

GCE

Design & Technology

Advanced GCE **A2 H453**

Advanced Subsidiary GCE **AS H053**

OCR Report to Centres June 2017

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 are dispatched to the appointed examiner in one package as soon as the reflection paper has been completed on the date set by OCR. Candidates 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, candidates should be encouraged to respond to challenges with an open mind rather than a focus on one material area.

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 creative work has been seen this series 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 of 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/>

Comments on Individual Questions:

The Challenge Assignment Comments on Individual Challenges

This year saw a wide variety of challenges approached, this spread was greater than in previous years.

Challenge 1

This was a popular challenge undertaken by candidates from a mixture of material areas, including food, graphics, product design and textiles. A number of candidates missed the need for their solution to be transported between venues by a travelling entertainer. Responses were wide ranging and some were very creative.

Challenge 2

This was also a popular challenge, undertaken by candidates from a mixture of material areas, including graphics, product design, systems and control and textiles. A large proportion of candidates didn't fully consider the key aspect, 'store money securely', in their initial thoughts or ideas. Many candidates considered interactive elements to attract interest.

Challenge 3

Again a popular challenge, approached in different ways with some creative engineered solutions often with multi-material approaches. A wide variety of solutions were presented from personal shelters to large shelters for groups.

Challenge 4

There were a number of innovative responses for this challenge, with the temporary aspect being fully addressed in a range of ways. Some modular design ideas were presented and some candidates made use of mechanisms to allow collapsing and folding for easy storage.

Challenge 5

This was also a popular challenge. A number of candidates created solutions with a sporting theme or a competitive aspect. Many candidates considered the whole problem and covered emptying the bin in their solutions. Some candidates made use of systems or mechanisms to provide interaction with the public.

Challenge 6

Some innovative solutions were seen with many material approaches from a mixture of material areas, including food, graphics, product design, systems and control and textiles. Most candidates considered the need to post the product.

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 entertainment venue 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 often with different material approaches, 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 product will be used and ensure 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 relating to the specification and construction & 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 often used a multi-material approach and 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. However, 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 this session with good evaluative annotation in the designing section. In many cases strengths of ideas are discussed with no mention of disadvantages or evaluation is just of the chosen idea.

Reference to sources of inspiration/job bag was 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 showing comments/response/modifications.

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.

The most able candidates suggested specific materials and methods of manufacture for their developed idea. Materials were sometimes 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 illustrate 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. 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. Many candidates accessed the 'S' supporting example marks; however often the third bullet point of both questions weren't addressed fully by many candidates.

Q1.

Many students struggled to identify a target market and often named the user rather than an events management company or council as being the purchaser.

Production levels tended to be identified easily with some explaining why batch was suitable and many also were able to name and justify specific processes as well.

Q2.

Ergonomic considerations and improvements to ergonomics were accessible to most students with many achieving 'S' through sketches or supporting notes. The last bullet point was often not achieved by candidates providing a weak or no link to a process and how it might improve ergonomics

On both Q1 and Q2 the third bullet point was the most poorly answered part. Unfortunately some candidates appeared to have prepared themselves to answer the 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 sustainable, rather than answering the specific questions set in this year's paper.

F522 Product Study

General Comments

As in the 2015 and 2016 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 the few remaining A3 style portfolios. 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 'ongoing 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.

The approaches detailed above will be extremely useful as we move to the new reformed qualifications.

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.**

Surprisingly having reported on this last year 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.

Centres of **20 candidates** or less should send **ALL candidates** work to moderators on or before 15th May – a remaining frustration is following up on work not received in the week following this date which slows the moderation process unnecessarily.

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.

OCR recommended A3/PP allocations are indicated for each section - the total should not exceed 25 pages/slides as a maximum.

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 and 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.

Ongoing 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.

Ongoing 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 is 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.

Ongoing 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.

Ongoing 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 website. 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 ongoing evaluation, which seeks the views of others and then provides evidence of responding to points raised.

Ongoing 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 ongoing 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.

Ongoing 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.

Ongoing 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; and Textiles.
- Work can be presented on 20/25 sheets/slides of A3 paper or USB to current OCR approved standard.
- Please use Arial font at least 10pt. This is widely available, can be read easily and 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/ongoing 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

There was an interesting and inspiring range of project choices across a range of material areas, and project folios were mostly well organised and presented. Candidates identified suitable opportunities for creative and innovative designing and, where they maintained regular contact with genuine clients or contacts within their target market, were able to sustain a focused approach throughout their project and access high marks. There was a wide variation in complexity and sophistication of the projects, and most were of a sensible scale, giving scope for attention to detail and depth in approach.

Many projects fell into a 'simple and straightforward' category as they did not contain sufficient difficulty and challenge 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 complex, particularly in key sections such as 4a: Design, Design Development and Making. Possible extension activities and tasks which can address a potential shortfall in this respect include; the consideration in detail of commercial manufacture in addition to the production of a one-off prototype; or the development and production of marketing and distribution items such as packaging, flat pack / interlocking / stacking features, or a 'Point of Sale' display.

Alongside detailed and highly relevant responses by some candidates, generic responses to the assessment criteria were common, where the work submitted did not relate directly to the specific project. The focus and relevant depth and detail required at Advanced Level were often not present, and Centres' assessments were found to be lenient in these respects, with marks in the lower bands often being more appropriate when responses were compared to the nationally agreed standard. Where relevant numerical, technical and constructional detail were not included, marks in the highest mark bands were not appropriate. Candidates with a sound theoretical knowledge and understanding underpinning their designing and making activities were able to respond more successfully to the requirements across all sections.

The commercial and marketing aspects of design and manufacture are important throughout all sections of the project. Candidates were able to score highly where they had included relevant and specific details and referenced the business and industrial contexts in their responses. Candidates showed enthusiasm and original design thinking, and this was most evident in Section 4a. Some did not get far beyond a superficial level, however, showing little design development and refinement after initial design concepts. More able candidates showed a clear progression from concepts to final design using physical and digital modelling and the opinions of others to produce effective solutions defined with a high level of detail.

3D printing was used widely, and this added enhancement to both designing and making processes, adding a level of functionality and commercial potential that is difficult to achieve by conventional methods. This was seen in a range of components such as casings for electronics and controls, and purpose-designed clips and furniture fittings. At the highest level, candidates used 3D printing as part of the design development, modelling and prototyping progressively and systematically to improve their designs in an iterative way with the aid of feedback from clients and users, achieving highly fit-for-purpose design solutions.

A wide range of ICT, CAD and CAM applications had been used, including Photoshop, Laser cutters and CNC routers. Some candidates were able to show skills at a high level. CAD working drawings as part of the specification for the final design are not specifically mentioned in the Assessment Criteria, but are standard commercial practice and therefore expected for high marks to be supported. The technical detail required for third-party manufacture was largely not

present. 3D CAD images were sometimes included as working drawings, but these mostly did not include sufficient detail for manufacture.

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

The vast majority of Centres submitted their coursework as e-portfolios, and candidates were able to include audio and video recordings and CAD simulations. A significant number of e-portfolios had problems with videos not playing directly from the PowerPoint, and some files 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. Candidates' use of small font sizes or coloured text on a patterned background made reading the text very difficult in a few cases.

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, clerical errors (e.g. transcription or addition of marks) 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 used the old mark grid for the breakdown of marks in Section 4a. The mark bands and descriptors for Section 4a were revised in 2014.

Comments on Individual Sections

1 DESIGN BRIEF (3 marks)

Present a design brief for a marketable product

To support maximum marks in this section, a structured response covering four key areas is needed:

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

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

A common misunderstanding was the 'marketing' aspect. To fully satisfy the assessment objective and support maximum marks, clear reference by the candidates to specific aspects of the design of their product that would need to be considered from a marketing perspective were needed. These should explain the potential features and qualities of the product and its presentation that would be needed for people to want to purchase it. These might include the packaging, range of styles and colours, flat-pack / self-assembly, variety and choice of features and product variations, product identity and branding, pricing, simplicity of use, adaptability for different contexts, situations and users, and potential Unique Selling Points.

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 high-quality responses in this section that included first-hand information and experiences. Candidates presenting concise, meaningful and authentic research, that was carefully edited and directly relevant to their own project, 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, user or stakeholder
AND/OR
- Direct personal contact with existing / similar physical products.

There was a tendency for candidates to over-rely on the use of the internet in this section, often copying and pasting many images with limited benefit in terms of the detailed analysis required to provide a clear framework and direction to the designing. Where candidates had analysed products they had themselves handled, the overall influence was strong and valuable. Generic responses lacking quantitative and technical data were not able to support high marks when responses were compared with the nationally agreed standard.

Homage to a famous designer was often seen without considering alternatives or the relevance of that designer's work to the item being designed by the candidate. Questionnaires and interviews to the client or user group were widely used. These often contained a minority of design-related questions (usually in the form of confirming the key features they would like the product to have) but tended to be biased towards confirming the need for the product itself, therefore not always informing the specification and the designing in the detail required.

'Mood boards' were a feature of candidates' responses in this section, and these included inspirational images of existing products, forms, shapes and colours relating to the products to be designed and the themes. Few candidates acknowledged their sources. Candidates' annotation of the images gave some value to their inclusion, although in general the images and products included were not analysed or evaluated in sufficient depth and technical detail to give detailed guidance and data for future sections. Further significance and value was added to this early research where candidates showed the direct influence of the content from these mood boards on their designing in Section 4a.

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 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 be light in weight’*, *‘must be sustainable’*, *‘must be aesthetically pleasing’*, *‘should be durable’* and *‘must be easy to use’* were of little value, and these required further explanation and specific detail to support high marks.

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

For marks in the middle and higher mark bands to be supported, specification points must be specifically related to the 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 ongoing evaluation, and**
- **the planning and making of the product**

Candidates work in this section should include evidence against all five strands listed above. The best responses were seen where candidates had adopted an integrated approach with sketches, drawings, diagrams, CAD visualisations, models, experiments and trials presented in real time 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.

The depth and scope of the designing and making tasks involved, along with the level and range of skills exhibited by the candidates influence marks in this section. The ‘intellectual challenge’ and depth of ‘design thinking’ involved in the designing and making varied considerably, and this should be reflected in Centres’ assessments. Centres’ assessments were often lenient where there was insufficient depth, difficulty and complexity to meet the marks submitted when compared with the nationally agreed standard.

In some cases, the final outcomes as presented represented ‘preliminary’ prototypes rather than ‘final’ prototypes, and as such further refinements and structured design development through further iterations were needed to meet your marks. Prototype outcomes were not always of sufficient quality and completeness to be able to support full testing in the intended environment by the intended users, and as such some would more correctly be described as ‘models’ or ‘non-functioning’ prototypes.

When projects and the possible routes to design solutions and prototype products are being considered, a discussion with each candidate is beneficial to determine whether an appropriate level and complexity of designing and making skills will be possible. Where simpler and more

straightforward projects are undertaken, they will need to be carried out in greater depth to achieve the same marks as a more complex project.

‘Static’ designs and practical outcomes do not require the same level of skill in designing and making as those incorporating articulation or movement. Candidates were able to demonstrate higher level skills and access higher marks through the use of features to enable flat-pack or adjustment, folding mechanisms, interchangeable parts, complex assemblies / manufacturing techniques, stacking facility, and opening / closing / sliding features.

The generation and exploration of design possibilities

A good number of candidates presented evidence of their creative and innovative designing, with lateral thinking and systematic design thinking able to access high marks. The influence of the OCR’s Advanced Innovation Challenge, part of the AS Product Design course, continues to be evident in many cases. In some cases, the ideas and possibilities presented were relatively straightforward and simple ‘standard’ designs, often presented in outline rather than detailed form. To support high marks at this Advanced level, a greater sense of risk-taking and journey into more difficult, novel and uncertain possibilities, even if they are later dismissed, is expected.

The phrase ‘...exploration of design possibilities’ is included in the assessment criteria. A wide variety of alternatives, variations and options were needed around the ideas presented, before moving on to fresh ideas, for marks in the upper middle and next to highest bands for this strand to be supported. Greater technical detail and evidence of the consideration of practicality and construction, detail of assembly, wider market use and volume production are needed to support marks in higher bands.

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 a consideration of important aspects such as adaptability, compactness, ease of use, maintenance, and standardisation of components. This approach is encouraged - both the final product designs and the marks that could be confirmed were improved by such approaches.

The use of digital technologies

Skills in the use of digital technology by many candidates were of a very high level. There was excellent use of CAD programs such as SolidWorks, Autodesk Inventor, CREO, ProEngineer and SketchUp, which were 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.

More generic digital technologies such as photography, scanning and videos were widely used. Various forms of CAD and 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, also in the use of 3D printing. These helped to support high marks in some cases.

When making assessments in this strand, Centres should consider the difference in complexity between 2D and 3D digital tools and equipment. There is a difference in the level and complexity of the skills involved in designing and making using 2D CAD tools and a laser cutter or vinyl cutter, and the skills involved in designing and making using 3D CAD tools and a 3 or 4 axis CNC router.

Experimenting and modelling

Modelling and experimenting is a key part of the design process for many candidates, enabling 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. This often benefitted 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.

Looking forward to the reformed Design and Technology specifications, purposeful modelling and prototyping of design iterations play a key role in developing and refining fit-for-purpose design solutions through the active involvement of, and feedback from, stakeholders and users. Some candidates adopted this approach to great benefit. In some cases, while candidates' modelling satisfied the requirement, its purpose was sometimes not clear in the progression of the design.

The refining and defining of a final design through ongoing evaluation

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, with scores out of ten, or ticks against a list of specification points, and these were less effective than spontaneous annotation added in 'real time' around design sketches, CAD images, and photographs of models. While 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 the views of users often not considered.

Evidence of structured and thorough client / target market input and feedback through the process of design development was invariably valuable. Candidates' own views and views of fellow students were also included, but these tended to be subjectively positive rather than objectively constructive.

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, for high marks to be supported. Pencil-drawn working drawings were common, also outline CAD drawings with few sizes, and in these cases candidates were able to score low marks only. A surprisingly large number of Centres and candidates embarked on the planning and making of the final product prototype without fully defining the final design.

Overall, greater depth and technical detail was required to meet the marks submitted for this strand. Specifically, the terms 'refining' and 'defining' are included in the assessment criteria, and a greater level of refinement in the definition of the final outcome and construction details was needed. As a guide to Centres, to submit marks in the higher bands for this strand, the drawings, plans and manufacturing specifications should contain sufficient detail to allow a third party to manufacture the product without further guidance. Where CAD drawings are not presented in this strand, a maximum of 30 marks should be submitted.

The planning and making of the product

Evidence of 'planning' was included in most folios but this was often retrospective, recording what had already happened. Responses were often superficial, including few points of real value, such as 'Use a ruler to draw a straight line', and 'Take care with the cutting blade'. 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. One page or slide is usually sufficient for the candidates' skills in this respect to be assessed.

There was a large variation in the level of challenge and difficulty in the making tasks involved in the production of the final outcome. There was wide use of CAM and 3D printing, and also a number of textiles projects using sublimation printing. In many cases, the designs as finalised and the practical tasks and construction methods involved did not contain the higher skill levels and the level of demand and sophistication to meet Centres' marks when compared with the nationally agreed standards. High marks were often submitted for well finished but undemanding products. Where a narrow range / depth of skills have been involved, or if the outcome is largely 'static', marks in the lower bands should be submitted for this strand.

This year moderators saw large numbers of final products with marks in the highest mark bands that were very simply-made 'static' MDF carcass constructions using glued and screwed joining methods. While the outcomes were effective and soundly made, high marks needed support from a greater range and depth of skills.

Centres' marks tended to be lenient when compared with the nationally agreed standard. In many cases, product prototype outcomes fitted the category of 'relatively simple and straightforward', often having reached a 'preliminary' completion stage. To meet Centres' marks in the higher bands, these would have benefitted from progression, fine-tuning, modifications and improvements and significant further work to complete the outcomes to a more refined and advanced working prototype product stage that would enable full and rigorous testing over a timed period by the intended users and clients in the intended locations for the product. In general, further stages of design refinement or the practical modification of one or more aspects of the final outcome by the candidates would have potentially enabled Centres' assessments to be confirmed in this strand.

4b INNOVATION (15 marks)

Show innovation Moderators supported Centres' assessments 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. 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

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.

To attain high marks in this section it is expected that the final product will undergo structured and rigorous testing against the specification, in its intended environment by intended users, as well as by independent others not connected in any way to the candidate, centre, or project. Verification that those evaluating and testing the product have actually made direct contact with the candidate and their project outcome is required. The findings from these tests should be compiled into a summary of the strengths and weaknesses of the product, incorporating technical details and where appropriate suggestions to improve the prototype product.

Centres' assessments in this section tended to be lenient when compared with the nationally agreed standard. Responses where moderators were unable to confirm Centres' assessments because key elements were missing included:

- Written comments and visual evaluation without proper physical testing of the final product. One example of this was waterproof clothing which had not actually been worn in the rain, and no other approach to testing the waterproofing of the materials or 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.
- Opinions and comments from peers lacking objectivity and detail.
- Evaluation by a truly independent person or group was missing.

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.

6 MARKETING PRESENTATION (15 marks)

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

This section is one that is tackled enthusiastically, although it is evident that many find time short to give this section the attention it requires following the making of their product. In this respect, the best responses follow an approach where marketing aspects are considered and applied by candidates throughout the project, from the very start, and where marketing and promotional features are considered and included as part of the design development. Where candidates had built a sound theoretical understanding of all that is involved in marketing and promoting products, this underpinned and strengthened their application of the relevant principles to their 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. Where candidates presented generic 'marketing theory', with little clear and specific relevance to the product they had designed, the Moderator was unable to support high marks submitted by Centres.

Product or company 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 and 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.

Most candidates listed USP's for their product, and considered the 4 P's of marketing, essential elements of any marketing strategy. Some candidates made comparisons and reference to the marketing features and methods used in existing products, and this was helpful in identifying aspects for consideration in their own products. 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.

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 mostly well done with candidates evaluating the design **process** they had followed. High marks were appropriately rewarded where positive reflections gave active outcomes from the review, for example modifying the process or approach in future, whether it be the manufacturing process or the candidate's approach to design. This aspect in this section was often confused with the evaluation of the **product**, which is Section 5.

Responses to the 'wider impact' aspect had improved this session with many 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' responses more often tended to focus 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. Relatively few candidates considered how to develop or modify their product to give optionality to potential customers and few had considered how to reach out to other markets with spin-off and variations on their products. The best responses included diagrams, drawings and visualisations of how things might develop.

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, as tends to be the norm with this component. Question 6 (Resistant Materials) was the most popular again, 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.

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 'Just in Time Production', mostly referring to a reduction in storage costs. However, other popular responses covered the ability to respond to fluctuation in demand as well as need for strong relationships between suppliers to ensure stock arrived on time.

Part **(c)** was generally answered very well. Most candidates fully described how at least one product had used a textured surface to aid grip. Braille being added to a range of products to support visually impaired users was also well explained by many candidates.

Part **(d)** responses had a surprisingly wide range of differing responses. Many candidates referred to thermochromic, photochromic, polymorph and piezo electric material with excellent descriptions. However, many managed to explain a change in colour due to heat or light but without naming the Smart material. There were quite a few responses that referred to Modern materials rather than Smart.

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. Where it was well answered; candidates were able to refer coherently to: materials, manufacturing, transport, depletion of resources and how the public make informed decisions when purchasing goods that have a positive or negative impact on the environment and how these inform the designer. Excellent examples were given to support their comments. Typical ones were plastic bags and electric/hybrid cars.

Comments on Individual Questions:

Question 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 floor structure would be constructed in part **(e) (ii)**.

Question 2, Engineering

A number of candidates made successful attempts at this question. **(a)** Was generally well attempted with ergonomic considerations being clearly understood as were insulation of the handle and the conducting of heat for the pan. Part **(e) (i)** was answered well although some responses lacked reasoning or explanation. Responses to **(e) (ii)** referred to press forming with detailed sketches/flow charts and achieved a high number of the marks available. A small number of responses chose incorrect processes for the product required.

Question 3, Food

There were very few attempts at this question. Responses were usually good with most candidates giving at least three valid, justified design requirements for the pack of six Chelsea buns of the type shown. **(e) (ii)** demonstrated that the candidates had a good understanding of the stages required.

Question 4, Graphic Products A popular question again this series and generally well answered. Most candidates gave at least two and often three valid, justified design requirements for the hot drinks carrier however few candidates achieved full marks for part **(a)**. Most candidates stated an appropriate material in part **(e) (i)** with valid reasons for choice for the drinks carrier. A few candidates did not receive credit for stating 'cardboard' however a number of responses did receive credit if an appropriate weight was stated. The cutting and folding of the drinks carrier for part **(e) (ii)** was generally presented well by most candidates stating die cutting as the appropriate method of manufacture.

Question 5, Manufacturing

This was the second most popular question as in previous series. Responses were generally very good with most candidates giving at least three valid, justified design requirements for the door handle. Part **(i)** saw the majority of candidates stating an appropriate material for both the cover and handle and they were able to state and justify appropriate characteristics. Part **(e) (ii)** was approached through the use of injection moulding by many candidates although a number of responses lacked detail in the sketch of the injection moulding machinery/mould or the process itself.

Question 6, Resistant Materials

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

Many candidates achieved full marks for part **(e) (i)**, stating appropriate materials with valid reasons. Acrylic or another named thermoplastics being the most popular choice by far, followed by aluminium.

Candidates often chose laser cutting as the manufacturing methods for part **(e) (ii)**. Most considered the low batch number and the requirement to ensure repeatability with jigs/formers.

A small number of candidates chose incorrect processes for the batch size and product. 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 many candidates did not fully complete part **(e) (ii)** and present a solution to achieve the required ratio. For part **(e) (i)** a number of candidates also presented solutions that did not transfer rotary motion to oscillating but to other types.

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 work overalls for part **(a)**.

The majority of candidates correctly explained why a double stitched seam had been chosen in **(e) (i)** although repetition of durability in one form or another was frequent without the justification of double stitching or that the fabric had been folded over.

(e) (ii) had a mixed range of responses. Many candidates managed to achieve some marks by explaining how to dye fabric in the classroom but could not relate this to industrial dyeing techniques. A small number of candidates misunderstood what was required from the question and explained how a pattern would be printed onto the fabric rather than how the fabric would just be dyed.

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 altogether missing.

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 completed 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. It 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 No. 1 Built Environment and Construction

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

Question No. 2 Engineering

This question, about a trailer for attaching to a bicycle, was quite popular and produced some good responses. Candidates had focussed on the functional aspects of the product with a variety of approaches suggested. Few if any candidates provided details of mechanisms (levers, quick release systems, pivot points, clamping between trailer and bicycle etc) that would allow the mechanism to function.

Question No. 3 Food

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

Question No. 4 Graphic Products

This was a reasonably popular question, asking students to design innovative promotional materials for a range of sunglasses. This was an extremely open ended starting point resulting in

a wide variety of appropriate solutions including point of sale displays, both, floor standing and counter top, packaging for sunglasses and other materials to raise awareness of taking care in the sun.

Question No. 5 Manufacturing

This popular question asked candidates to design a product for moving stacks of chairs. Most candidates focussed on the need to provide a form of wheeled trolley, in many cases the solutions were practical but lacking in creativity or innovation. Most disappointing was the apparent ignorance of methods and mechanisms to make the trolley collapsible or fold up; only a small number of candidates showed details of these in any depth. Some candidates ignored this requirement altogether and designed inappropriate elaborate powered trucks.

Question No. 6 Resistant materials

This was the most popular question, producing a good range of responses. Most solutions were reasonably predictable with the profile of animals being the most common theme being connected to wildlife. Many candidates did not show any understanding of the need for an adjustable mechanism. In many cases the solutions were practical but lacking in creativity or innovation. Most disappointing was the apparent lack of depth of thought in design thinking and development.

Question No. 7 Systems and Control

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

Question No. 8 Textiles

This question asked candidates to design a wearable product that was appropriate for a range of weather conditions and enabled carrying of personal belongings. Most candidates designed a jacket 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 to the garment for changes in weather and appropriate safe storage of belongings.

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