well as carry out testing; this feature is often omitted and leads to moderation adjustments. In general if no planning is evident marks should not be awarded in the top band.
- Some excellent examples of testing by outside agencies related to the chosen product.
- Videos used well by centres using PowerPoint in this section.
- Testing is much improved with products often tested in their working environment by a third party.
- Appropriate testing is open to interpretation but many centres are awarding marks for limited testing – a questionnaire to friends seems to be the order of the day for many but would they actually be the user group?
- Centres need to critically analyse what is appropriate for candidates working at this level - if simplistic questionnaires are rewarded with high marks, mark reductions are likely.
- There continues to be plenty of examples of ‘anonymous’ comments and questionnaires being given high marks. Blank questionnaires should be avoided!
- Testing should be ‘rigorous and objective’. This is particularly relevant to marks awarded in the high band. Some excellent examples of testing by outside agencies related to the chosen product.

**Produce a summary of the results of the product development with detailed analysis of how the prototypes and final tests contributed to establishing the validity of the chosen idea.**

### **Present one further improvement in detail. (8) (2 x A3/PP)**

In addition to the presentation of the final test results, candidates should summarise the results of their prototyping and suggest **one** further possible improvement to the product. There are three distinct sections to this assessment criterion. For marks in the top band, all three areas need to be considered. Better candidates show a clear annotated sketch of a further improvement. Analysis of results is also a more complex matter than simply stating results in a table.

### **On-going comments from Moderators:**

- Some candidates completed a separate section as a conclusion; others relied on the summary produced during the development section.

- Centres are awarding high marks in this section without candidates addressing all three aspects.
- Many centres are awarding marks just for the analysis of the testing - this section requires a broad look back at the whole process of development.
- This section has three distinct requirements which should all be present in a discrete summary section.

### Communication (8 marks)

**Use a wide range of high quality text, graphical techniques, digital technology, and interactive dialogue as appropriate to present information. (8 marks All 20 A3 sheets/PP slides)**

The use of ICT must be included in the range of communication techniques used in the presentation of the folder; an over-dependence on the use of ICT/CAD should however be avoided. A combination of different approaches is to be encouraged.

### Candidates presenting on CD/USB still need to provide evidence of annotated sketching.

- For this specification the use of 'real time digital images' **is mandatory** - they have to be used to record evidence of work as it actually happens.
- If the preferred option is to continue to use a paper portfolio, digital photographs must be used and interactive dialogue must be presented in alternative forms which show a positive response to the first-hand opinions of others. Overlay sheets could provide an opportunity for comment without affecting the quality of candidate presentation. Comments should not be retrospective and re-typing should be avoided.
- Communication in this specification relates to the whole product study.
- Candidates should not over-enhance the background of design sheets.
- The use of Arial 10pt (min) should be encouraged for PowerPoint presentations – this is widely available and does not corrupt.
- The overall ethos for this specification is based on 'real time recording' of events as they actually happen. The expectation was that the majority of centres would submit projects as e-portfolios - this remains the preferred option.

### Ongoing comments from Moderators

- The vast majority of folders were well organised and matched the layout of the mark scheme.
- Many cases of imaginative use of digital technology and some interactive dialogue. Centres should be encouraged to use digital technology to enhance the quality of the candidates work.
- Centres should be encouraged to develop e-portfolios at the earliest opportunity.
- Some candidates are still spending a considerable amount of time detailing the manufacture of models- there are **no marks** for this.
- This series the majority of presentations were through e-portfolios on USB drives

### Summary of Main features for Unit F522

- The ethos of the unit remains - **A single specific named** product is selected and shown in use - a detailed description of the product is given together with needs of manufacturer and consumer. Key criteria are identified. Throughout the study an identified improvement is developed, tested and evaluated.
- A 'real time' digital image of the selected product in use will be an essential feature.
- Products for analysis can be selected from any of 8 different focus areas:

- Built Environment and construction, Engineering, Food, Graphic Products, Manufacturing, Resistant Materials, Systems and Control, Textiles.
- Work can be presented on 20/25 sheets/slides of A3 paper or USB to current OCR approved standard. (currently PP)
- Please use Arial font at least 10pt- this is widely available -can be read easily -does not corrupt.
- If video clips are used, 3-5 of no more than 20 seconds each would be appropriate. Make sure they work from a USB on an independent stand-alone laptop.
- A candidate must submit either an A3 paper folder or an individual USB not both.
- A centre can submit some candidates' work as A3 paper folders and some as USB.
- Centre and candidate name and number must be on all paper and individual USB.
- Work must be recorded in real time and digital technologies must be used.
- Centres and candidates should note that creative/innovative ideas should be presented through a wide range of high quality annotated sketching.
- It is important that all focus areas are responded to with presentation of an appropriate range of prototyped developments.
- One single 'final prototype' is not within the overall ethos of the specification
- The requirement to make a test rig is no longer necessary. This has been replaced with the need to plan and implement an appropriate test on the final developed idea. It is, however, still possible to submit one if it is considered an appropriate test.
- Communication skills should include the use of digital technology. Interactive dialogue candidates who fail to use these techniques should be marked in the lower bands.
- Interactive dialogue involves discussing the selected product/comparative products/prototype development/on-going evaluation and testing with others and responding to suggestions made. It could be used in other sections – evidence of interaction should be recorded in real time with the active comments of those involved recorded first hand and not retrospectively. Re-typing of genuine first hand comments is totally counterproductive and should be avoided.
- As a backup only an additional folder can be submitted containing all videos used in the presentation (only one final copy of each)
- Serious consideration should be given by the centre to the file size of some presentations. Complex presentations, which take a long time to load, are counterproductive. The use of a USB key will save a great deal of time on the part of the Centre and our Moderator's.

## F523 Design, Make and Evaluate

### General Comments

Candidates mostly identified genuine needs and opportunities for their coursework and there was an interesting range of project choices in a range of material specialisms. Candidates with genuine clients or named contacts within their target market, and those with topics outside their own interests, tended to adopt a focused approach throughout and were able to access high marks. Regular contact with clients and potential users throughout the coursework, to obtain comments and feedback on the designs as they are developed and refined, is recommended.

Coursework titles chosen by candidates were suitable for the requirements of the examination, and there were adequate opportunities for them to be innovative and creative in the designing and making tasks.

Overall, projects were sensibly scaled, and there was a wide variation in complexity and sophistication. This year there were many 'simple and straightforward' projects that did not contain sufficient difficulty and demand to support the marks submitted by Centres. Simpler projects need a greater depth of approach to attain the same marks as those more sophisticated and intellectually challenging, particularly in key sections such as 4a: Design, Design Development and Making.

A number of candidates chose architecture-based projects where the final outcome was a model rather than a working prototype product. The design of a building is specialist and technical, and where a model is the sole outcome, significantly greater depth of approach and higher level skills are required for candidates to access high marks in Sections 4a and 5.

Responses to the assessment criteria often did not relate directly to the specific project, and generic responses were common. The focus and relevant detail required at Advanced Level were often not present, and Centres' assessments were found to be lenient in these respects, and marks in the lower bands were more appropriate when responses were compared to the nationally agreed standard.

Reference by candidates to the commercial and marketing aspects of design and manufacture is important throughout all sections of the project. Where candidates had included relevant and specific details they were able to score highly.

The strongest section of the folders was often Section 4a, with candidates showing evidence of enthusiasm and creativity. Many did not get far beyond superficial thinking, however, showing little real evidence of design development after analysis and synthesis of initial thoughts. There was often quite a jump from outline concept ideas to the final solution. More able candidates showed a clear progression from concept to final idea using physical and digital modelling and the opinions of others to refine ideas and progress to their solution with increasing detail.

Rapid prototyping and 3D printing was used widely, and this added enhancement to both designing and making processes, adding a level of functionality and commercial potential that would be difficult to achieve by conventional methods (e.g. bespoke clips, fastenings and furniture fittings). At the highest level, candidates accompanied their use of 3D printing with wider industrial practice, revisiting and improving their designs with the aid of feedback from clients and users. This method of progressive refinement towards highly fit-for-purpose design solutions will be appropriate to the iterative design process that forms a key part of the GCE Advanced Level specifications to be taught from 2017.

Skills in a wide range of ICT, CAD and CAM applications were seen, including Photoshop, Laser cutters and CNC routers. Some candidates were able to present a highly professional standard of work. Although CAD working drawings or details of the final design are not specifically mentioned in the Assessment Criteria, they are standard commercial practice and are therefore expected if high marks are to be supported. 3D CAD images were sometimes included as working drawings, but these mostly did not include the technical detail required for manufacture.

Sections 5, 6 and 7 are important sections following the making of the final working prototype. Candidates often allowed insufficient time to adequately address the requirements of these sections.

A small number of Centres submitted their coursework as paper portfolios. E-portfolios enabled candidates to include audio and video recordings including CAD animations and stress-analysis simulations, and generally worked very well. A significant number of e-portfolios had problems with videos not playing directly from the PowerPoint, and some took a considerable amount of time to open. Centres are recommended to send a separate folder with video files and also to reduce the PowerPoint file size. Submission of all candidates' e-portfolios on a single USB memory stick per Centre is now the recommended method of submission for moderation, although submissions in paper or CD/DVD format remain acceptable. A common problem again this year was the use of small font sizes or coloured text on a coloured or patterned background, making reading the text extremely difficult.

Most Centres sent their candidates' work by the due date, enabling moderation to proceed promptly. The process of moderation was delayed in some cases due to incomplete or incorrect documentation, late delivery of coursework, and open or damaged parcels. A large number of portfolios (paper and electronic) were not clearly and securely identified with Centre and candidate names and numbers. Many Centres are still using the old mark grid for Section 4a. The mark bands and descriptors for Section 4a were revised in 2014, and the new mark grid should now be used.

## Comments on Individual Sections

### 1 DESIGN BRIEF 3 marks

#### Present a design brief for a marketable product

Four key areas need to be addressed in this section for maximum marks to be possible:

- Details of the CLIENT and the CONTEXT – the target market / named client, the specific users and stakeholders, situation, the problems, the needs...
- A clear and precise BRIEF - what the candidate will design and make.
- Clear reference to MARKETING - the important aspects of design and manufacture if the product is to be marketable. What will the product need to be for people to want to buy it?
- Reference to KEY ISSUES – the crucial / critical parts of the designing if it is to be successful.

The marking of this section tended to be lenient when compared with the nationally agreed standard, where one or more of these key areas had not been targeted.

Responses continue to improve in this section, with a common shortcoming being the misunderstanding of the 'marketing' aspect. Many candidates explained how the product would be marketed rather than explaining the features and qualities the product would need to ensure that it was an item people would want to purchase.

Many candidates showed evidence of contact with their clients and target users at this crucial initial stage. This enabled them to follow through into section 2 to gain more focussed and specific information about their requirements, in section 4a to receive on-going feedback throughout the designing and development stages, and then to obtain evaluative comments on the final prototype product in section 5.

## **2 INFORMATION, INSPIRATION and INFLUENCES 9 marks**

### **Obtain information relevant to the design of the product**

#### **Present a range of evidence to show the sources of inspiration and influences on the designing**

There were some excellent responses in this section that included first-hand information and experiences. Those candidates presenting concise, meaningful and authentic research, that was carefully edited and directly relevant to their own project and from both primary and secondary sources, were able to score highly. High marks could not be supported where there was no primary research or 'direct-contact' investigation.

For marks to enter the top mark band (7-9 marks) in this section, there must be clear evidence of:

- direct personal contact (person to person) with a client or representation of the target market
- AND/OR
- direct personal contact with existing / similar physical products

This session Moderators reported many excessive responses in this section. Quantity is not a substitute for quality, detail and relevance. There tended to be an over-reliance on the use of the internet and this often resulted in shallow and generic responses that were of limited value and which could not meet high marks submitted by the Centre

Mood boards were common and, where they were suitably annotated and technical details included, contributed to the designing.

Candidates who included relevant quantitative and technical data such as measurements, capacities, weights, and timings provided important data for future sections, and were able to score well. It was not possible to support high marks for large amounts of 'generic' or 'standard' research (for example 'anthropometric data', materials theory), which were often included without any analysis that related it to the project.

In general, Centres' assessments were lenient when compared with the nationally agreed standard.

## **3 DESIGN SPECIFICATION 3 marks**

### **Produce a design specification for the product**

Centres' assessments in this section tended to be lenient when compared with the nationally agreed standard.

Design Specifications were generally well structured and presented clearly, many using appropriate headings. Specific performance targets that would be useful when evaluating and testing designs and products were included in good responses. Unsupported and generic statements that could be inserted into any folio such as '*must not be heavy*', '*must be aesthetically pleasing*', '*should be cheap to buy*' and '*must be safe to use*' were of little value.

Several candidates had involved their client or a representative of the target market in formulating the specification and also obtaining their signature to formally approve the list of design requirements. This had a clear benefit in improving the quality and value of responses.

For marks in the middle and higher mark bands to be supported, specification points must be specifically related to the specific product being designed. For maximum marks to be submitted in this section, the Specification should include a range of relevant numerical / technical requirements, such as life span, capacities, weights, sizes (max / min / range of adjustments, positions), quantities and costs. Measurable targets are crucial to provide a framework for on-going evaluation during the design development, and also in the testing and evaluation of the final product. Where the Design Specification did not contain an appropriate level of specific

detail, this had a clear impact on the marks possible in Section 5 where the Design Specification has a key role in the testing and evaluation of the final product against the original requirements.

#### **4a DESIGN, DESIGN DEVELOPMENT and MAKING 57 marks**

**Demonstrate competence in the design, design development and making of the product, to include the following package of evidence:**

- the generation and exploration of design possibilities
- the use of digital technologies
- experimenting and modelling
- the refining and defining of a final design through on-going evaluation, and
- the planning and making of the product

The package of evidence of the candidates work in this section should include evidence against all five key strands listed above.

Many candidates submitted high quality work, with the best responses adopting an integrated approach with sketches, drawings, diagrams, CAD visualisations, models, experiments and trials presented as they took place in chronological order with clear progression to a final design solution. A key influence on the usability and fitness for purpose of the final outcomes was the involvement of stakeholders including clients and users throughout the process.

A formulaic approach was often evident with lower ability candidates, addressing the five strands in a more segregated way.

The level of 'intellectual challenge' and 'design thinking' involved in the designing and making varied considerably, and this should be reflected in Centres' assessments. Centres' marking was often lenient where there was insufficient depth, difficulty and complexity to meet the marks submitted when compared with the nationally agreed standard. In many cases, further stages of development and refinement to the final design or manufactured outcome would have helped the quality of response to meet the high marks submitted by Centres.

An appropriate level of complexity and refinement at this Advanced level was found where candidates had incorporated articulation or movement in their designs and practical outcomes ('static' items do not require the same level of skill in designing and making). Other areas through which candidates were able to demonstrate higher level skills and give access to higher marks included the use of features to enable flat-pack and adjustment, also folding mechanisms, interchangeable parts, complex assemblies / manufacturing techniques, stacking facility, and opening / closing / sliding features.

- **the generation and exploration of design possibilities**

Creative and innovative designing was evident from a good number of candidates, with lateral thinking and systematic and strategic design methods able to access high marks. The influence of the OCR's Advanced Innovation Challenge, part of the AS Product Design course, was evident in many cases.

Some responses showed little creative thinking or meaningful exploration of alternatives and were based on standard readily available designs. Poor quality sketching and untidy presentation was sometimes over-rewarded.

The words 'exploration', 'experimenting', and 'refining' in the assessment criteria clearly imply that a good number of alternatives, options, and choices will need to be considered and/or developed if high marks are to be attained. Many candidates would benefit from greater consideration of the technical and constructional aspects of their designs to meet the Centres' assessments.

In the best responses, candidates reflected commercial practice by including marketing aspects in their design thinking from the start, incorporating features relating to lifestyle and fashion, product identity and branding, styling and logos. Also considerations of important aspects such as adaptability, compactness, ease of use, maintenance, and standardisation of components. This approach is entirely correct and is encouraged - both the final product designs and the marks that could be confirmed were improved by such approaches.

- **the use of digital technologies**

Digital technology such as photography, scanning, CAD, and videos was widely used. Various forms of CAM were often used in the modelling and making processes, with candidates usually presenting appropriate evidence to support the Centre assessments. There was an increase in the use of image manipulation software (such as Photoshop), animations and stress analysis tools within CAD software, and this helped to support high marks in some cases.

The use of digital technology by some candidates was very high indeed. There was excellent use of CAD programs such as SolidWorks, Autodesk Inventor, CREO, ProEngineer and SketchUp which were effectively used as development and design refinement tools in addition to being used to visualise ideas. Almost all candidates had used 2D Design software, although some were unable to utilise many of its features when using this program to produce working drawings.

There is a difference in complexity between 2D CAD and 3D CAD programs and this should be reflected in the marks submitted in this section. Similarly, there is a difference in the level of skill involved in designing and making using a 2D laser cutter or vinyl cutter and designing and making using a 3 or 4 axis CNC router. The marks submitted by Centres should reflect this difference in complexity.

- **experimenting and modelling**

For many candidates the modelling and experimenting was a key part of the design process where there was genuine exploration, testing of design concepts and possibilities including mechanisms and construction, and positive development of their design thinking, often with client and user feedback. The best responses showed candidates making refinements, adding details, and making further models and mock-ups to improve and progress their design to meet user requirements, often benefitting from the use of full scale modelling to determine ergonomic, dimensional and functional suitability. In such cases, moderators were able to support high marks submitted by the Centre.

For some, the modelling lacked purpose and value, with modelling satisfying the assessment requirement but not serving to inform the design development. In such cases, the marks were often generous and could not be agreed by the moderator.

- **the refining and defining of a final design through on-going evaluation**

The majority of Centres' assessments in this section were lenient when compared with the nationally agreed standard. This was one of the weakest strands in Section 4a for most candidates, where greater attention to technical aspects and details in the refining and defining stage of design development was needed to support Centres' marks. Details of dimensions, materials, construction, ingredients, components, and fittings, were crucial to access higher marks.

Annotation of design possibilities was often descriptive, with features being labelled rather than being evaluated against the key requirements in the Design Specification. Formal charts entitled 'Evaluation of ideas against the Specification' were common, and these were less effective than spontaneous annotation added in 'real time' around design sketches, CAD images, and photographs of models. Many candidates gave scores out of ten, or ticks against a list of specification points, for their ideas and designs. While this method of quantitative evaluation provided an order of suitability of developed ideas, the most crucial design aspects and features were usually not appropriately weighted and considered in the depth required to support high marks, and in these cases the views of users were usually not considered.

Many candidates used only their own evaluative comments, with fellow student views in some cases. Evidence of structured and thorough client / target market input was invariably valuable when taken seriously.

The use of suitable CAD software to produce a clear definition of the final design solution is expected at this level as a clear and necessary mirror of industrial practice. Pencil-drawn working drawings were common this session, and in these cases candidates were able to score low marks only. Many candidates started to make the final product prototype without fully defining the final design. This was particularly evident in Textiles projects and some Graphic Products (architectural) projects.

As a constructive guide to Centres when making future assessments in this strand - the evidence of competence of candidates should be considered against the three key requirements:

- **Refining**

- by evaluating, by obtaining feedback and advice from users / clients?
- by testing possible modifications?
- by incorporating additional features?
- by changing aspects of the design?
- What is the overall level of detail?
- Is there evidence of in-depth consideration of the various components of the design, such as the ranges, types, and sizes of fittings and fastenings?

- **Defining**

- The use of appropriate CAD software to produce 'working drawings' is expected for all material focus areas. (Print-ready images in Graphic Products and Lay Plans in Textiles)
- Final designs should be sufficiently detailed for third party manufacture without further guidance (i.e. fully dimensioned and cutting lists)
- Do the drawings or manufacturing specification include technical details and sizes of all components and of all joining methods?
- If the solution is not defined clearly using CAD software (i.e. pencil/pen drawings are presented), a mark in the lower bands is appropriate.

- **Ongoing evaluation**

- Is the annotation descriptive or evaluative?
- Progression is a key word here - has the design benefitted (changed and developed) as a result of on-going evaluation?
- Regular consultations (in person, authentic) with the client, target market, or potential users are important, against the Design Specification. Personal, direct contact with the client / target market / potential users is required for marks to be supported in the highest bands.
- Reference to the Design Specification is required (specific performance, functional and measured).

- **the planning and making of the product**

Most folios included some evidence of 'planning' but this was often more of a retrospective log or diary of making where the 'planning' was a record of what had already happened. Responses were often superficial, including few points of real value, such as 'Go to the machine', and 'Use the knife carefully to cut the material'. The identification of the major stages of the making to show that a logical process and priorities have been established in advance is required, including key stages to ensure a fit-for purpose outcome.

The production of the final outcome showed a large variation in the level of demand of the making tasks. There was wide use of CAM and 3D printing, and also a number of textiles projects using sublimation printing.

It is crucial that the level of difficulty and complexity involved is reflected in Centres' assessments for this strand. High marks were often submitted for well finished but undemanding products, and in general, Centres' marking tended to be lenient when compared with the nationally agreed standard. Where a narrow range / depth of skills has been involved, or if the outcome is largely 'static', marks in the lower bands should be given for this strand

In many cases, a further stage or stages of design refinement or the practical modification of one or more aspects of the final outcome by the candidate would have potentially enabled the Centres' marks to be confirmed. Centres are recommended to adopt such further stages of refinement with their candidates as part of their preparation for the iterative design process to be adopted in the revised Specifications to be taught from 2017.

#### **4b INNOVATION 15 marks**

##### **Show innovation**

Centres' assessments were agreed by moderators in many cases. On the whole, candidates embraced this aspect and explored a broad and creative range of alternative designs and manufacturing options, and Centres allocated marks accordingly.

In some cases, Centres had submitted a mark in the top mark band, alongside marks in lower bands in most other sections of this Unit. Although this is not an impossible scenario, only in rare cases might high marks be justified in this section alongside much lower marks in other sections. Marks are normally expected to be '*proportionate*' or '*equivalent*' to marks in other sections, in particular section 4a. To clarify this means that, under normal circumstances, if the mark for section 4a is in one of the middle mark bands, a mark in the middle band in section 4b is likely to be the most appropriate. An assessment of the innovation shown will be influenced by the overall complexity, challenge, and level of difficulty involved in the project as a whole.

A few Centres had prompted candidates to produce specific information about how and where they had shown innovation, and to point specifically to evidence in the folder. This approach is encouraged as a positive means of supporting the Centre's mark in this section.

#### **5 TESTING and INDEPENDENT EVALUATION of the FINAL PRODUCT 9 marks**

##### **Show evidence of the testing of the final product against the specification**

##### **Identify and state strengths and weaknesses in the product**

##### **Respond to independent evaluation**

Centres' assessments in this section tended to be lenient when compared with the nationally agreed standard.

There are three clearly stated requirements for candidates' responses if they are to satisfy the assessment objective. For the highest mark to be submitted, all three elements need to be covered thoroughly and in depth. Moderators were able to confirm high marks submitted by the Centre where candidates had clearly addressed all three requirements.

Aspects completed successfully by candidates included suggested modifications to the prototype product as a response to testing and evaluation. Responses included some excellent drawings and CAD images of proposed improvements. These were sometimes misplaced in Section 7, which refers to the future developments of the product in a wider more commercial market.

Key elements to be included for high marks are:

- Systematic and rigorous testing

- Actual testing in the intended location by the intended user.
- Qualitative and quantitative test results with technical data, relating the various aspects of the product to the specification
- Numerical and measurable requirements in Section 3 giving potential for higher attainment in this section.
- A list clearly stating strengths and weaknesses, with modifications to the product identified and described with sketches/diagrams.
- Authentic and formally recorded comments from an '*independent*' expert person or user group (to be 'independent' this person or group should not be associated with the candidate, school or project). Video clips are ideal evidence here.

Common shortcomings in this section, resulting in moderators often being unable to confirm Centres' assessments include:

- Written comments on visual evaluation without proper physical testing of the final product.
- Strengths and weaknesses in the product not identified and stated clearly
- Lack of clear evidence that those evaluating and testing the product had actually been in physical contact with the product.
- Evaluation by a truly independent person or group was missing.

## **6 MARKETING PRESENTATION 15 marks**

### **Using appropriate techniques create a marketing presentation suitable for the final product**

A good number of candidates gave a thorough, insightful analysis of how the marketing of their product might be structured from a strategic point of view, with thought through and well-prepared examples of promotional materials, designs for packaging, and video marketing presentations. It was evident that time management was a problem for some and as a result this section was often very rushed. Many candidates presented generic 'marketing theory' with little clear and specific relevance to the product they had designed.

Company or product logos and brand identities had been developed in most cases, with some creative and innovative designs and suggestions for these important marketing elements. Details for packaging & instructions were included less often. Many worked-through examples consisted of images of well-known retailers' websites copied and pasted from the internet with an image of the candidate's final product copied and pasted onto it, then details of the product added with a selling price. Higher ability candidates had developed aspects of a real-life / working website with various web pages and links.

The suggestion of roadside posters for advertising was widespread, with candidates copying and pasting an image of their product onto a downloaded image. Such 'public' sites for advertising were often inappropriate for specialist products not normally marketed to the general public. To support marks in the higher band, part of the strategic marketing analysis should include full details and explanation of the placement of suitable promotional materials.

Candidates who gave a presentation to groups of students and staff found this effective as part of their consideration of the many and varied aspects of marketing.

Overall there was a large amount of generic content in this section that was not expressly related or directly relevant to the specific product and its intended market. The majority of responses warranted marks in the middle assessment band. For marks in the highest mark band to be submitted, a thorough, in-depth coverage of all key aspects of marketing is needed, including designs for promotional materials such as posters, leaflets, advertisements, presentations, and websites. Responses covering a more limited range of aspects in depth, or a wider range in less depth, should be given marks in the middle mark band.

## **7 REVIEW and REFLECTION 9 marks**

**Review and reflect on the effectiveness of the designing and making process that led to the final product**

**Consider the possible wider implications and impact of the product, including possible future developments**

There are three clearly stated requirements for candidates' responses if they are to satisfy the assessment objective:

- A review and reflection on the effectiveness of the designing and making process
- Consideration of the wider implications and impact of the product
- Consideration of possible future developments

For the highest mark to be submitted, all three elements need to be covered thoroughly and in depth. Moderators were able to confirm high marks submitted by the Centre where candidates had clearly addressed all three requirements.

The 'review and reflection' aspect was usually well done with candidates evaluating the design **process** they had followed. This aspect was often confused with the evaluation of the **product**, which is Section 5.

Responses to the 'wider impact' aspect had improved this session with the majority of candidates appropriately including a Life-Cycle Analysis (LCA) approach to their analysis. In some cases this was generic and not focused directly enough to their product to meet the marks submitted.

'Future developments' tended to lack the detail and depth required with responses often focusing on improvements to the prototype product rather than looking forward to the next stage of the design and manufacturing process as the product enters the industrial and commercial world. Best responses here included quality improvement or design variations with diagrams.

This section was often rushed and incomplete. Centres' assessments in this section tended to be lenient when compared with the nationally agreed standard.

## F524/01 Product Design Written Paper

### General Comments:

Candidates attempted the full range of questions on the paper. Question 6 (Resistant Materials) was the most popular, but there were also large numbers attempting Question 5 (Manufacturing), Question 4 (Graphic Products) and Question 8 (Textiles). The vast majority of candidates correctly fulfilled rubric requirements and answered one question; a very small number of candidates attempted more than one question, a practice which is to be discouraged.

It was pleasing to see an increasing number of candidates successfully attempting Question 1 (Built Environment and Construction) and Question 3 (Food). The number of candidates attempting Question 7 (Systems and Control) however continues to fall.

Parts **(a)**, **(b)**, **(c)**, **(d)** and **(f)** are common across all questions.

Responses to the common parts of the question were generally very good. Some candidates however, attempted to answer all common parts through their selected subject focus and in many cases, restricted their chances of achieving higher mark ranges.

Part **(a)** was answered well with most candidates giving at least two design requirements for the given product. Many achieved full marks giving four justified requirements. Marks were not awarded for generic or brief unjustified responses.

Part **(b)** responses showed that most candidates were able to describe at least one feature of 'Total Quality Management', mostly referring to regular quality control checks. Relatively few candidates made reference to the responsibilities of all workers involved at every stage for quality control and that the whole process from delivery of resources to roll out is involved.

Part **(c)** was generally answered very well. Most candidates fully described the benefits in detail in terms of time and money. Many correctly referred to choice of suppliers and that quality of components would be assured by the providers.

Part **(d)** responses had surprisingly few candidates achieving full marks. Many candidates incorrectly referred to safety or warranties and guarantees and issues covered by the Sale of Goods Act. The best responses included detail of the expectation of customers to not be misled by incorrect or untrue claims made for a product.

Part **(e)** assesses specific material content from the focus area.

Part **(e) (i)** was answered well with most candidates stating an appropriate specific material example and giving appropriate properties or performance characteristics. A number of candidates however proposed unsuitable materials for the stated product/part.

For part **(e) (ii)**, most questions include the instruction for candidates to 'Use a flowchart and/or annotated diagrams to support your answer'.

There were some outstanding responses from candidates who used a combination of sequential flow chart and annotated diagrams of key points in the process. Some candidates produced very brief responses lacking sufficient detail to access the middle or higher mark ranges.

Part **(f)** is the 'discuss' question. Candidates were generally well prepared to raise and explain a number of issues and include supporting evidence or examples.

There was a wide range of responses to part **(f)**, with a significant number of candidates achieving very high marks. Many candidates focussed on seasonal products and the need to react to rapid change of customer demand brought about by new trends or fashions. Some candidates focussed on only one issue and did not access the higher mark range. Most candidates drew on relevant examples or introduced appropriate evidence to support their answers.

There are a number of acceptable methods of manufacture for all questions. Candidates were required to take into account factors such as the possible use of jigs, formers and special tooling, quality control checks and batch size. Whilst most candidates responded with appropriate methods of manufacture, a significant number described processes that were only remotely feasible and were awarded limited credit, such as injection moulding the lower part of the jewellery box for Question 6 when a batch of 100 was required. The manufacture of the leaflet holder in Question 4 was generally described well but many candidates did not include how colour graphics would be applied.

Whilst there were many excellent responses to Question 8 Textiles a significant number of candidates lost marks by not describing how to attach the buttons to the front of the satin shirt.

### **Comments on Individual Questions:**

#### **Question No.1, Built Environment and Construction**

Relatively few candidates attempted this question. Many responses were full and detailed for parts **(a)**, **(b)**, **(c)**, **(d)** **(e (i))** and **(f)**. There were very few fully detailed, correct descriptions of how the sides of a foundation trench could be temporarily supported to prevent collapse.

#### **Question 2, Engineering**

A number of candidates made successful attempts at this question. Most candidates gave at least two valid, justified design requirements for the flood defence system although some candidates repeated or reworded similar requirements and did not receive credit. Part **(e) (i)** was answered well although relatively few candidates refer to aluminium alloy. Responses to **(e) (ii)** were varied. The best responses described in detail the use of channel section cut to length and seam welded extruded tube, assembled by welding and an appropriate finish applied.

#### **Question 3, Food**

There were very few attempts at this question. Responses were generally good with most candidates gave at least two valid, justified design requirements for a pizza of the type shown. Most candidates described the manufacture of a single pizza for **(e) (ii)** rather than considering the requirement for a batch of 500 frozen pizzas and consequently did not access the higher marks available.

#### **Question 4, Graphic Products**

A popular question and generally well answered. Most candidates gave at least two valid, justified design requirements for the counter-top leaflet holder however few candidates achieved full marks for part **(a)**. Most candidates stated an appropriate material with valid reasons for choice for the leaflet holder. A few candidates did not receive credit for stating cardboard. Further definition is required such as Duplex board or 2000 micron white cardboard, The cutting and folding of the leaflet folder for part **(e) (ii)** was described particularly well by most candidates. Not all candidates described how to apply colour graphics.

#### **Question 5, Manufacturing**

This was the second most popular question. Responses were generally very good with most candidates giving at least three valid, justified design requirements for the paint tray. Most candidates stated appropriate materials for the tray with valid reasons given. Many candidates achieved full marks for part **(e) (i)**.

There were many excellent answers to part **(e) (ii)**. Vacuum forming and metal pressing were two of the most common manufacturing methods described, Injection moulding was also a popular choice but candidates needed to give details of the type of mould used to access full marks. The best responses included a full sequence of stages with annotated diagrams of key stages in the process.

### **Question 6, Resistant Materials**

The most popular question and generally answered well. Most candidates give at least three valid, justified design requirements for the jewellery box in part **(a)**.

Many candidates achieved full marks for part **(e) (i)**, stating appropriate materials with valid reasons.

Candidates described a wide range of appropriate manufacturing methods part **(e) (ii)**. . Most considered the low batch number and the requirement to be of a quality suitable to hold jewellery.

A small number of candidates did not acknowledge that the jewellery box was cylindrical.

Most answers were well structured, describing a logical sequence of stages with detailed annotated diagrams of key stages.

### **Question 7, Systems and Control**

There were very few attempts at this question. Responses were generally good although not all attempts at part **(e) (ii)** included correct circuit diagrams including all of the features required.

### **Question 8, Textiles.**

This was a popular question with many candidates achieving very high marks. Most candidates give at least three valid, justified design requirements for the satin shirt for part **(a)**.

The majority of candidates correctly stated an appropriate specific fibre for the satin woven fabric for the shirt and gave valid reasons for choice for part **(e) (i)**,

Candidates answered part **(e) (ii)** very well although a significant number did not include details of how to attach the buttons to the front of the shirt.

## **F524/02 Product Design Written Paper**

### **General Comments:**

The format of the paper and generic mark scheme were unchanged from previous sessions of the examination.

It is very clear that preparation for the examination varies greatly from centre to centre; although there are exceptions, in most cases all responses from a centre score similarly indicating the degree of success achieved by the preparation of candidates for the paper. To do well it is essential that candidates have experience of working to the strict time constraints imposed by the examination and learn to target the criteria of the generic mark scheme.

### **Specification points**

Many candidates lose marks by repeating information from the question or by making generic statements about, for example, cost, aesthetics or sustainability. Successful responses show that the candidate has really thought about the people who will use the product, how it will be used and the factors that will make a difference to the experience of the user.

For most candidates specification points cover essential, and usually obvious requirements (for example 'must be waterproof because the product will be used outdoors') which are valid but show a disappointing level of design thinking.

It is relatively rare to find specification points that really show a full engagement with the problem set in the paper. When this happens the candidate has a great advantage in subsequent sections of the paper because they are much more likely to show evidence of their design thinking in their ideas, and to carry out thoughtful evaluation of their initial ideas.

It is clear that writing specification points is a skill that can be taught, with marks awarded following a definite trend from centre to centre.

### **Range of ideas (R)**

To achieve high marks in this section there are two complementary demands: firstly to produce a number of different concept solutions to the design brief set in the question, secondly to explore each concept to show details of possible alternatives and to consider how modifications could better suit the needs of user and manufacturer.

In general, most candidates produce an adequate number of concept ideas but the subsequent exploration and development of these basic ideas is often weak or missing altogether.

### **Technical Detail (D)**

Assessment of this criterion is based on three strands:

- consideration of methods of construction, assembly or manufacture,
- understanding of suitable materials, components, or ingredients
- details of dimensions or quantities.

At this level of examination candidates are expected to have detailed knowledge of materials and components, and how these are used to construct, assemble and manufacture commercial products from their focus area. In this unit they are expected to be able to apply this knowledge to their own design proposals. The more successful candidates showed good subject knowledge by offering realistic options for construction and justified choices of materials by reference to

their properties and performance. In some cases suggestions for construction and materials were inappropriate whilst a significant number of candidates made no reference to specific materials or construction details at all.

Dimensional detail was often lacking. In many cases the size and scale of the product could only be estimated by comparison to human figures or reference to known items. It was rare to find sketches which included information about component sizes, thicknesses of materials and so on.

### **Evaluation of ideas with reference to specification and volume production (E)**

This was done well by some candidates who considered how the product would be used and manufactured and drew attention to both positive and negative aspects of their designs.

Unfortunately in many cases candidates continued to offer comments that were only descriptive rather than evaluative, becoming simple statements that did not show any evidence of balance in their value judgements.

A few candidates used summary tables to evaluate their ideas, often with simple ticks or crosses, or scores out of ten to show success or failure. This should be discouraged because it does not allow the candidate to show the depth of thought necessary for high marks at this level.

### **Final Developed Outcome (F)**

This section is done well by many candidates showing a complete final idea with specific features identified. It is clear that some candidates spend far too long on this final section, usually to carry out unnecessary evaluation which cannot be awarded marks. I would be much better to spend the time on the previous section where more marks are available.

### **Communication (C)**

The mark awarded for communication is based on a combination of factors:

- The overall clarity of presentation evident in the layout of the three design sheets of the paper.
- The range and quality of graphical skills evident.
- The use of clear annotation which communicates the quality of the candidate's design thinking.

Techniques of annotation (for example using arrows to connect comments to specific points) avoiding long passages of text would also help candidates communicate speedily and effectively.

The more able candidates show impressive skill, managing to communicate broad concepts whilst also including useful detailed sketches and informative notes on clear, attractive sheets.

### **Comments on Individual Questions:**

#### **Question 1, Built Environment and Construction**

Insufficient responses to this food focus question were seen to be able to make a general comment.

### **Question 2, Engineering**

This question, about cutting branches of tall trees, was quite popular and produced some good responses. Candidates had focussed on the functional aspects of the product with a variety of approaches suggested based on existing garden appliances (shears, secateurs, chainsaws and so on). Few if any candidates provided details of mechanisms (levers, systems to transmit power between motors and blades etc.) that would allow the mechanism to function.

### **Question 3, Food**

Insufficient responses to this food focus question were seen to be able to make a general comment.

### **Question 4, Graphic Products**

This was a reasonably popular question, asking students to design a product to be used at a child's fancy dress party. This was an extremely open ended starting point resulting in a wide variety of appropriate solutions being appropriate including role play equipment, costumes, masks, games and much more.

### **Question 5, Manufacturing**

This popular question asked candidates to design a multi-functional unit for a child's bedroom. Most candidates focussed on the need to provide storage and worked on furniture that combined storage with one or more other functions, typically sleeping and/or studying. In many cases the solutions were practical but lacking in creativity or innovation. Most disappointing was the apparent ignorance of the standard industrial knock down fittings almost universally used in self-assembly furniture; only a small number of candidates showed any details of these and many specified dovetail or mortice and tenon joints for carcass construction of man-made boards.

### **Question 6, Resistant Materials**

This was the most popular question, producing a good range of responses. Most solutions were reasonably predictable wheeled trolleys although similar designs with tracks or skis were also very common. Many candidates did not show any understanding of the need for a steering mechanism on a four wheeled trolley without which would be difficult to turn from a straight line. Similarly most candidates specified chunky tyres or tracks to give 'good grip' which is not really appropriate to a device that is to be pushed or pulled by a single person as specified in the question. Some candidates ignored this requirement altogether and designed inappropriate elaborate powered trucks.

### **Question 7, Systems and Control**

Insufficient responses to this systems and control focus question were seen to be able to make a general comment.

### **Question 8, Textiles**

This question asked candidates to design a wearable product to protect primary aged children from the sun. Most candidates designed a hat or smock like garment with appropriate detailing to show its relevance to the target group. More able candidates gave details of the construction of the garments with pattern pieces and details of seams and standard components used for fastenings and to provide adjustments for growing children.

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