GCSE

Rewarding Learning

Chief Examiner's and Principal Moderator's Report

Technology and Design

Summer Series 2024

Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the Summer 2024 series.

CCEA hopes that the Chief Examiner's and/or Principal Moderator's report(s) will be viewed as a helpful and constructive medium to further support teachers and the learning process.

This booklet forms part of the suite of support materials for the specification. Further materials are available from the specification's microsite on our website at www.ccea.org.uk.

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GCSE TECHNOLOGY AND DESIGN

Chief Examiner's Report

Subject Overview

In several instances, poor handwriting caused difficulties for markers. While markers make every effort to award marks in such cases, they cannot do so if the handwriting is illegible. It is crucial to make candidates aware of the importance of presenting their answers in clear, legible handwriting to ensure that they receive credit for acceptable responses. In some scripts, certain answers were completely illegible.

Many candidates successfully produced well-organised flowcharts using the symbols outlined in Appendix 3 of the specification. However, others did not recognise the importance of this and submitted flowcharts with unacceptable or incorrect symbols. In some cases, candidates resorted to using crude, rough circular shapes for everything. Neat, well-organised flowcharts, utilising the correct symbols from Appendix 3 of the specification, will benefit many candidates.

Candidates should be encouraged to show their working in questions that require calculations. In many cases, this was done, and the calculations were well laid out, enabling many candidates to receive partial marks for a solution even if the final answer was incorrect.

A total of 4,067 candidates were entered for the core module. Option C: Product Design was the most popular choice, with 2,027 candidates, followed by Option A: Electronic and Microelectronic Control Systems, with 880 candidates, and Option B: Mechanical and Pneumatic Control Systems, with 603 candidates.

Candidates should be encouraged to read every question carefully to ensure they clearly understand what is required, as this was not always evident in some responses. Additionally, candidates who use additional sheets to answer questions need to ensure that the questions are correctly numbered, as this was not always the case.

Assessment Unit 1 Technology and Design Core Content

Unit Overview

It was pleasing to note that there were fewer low-marked scripts than in previous years. However, it was evident that some of the weaker candidates struggled, as they answered only a few of the basic questions and left many of the more challenging ones blank.

Markers confirmed that the paper catered to the full range of abilities and that the vast majority of candidates attempted all questions. They also confirmed that the level of language and readability of the questions were appropriate.

Candidates should be advised to take time to carefully read each question before answering. In a number of cases, candidates provided answers related to the question area but did not directly address what was being asked.

Question marks ranged from one to ten, with the level of difficulty varying from basic to more substantial questions that required reasoning and discussion of processes.

There was no evidence to suggest that candidates had insufficient time to complete the paper.

Q1 Part (a) of Question 1 is closely aligned with the symbols in Appendix 3 of the specification. It was designed to provide candidates with a strong start in this paper. Although many candidates performed well on this question, it was disappointing to find that some were unable to provide the correct names as they appear in Appendix 3 of the specification.

Part (b)(i) was well answered, but it was surprising that a significant number of candidates were unable to answer Part (b)(ii) correctly. Most candidates were able to provide two acceptable responses for Part (b)(iii).

Q2 Although the design process is a substantial element of this subject, many candidates struggled to provide acceptable definitions or stages of the design process in response to Part (a) of this question. Only the most capable candidates were able to clearly express their understanding of the design process and produce acceptable written answers. While a majority of candidates were able to provide one or more acceptable responses for Part (b), many still struggled to produce satisfactory answers.

Part (c) was very well answered by the majority of candidates, with most correctly identifying and describing the grip on the travel cup. However, a number of candidates provided answers that did not focus on ergonomics, as required by the stem of the question.

Q3 The majority of candidates responded well to Part (a) of this question, although some failed to mention the swinging motion in their descriptions. Similarly, most candidates were able to identify Y as the correct lever in response to Part (b)(i) and provided a clear explanation for this selection. However, some candidates who correctly selected Y for the lever often gave limited or vague explanations.

Part (b)(ii) of this question was the least well answered, with a number of candidates unable to sketch a second-class lever, although many others produced acceptable sketches. The most common errors were omitting the labels or showing the effort in the wrong direction.

Q4 The vast majority of candidates correctly named the four pneumatic symbols in Part (a) and were able to gain full marks for this section. A wide range of answers were acceptable for Part (b)(i), and most candidates were able to score at least one of the two marks available. However, some candidates provided answers that were too vague or generalised to be acceptable.

Part (b)(ii) had only one acceptable answer, and the majority of candidates were able to state the correct logic. In Part (b)(iii), there was a wide range of written responses, with most candidates earning some marks. Many candidates scored very well, achieving three or four marks. However, some candidates failed to refer to the function of each component, as required by the stem of the question, or failed to use correct terminology.

Q5 Part (a) of this question was well answered by the vast majority of candidates, who achieved full or nearly full marks. A small minority of candidates received low marks here, selecting incorrect answers for the use of such basic workshop tools as the tenon saw and the scriber. Additionally, a small minority incorrectly selected "used with a gear wheel" for the V-belt.

Part (b)(i) was generally well answered, with most candidates providing at least one correct answer. In Part (b)(ii), many candidates recognised the importance of cleaning, but only a minority acknowledged the necessity of heating before dip coating.

Q6 The majority of candidates correctly stated "Pole" in response to Part (a)(i), though a surprising number of candidates got this wrong. The symbol names required for Part (a)(ii) were correctly identified by most candidates. While nearly everyone identified the buzzer, some were unable to identify the thyristor, often confusing it with a thermistor.

Almost all candidates correctly responded with "four cells" for Part (b)(i). There were mixed responses to Part (b)(ii); many candidates received full marks, but common errors included failing to connect components to the circuit, not connecting the buzzer leads, drawing a bell symbol instead of the correct component, or placing components in the wrong locations.

Most candidates were able to achieve at least one mark for Part (b)(iii), though some were unable to provide the clarity required for their answers to be acceptable. Part (b)(iv) also saw mixed responses, with a range of marks being awarded. Most candidates achieved at least one mark, while the more capable candidates were able to achieve full marks.

Q7 Many candidates produced very neat, well-laid-out, and logical flowchart solutions using the correct symbols. However, other candidates who created logical solutions did not take enough care when drawing symbols, resulting in unacceptable or poorly drawn cell symbols that could not be awarded marks. At the other extreme, many of the weaker candidates appeared to draw circles around every instruction.

Candidates need to reflect on the importance of using neat, correct cell shapes when constructing flowcharts. The symbols shown in Appendix 3 of the specification are the only ones that should be used. This is also mentioned in section 1.39 of the specification. Statements within cells need to be clear and precise, and it is crucial for candidates to consider the sequence in the flowchart. Some candidates included a wait instruction within an output cell, or vice versa; this is not acceptable and should be avoided. Additionally, some candidates did not connect feedback loops, leaving them 'hanging'.

Overall, solutions ranged from excellent to very poor, but most candidates were able to achieve reasonable marks on this question.

Q8 Most candidates were able to provide one additional property in response to Part (a)(i) and correctly define the term “non-ferrous” for Part (a)(ii). A range of different softwoods were mentioned in response to Part (b) of this question. The more able candidates correctly identified cedar as the softwood with the appropriate weather-resistant properties.

Many acceptable answers were given in response to Part (c) of this question, with the majority of candidates able to produce one or two valid advantages. Part (d) was the least well-answered section of this question. While many candidates achieved full or partial marks, a significant number provided inaccurate explanations.

Q9 Almost all candidates were able to achieve full marks for the basic questions Part (a)(i) and Part (a)(ii). Many candidates responded well to explaining the operation of the crusher as required in Part (b)(ii), achieving full or nearly full marks. A majority of candidates were able to secure one or two of the four marks available in this section.

However, many candidates failed to mention that the unidirectional flow regulator output was restricted, or that this affected the SAC output. A large number of candidates also did not explain what would happen when button A was released.

Most candidates correctly named components B and C in response to Part (b)(ii) and Part (b)(iii). The explanations for Part (b)(iv) were generally good, although some candidates did not mention the AND logic. In Part (b)(v), most candidates understood that safety was the reason for the modification.

Q10 The marks awarded for this question ranged across all five response types: basic, limited, satisfactory, good, and excellent, with the majority of candidates scoring within the satisfactory or good range. The more able candidates were able to focus on and specify measurements when describing the marking out, bending, and drilling processes. Many candidates incorrectly described the order of drilling the hole and bending the acrylic. Additionally, the drilling of the hole was not well explained by a large number of candidates. There was little focus on crucial aspects such as using a slow drilling speed, masking tape, the correct drill angle, and the use of a sacrificial board.

Some responses incorrectly identified the tools used; for example, some candidates wrongly described using a hammer and centre punch to mark the centre of the hole on the acrylic sheet. This year saw a noticeable improvement in integrating safety precautions into the body of the text compared to previous years, though many candidates still provided lists of general safety precautions.

It was evident that some students did not read the question properly, as much of their discussion centred on cutting the acrylic sheet to size and then polishing it. Additionally, a number of candidates focused on the battery-operated clock.

Assessment Unit 2 Option A: Electronic and Microelectronic Control Systems

Unit Overview

The general standard of responses to the examination paper was good, with a significant number of candidates providing strong answers to both questions. The language used throughout the examination paper was appropriate for the candidates. There was no evidence to suggest that candidates generally lacked sufficient time to complete the paper. Examiners reported a wide spread of marks, accommodating a full range of abilities. Most candidates were able to attempt nearly all parts of each section of the two questions. The progression in both questions and the gradual increase in difficulty appeared to help all abilities provide answers, clearly aiding differentiation within the paper.

Overall, there was a good indication that candidates were confident in dealing with flow chart questions. However, there is room for improvement in drawing and using a range of component symbols and in performing calculations related to electronics, including selecting the correct formula from those provided at the front of the paper.

Q1 **(a)** **(i)** Most candidates correctly identified that the resistors were connected in parallel.

(ii) Most candidates were able to select the correct formula to calculate the current flowing through the resistor, but some did not state the unit or provided the correct answer with the wrong unit.

(iii) The majority of candidates correctly selected and applied the formula to obtain the total resistance. However, some candidates used the formula for a potential divider, misapplied the correct formula, or stated an incorrect unit.

(b) **(i) (ii)** Almost all candidates correctly identified the symbols for the voltmeter and ammeter. However, many were confused about their placement in the circuit, with numerous candidates placing the voltmeter in series and the ammeter in parallel instead of the other way around. Many candidates also included only one ammeter instead of the two required. Candidates must ensure they read the questions carefully to maximise the marks they achieve.

(c) **(i)** Most candidates were able to identify the symbols for the variable resistor and the thermistor, but a few could not identify the thermistor.

(ii) Most candidates identified that R4 could be adjusted due to a change in temperature, but fewer recognised that the temperature should be increased. Only a small number of candidates correctly identified that the resistance of R3 needed to be changed manually. Most answers were vague, stating that the resistance needed to be changed but not specifying how.

(iii) Most candidates were able to select the correct formula to calculate the output from the potential divider, but some students placed the variables in the wrong parts of the formula.

(iv) Most candidates were able to demonstrate that analogue signals vary for one mark. However, only the most able candidates were able to secure the second mark by explaining that this is due to the change in resistance of R3/R4.

(d) Some candidates produced sketches with the components in place despite being instructed not to do so in the question. A number of candidates did not attempt this question.

(e) **(i)** Many candidates were unable to name or describe the function of pin 7. Some candidates achieved one mark by identifying pin 7 as a discharge pin, but only a few earned the second mark by referencing the capacitor.

(ii) Many students struggled to clearly articulate the term "astable" with respect to a 555 timer circuit. However, many students were able to attain one of the two marks available by describing that the output voltage switches between two states, though most omitted to explain that this occurs continuously.

(iii) This question was very poorly answered. While almost all candidates correctly determined the maximum output voltage as six volts, very few were able to correctly identify the time period or the frequency.

(iv) Most students gained two or three marks on this question, with a small number achieving one mark.

(f) This question was well addressed by the candidates, with most scoring five or more marks and many scoring between eight and ten marks. Candidates were generally familiar with the advantages and disadvantages of bulbs and LEDs, as well as the applications of seven-segment displays.

Q2 **(a)** **(i)** Most candidates correctly identified the SPST switch from the symbols presented. In general, candidates' responses to symbol identification questions were good.

(ii) Most candidates were unable to explain the operation of the reed switch, with only a small number mentioning the use of a magnet.

(iii) This question generated a wide range of responses. Many candidates did not identify the correct switch, and among those who did identify component C, only the most able candidates were able to articulate the latching action.

(b) **(i)** Many candidates struggled to explain two benefits of using microcontrollers (PICs), with some answers being vague and lacking the clarity needed to achieve the marks available.

(ii) Most candidates correctly determined the voltage as 5 volts, but many were unable to provide a satisfactory explanation.

(iii) Very few candidates achieved full marks on this short flowchart. While most were able to secure at least three marks by including the decision box, the "no" loop, and the "output high," very few included the "yes" loop or the "output low" box.

(iv) Very few candidates achieved full marks for this circuit. Most were able to secure at least 2 marks for correctly identifying the resistor and transistor, but many did not include the diode, the 12V rail, or use the correct symbol for the solenoid. Many candidates used the older spiral symbol; centres need to reinforce the use of symbols found in the appendix of the specification.

(c) **(i)-(iii)** Most candidates correctly used the shapes for the flowchart symbols.

(i) A number of candidates did not include a count in the flowchart, and a few attempted to repeat the pattern five times. Candidates need to be reminded to carefully read the stem of the question. They should be confident in using flowcharts to perform a range of sequences a set number of times.

(ii) This question had some of the best responses among the three flowcharts; however, some candidates produced incorrect responses due to misreading the question.

(iii) This flowchart was generally well addressed by candidates. However, many candidates need more instruction on integrating macros into flowcharts. Instead of using the Batch/Display macro boxes required, many candidates simply rewrote their flowcharts from Part (i) and Part (ii), which cost them valuable marks.

Candidates should be encouraged to make their flowchart symbols and commands as neat as possible and to write the contents legibly.

Assessment Unit 2 Option B: Mechanical and Pneumatic Control Systems

Unit Overview

This is an optional unit with 603 entries. The paper had a duration of 1 hour and 30 minutes, and Quality of Written Communication (QWC) was assessed in Question 2 Part (f). Examiners reported that the level of language used in the paper was appropriate and that most candidates attempted the full range of questions. They also noted that there was no evidence to suggest that candidates had insufficient time to complete the paper. Candidates should be reminded that in the QWC question, spelling, punctuation, and grammar should be of a very high standard to achieve marks in the 'very good' band. In the majority of papers, handwriting was clear; centres should encourage and support candidates to produce legible writing under exam conditions through prior practice.

The paper offered candidates the opportunity to answer effectively and catered to a range of abilities, with accessible A01 questions and challenging A03 questions. Candidates generally performed slightly better in the pneumatics section, with a noticeable improvement in Question 2 Part (e)(iii), demonstrating a solid understanding of piping pneumatic systems, which was positive to see.

Students continued to struggle with basic mechanical and pneumatic symbols. It is important to adhere to the specification appendix when naming and drawing symbols. Some candidates also struggled with the mathematics element of the paper, particularly in applying formulae to real-life situations. When ratios are asked for, the answer should be given in a ratio format, such as 1:2, rather than as a fraction or decimal.

Q1 **(a)** Candidates answered this question well, although there was some confusion regarding the single pulley and the naming of the snail cam, with “drop” being used on occasion. Candidates should be reminded to use the names provided in the specification appendix. Additionally, when functions are given, they should follow the question instructions and record the appropriate letter in the box provided.

(b) **(i)** Well answered, with most candidates correctly naming the linkage.

(ii) Some candidates failed to identify only the fixed pivots and labelled multiple pivot points as fixed.

(iii) When two reasons are asked for, candidates should not list multiple answers in an attempt to gain an advantage. Often, the answers provided were too vague or lacked sufficient explanation to merit credit.

(c) **(i)** Answered well, with most students achieving high marks.

(ii) While the majority of candidates had no issues answering this question, belts were occasionally drawn vertically. Candidates were credited here if the drawing was operational as required. A few candidates used chains instead of belts; candidates should read the question carefully to ensure they answer correctly.

(d) **(i)** Well answered in most cases. When incorrect, some candidates identified the belt as flat or round, attempting to use the words provided in Part (c)(i) to support their answers.

(ii) Well answered by most, with clear diagrams of a good size.

(iii) This question challenged some students’ understanding. While many correctly identified the gear ratios, some struggled to calculate the output speed of A/D.

(iv) This question challenged students, with only a few candidates achieving full marks. Some candidates inverted the formulae or used gears on the same axle for a different gear ratio. Many candidates did not provide their answers in a ratio format.

(v) Error carried forward (ECF) was applied to advantage candidates and often allowed them to access the full 2 marks for this question. The input speed is clearly given in Fig. 5, and candidates should take the time to identify and use key information provided.

(vi) Many candidates failed to identify a rack and pinion in a vertical alignment. Candidates should be aware of real-life applications of mechanisms and understand that they may need to identify and apply different gear types in mechanical systems.

(vii) This question was answered well by higher-ability candidates but caused difficulties for many lower-ability candidates, with some leaving it blank. Lower-ability candidates did not consider the depth from the workpiece and the depth of the hole, while others struggled to understand how to use pitch to calculate the distance travelled per turn of the gear.

(e) **(i)** Generally well answered. Candidates are reminded that generic terms such as 'durable' or 'tough' are not sufficient as suitable reasons. When asked for a reason, candidates should avoid providing one-word responses.

(ii) Most candidates identified the effort but struggled to locate the fulcrum and load. When asked to use arrows and labels, candidates should ensure that it is clear on the diagram where they are discussing. Leaving arrows and labels in the vicinity of the correct answer, without directly identifying the location, will not be awarded marks.

(iii) Well answered.

(iv) This question differentiated candidates based on their mathematical abilities. Many candidates struggled with calculations involving moments of forces, while higher-ability candidates answered this question well.

(v) This question differentiated candidates based on their mathematical abilities. Many candidates were able to identify the correct formulae provided at the front of the exam paper and use them to calculate the mechanical advantage. Error carried forward (ECF) was applied from Part (e)(iv), which often allowed candidates to receive full marks even if Part (iv) was incorrect.

(vi) This question differentiated candidates based on their mathematical abilities. Most candidates were able to identify the correct formulae provided at the front of the exam paper and use them to calculate efficiency. Some candidates did not convert their answer to a percentage by multiplying by 100. Although this was not penalised in this series, candidates should provide efficiency answers as a percentage, in line with the formulae provided on the exam paper's formulae sheet.

(vii) Some candidates produced excellent sketches supported by detailed annotations. Where sketches and notes provided clarity, examiners were able to award the maximum possible marks. However, some candidates submitted sketches with no notes and little to no evidence of redesign, which could not be rewarded.

Q2 **(a)** Most candidates answered this question well. Common errors included naming pilot pressure as a pressure source and failing to write the full names of the symbols, such as using "roller" instead of "roller trip." Candidates should use the full terminology provided in the specification appendix to achieve full marks.

(b) **(i)** Well answered.

(ii) Well answered.

(c) **(i)** Well answered.

(ii) Most candidates were able to successfully identify the method of operation and return for the 3PV shown. However, some described how to actuate the valve instead of stating its method of operation and return, as requested.

(iii) While most candidates correctly drew the connections and symbols for 2x uni-directional flow restrictors in the correct locations, difficulties often arose with the orientations of the symbols, resulting in candidates typically gaining only [1] out of [3] marks.

(iv) Most candidates identified A as being in control of the outstroke but incorrectly used B as controlling the instroke. Components were clearly labelled in Fig. 10; candidates should take the time to read diagrams carefully.

(v) Candidates struggled with the initial part of this calculation and did not appear familiar with calculating the area of a circle, although this is provided in the exam formulae section (point 7) of the exam paper. Error carried forward (ECF) was applied in these situations, allowing many candidates to achieve [2] marks if they then correctly calculated the pressure using the formulae given in (point 5) of the exam paper.

(vi) This question posed a challenge in differentiating candidates of higher ability. Many candidates calculated the instroke force but did not account for the need to subtract the piston rod area from the outstroke area, as calculated in Part (v). Error carried forward (ECF) was applied in cases where candidates had made an error in Part (v), allowing many to achieve full marks.

(d) **(i)** Well answered.

(ii) This question was answered surprisingly poorly, with some candidates unable to identify a pipeline junction as the component used to split the pilot air supply.

(e) **(i)** Well answered by most, with a minority of candidates, as in previous years, seeming not to understand the term “logic.”

(ii) Well answered.

(iii) This question distinguished between those with excellent knowledge and understanding of pneumatic systems and those who were less clear. Top candidates understood the need to separate the logic sequence with commas and presented the sequence in the correct order.

(iv) This question was answered well by the cohort, with many top candidates achieving full marks. There was a notable improvement compared to previous years, with candidates using pilot lines to connect the circuit and producing clear, tidy pilot line connections. A common error was the signal line at the 3PV roller trip for B-, with some candidates failing to connect the pilot line to the pressure source.

(v) This question was answered well by higher-ability candidates but caused difficulties for many lower-ability candidates, with some leaving it blank. Some candidates incorrectly suggested that a reservoir or a flow restrictor could be used, failing to recognise that a flow restrictor would provide a slower output speed rather than a time delay. As noted in the 2023 report, ‘time delays should be specifically referenced when explaining reservoir operation,’ and the use of a flow restrictor should be discussed to allow for alteration of the time delay. Many candidates did not identify the location of the time delay components in their responses.

(f) This question differentiated candidates based on their abilities. Most candidates attempted a response with varying degrees of success. Many used all the space provided, but only some offered a sufficiently detailed response to be credited in the ‘very good’ band. Higher-ability candidates were able to present pros and cons for the manufacturer, while some candidates focused their responses on the workforce rather than the manufacturing business. Descriptions were generally detailed, with many discussing the impacts of their suggestions. Candidates should avoid one-word or brief responses that lack clarity when discussing reasons. Spelling, punctuation, and grammar are assessed in this question.

Assessment Unit 2 Option C: Product Design

Unit Overview

Candidates achieved a full range of marks. More able candidates demonstrated high-level knowledge and accessed the top mark bands. Weaker candidates were able to obtain some marks and accessed the lower mark bands.

Q1 **(a)** This question was attempted by the vast majority of candidates, who achieved marks across the full range. However, a number of candidates copied the I and U profiles from the question without gaining marks in this instance.

(b) **(i)** This area calculation was completed well by most candidates. However, a number of weaker candidates calculated the perimeter instead or did not attempt the question.

(ii) This question served as a discriminator based on candidates' levels of ability.

(c) **(i)** Generally well answered. However, a large number of candidates confused tolerance with a material's ability to withstand forces.

(ii) The majority of candidates achieved at least one of the two marks for this question.

Q2 **(a)** **(i)** A number of candidates did not attempt this question. The majority successfully identified and marked the correct area of the lifecycle, although a small number marked it incorrectly.

(ii) The majority of candidates correctly named some or all of the other four stages of the lifecycle.

(b) This question served as a discriminator based on candidates' levels of ability. Most candidates correctly identified that toy sales were reaching their peak or starting to decline.

(c) The majority of candidates answered with lowering prices and changing advertising strategies. More able candidates also suggested a third method for prolonging the maturity stage of the lifecycle.

(d) This question served as a discriminator based on candidates' levels of ability. A large number of candidates answered it correctly, while a small number misinterpreted the question, suggesting that built-in obsolescence was a method of keeping users safe.

Q3 **(a)** **(i)** The majority of candidates answered this question correctly.

(ii) This question served as a discriminator based on candidates' levels of ability. More able candidates marked the Gantt chart correctly. Candidates who identified and marked the correct durations but made an error with the sequence were still able to access some marks.

(b) The majority of candidates obtained both marks for this question. A small number of candidates identified tools used in making the key fob but did not include marking out tools, and thus did not achieve the marks. Candidates should be reminded to provide the correct number of responses as indicated in the question. Several candidates listed more than two tools, which was not required.

Q4 **(a)** The majority of candidates achieved both marks for this question. A wide range of answers was accepted.

(b) **(i)** This question served as a discriminator based on candidates' levels of ability. A small number of candidates confused ergonomics with anthropometrics.

(ii) This question was generally well answered.

(c) **(i)** This question served as a discriminator based on candidates' levels of ability.

(ii) Most candidates achieved at least one of the two marks for this question. The majority correctly identified that the material was used to pull or straighten the teeth.

Q5 **(a)** Generally, well answered.

(b) **(i)** Most candidates correctly completed this calculation.

(ii) The majority of candidates calculated £640. More able candidates identified the need to include labour costs to determine direct costs and thus achieved full marks.

(c) This question served as a discriminator based on candidates' levels of ability. The majority of candidates made a good attempt at designing a solution that considered all three design features.

Q6 **(a)** Generally, well answered by the majority of candidates.

(b) This question was poorly answered by the vast majority of candidates. Several candidates noted that CAD could be shared electronically between sites.

Q7 **(a)** **(i)** A wide range of answers was accepted, and most candidates achieved two marks. Candidates should be reminded to provide the number of responses requested in the question. Several candidates included more than two properties in their answers.

(ii) Generally, well answered by the majority of candidates.

(iii) Generally, very well answered by the majority of candidates.

(iv) Generally, this question was answered very well by the majority of candidates. Candidates should be reminded to provide the number of responses specified in the question. Several candidates listed more than the two design features requested.

(b) **(i)** The majority of candidates achieved two marks in this question.

(ii) This question served as a discriminator based on candidates' levels of ability.

Q8 This question was attempted by the vast majority of candidates, with very few receiving zero marks. Candidates' scores varied across the mark range, with most achieving marks in the middle bands.

Candidates should be reminded that this is a QWC (Quality of Written Communication) question. They should utilise a range of communication techniques to effectively convey their designs and include detailed annotations to attain top marks.

It is important for candidates to address all the design features in their responses. Many did not identify or justify the main manufacturing techniques used in the construction of their designs.

Principal Moderator's Report

Internal Assessment Overview

Candidates across centres engaged well with both themes, although it was observed that the 'Play' theme was slightly more popular. The majority of centres presented all administrative documents for moderation, with work labelled and laid out in rank order, which facilitated the moderation process. Most centres with systems projects had access to batteries or power supplies to demonstrate a working final prototype. A minority of centres did not have models, jigs, and formers on display but were able to produce them when requested. These should be displayed for moderation alongside the final manufactured prototype.

Most candidates stayed within the 10 A3 page limit and adhered to the required font sizes. However, some candidates did not adhere to this font size limit, and teachers need to ensure that their candidates follow this guidance.

Candidates should be reminded that all sourced images must be referenced according to JCQ guidelines. It was noted, however, that the majority of candidates included these references within their portfolios this year. An increasing number of candidates are using QR codes within their portfolios to link to web sources, which is a tidy way to present this information. However, it is important that pupils check these codes to ensure they work.

The moderation process is aided if portfolio pages are numbered and titled with the headings of the five sections, and if these pages are collated in the correct order. This is particularly important to make it clear where the concept pages end and the development of the solution begins within the portfolios. This issue was noted last year and was still observed in some centres this series.

It is important that candidates sign the Portfolio Cover sample sheet so that quality work can continue to be used for Agreement Trials. Teachers are also encouraged to annotate the eCRS forms to allow moderators to see how marks have been allocated. It is crucial that teachers include annotations of any additional support provided to candidates on the eCRS.

It was noted that an issue this year concerned inconsistent marking and a lack of rigorous internal standardisation in departments where there was more than one class. It is important that centres take time to complete internal standardisation between classes to ensure that marking is consistent across the centre.

The Agreement Trial this year was pre-recorded, and access links for the recording and support materials were provided to centres. Reviewing the annual Agreement Trial support materials is extremely important to ensure that all teachers have access to the guidance provided by the senior moderating team and to gain further clarification of the mark descriptors for this controlled assessment task.

Assessment Unit 3 Design and Manufacturing Project

Unit Overview

Design Thinking, Analysis and Specification

Most candidates are engaging well with this section, choosing a design theme and exploring possibilities within it. Exploration of the theme was demonstrated in a wide variety of ways, including mind maps, client interviews, internet research with analytical evaluation of that research, and product testing. The more able candidates were able to evaluate this exploration and use it to drive the design brief and specification.

Candidates should be encouraged to be analytical in this section and justify what they write, as many are still providing very descriptive annotations, which will limit the marks available to them. Some candidates are still including generic information on materials or components, which is unnecessary unless it is used to inform design decisions.

Specifications would benefit from quantifiable data that can later be used in the evaluation section to aid with product testing. Some candidates are making decisions about their final design solution within the specification and design brief, which is discouraged, as it limits creativity in the concepts section of the portfolio.

The most able candidates are providing analytical commentary on a range of existing solutions, with many summarising how they can use this product research to help generate concept ideas.

To comply with JCQ guidelines, all reference material should include sources; a minority of candidates are still not referencing images used within this section.

Concepts and Analysis

A wide range of skills was demonstrated by candidates in this section. Some outstanding graphical skills were evident, but many candidates often provided limited annotation, highlighting key features without mentioning technical details such as manufacturing processes, materials, or joining techniques. It is important that candidates demonstrate detailed knowledge and understanding of their potential solutions. The more able candidates were able to use succinct annotations to enhance their sketches with analytical design thinking. Candidates should be discouraged from including overly text-heavy annotations in this section.

There was evidence of creative and innovative thinking across many candidates, with some excellent freehand sketching being demonstrated by the most able candidates through 2D, exploded, sectional, and zoomed views. However, many candidates are only producing limited graphics or 2D sketches in this section and would benefit from being encouraged to employ a range of freehand graphical techniques.

Moderators noted there was almost no evidence of CAD being used within this section this year, which can limit the marks awarded to candidates, as no CAD should be used for concepts. However, it was noted that a small minority of candidates continue to use internet images of existing products and closely replicate these in their own concepts. This practice should be discouraged as it limits not only the candidate's creativity but also the marks they can be awarded in this section. It could also be construed as plagiarism.

It is important that centres undertaking a systems approach to the design solution present concepts for both the system and the casing in this section. These concepts can be presented as block diagrams, basic circuits, and simple flowcharts, allowing scope for development in the next section of the portfolio. There was evidence that most system centres were encouraging their candidates to include these within their portfolios this year.

It should be noted that there is no need to create models within the Concepts and Analysis section.

Development of Proposed Concepts: Modelling and Testing

In this section, candidates should develop creative design thinking, explore how their solution may perform, create a working drawing that shows the necessary details to enable the prototype to be manufactured, produce scaled physical models that convey an understanding of form and function, and provide evidence of testing and evaluation of the models. Not all candidates provided evidence of all these areas, which limited the marks they achieved in this section.

It is encouraging that many centres are utilising modelling earlier in this section, allowing it to drive design decisions in the development of the design solution. However, candidates in some centres are still producing a model at the end of the development process and not evaluating it or using it to inform design decisions. It is important that teachers review the Agreement Trial material, which discusses the use of modelling in this section, and pass this information on to their pupils. Some candidates are still including a storyboard of how they made their model rather than an evaluation of the model to inform what design changes are needed in the next stage of their development. Candidates within a small minority of centres did not include any modelling within their portfolios, which limited the marks they were able to achieve.

The most able candidates used their sketches and models to make incremental changes to their initial concept, leading to a fully developed solution ready for manufacture, along with analytical annotations that justified their materials, manufacturing, and fabrication decisions. Weaker candidates produced limited annotations that were mainly descriptive, and some candidates presented final solutions that were almost identical to their chosen concept. There should be clear development in this section, beginning with the chosen concept and ending with the fully developed final solution and working drawing.

Just as storyboarding how the model is made is discouraged, so too is presenting a manufacturing plan in the form of a storyboard. Some candidates are still including this, and it is unnecessary, with page space being taken up that could have been used for more meaningful development of the solution.

In systems portfolios, most candidates showed the development of their system design through circuit design, flowcharts, and PCBs. It is important that some development of the casing also occurs with systems candidates and that models of the casing are produced, tested, and evaluated.

There was evidence of excellent CAD skills across the majority of centres, with a clear improvement from the previous series. It should be noted that some candidates did not utilise CAD at all in this section, with all sketches and working drawings hand-drawn, and still achieved marks in the excellent band. An area of focus for some centres should be how working drawings are presented, as moderators are still seeing work where key dimensions and parts lists are missing, and some candidates are not producing third-angle drawings to BSI standards.

Development of Proposed Concepts: Manufacture

Moderators noted a varied and impressive array of creative and innovative outcomes in most centres, with candidates employing a range of manufacturing techniques. A variety of materials were used, and many centres are moving away from entirely acrylic projects, opting instead for other materials or a combination of materials for the prototypes. Many candidates displayed excellent skill and precision in the manufacture of their outcomes, utilising a wide range of tools and processes. However, some centres are still producing very simplistic laser-cut boxes that do not demonstrate a creative outcome, and these were often marked very leniently.

It was observed that the quality of material finishes in the manufactured outcomes was an issue in some centres. It is important to encourage candidates to finish all materials to a high standard to justify the mark band awarded by the teacher. Often, work with a poor or incomplete finish was being marked leniently and placed in the excellent band.

There was evidence of CAM use in many centres, with more candidates incorporating 3D printing as part of their final solution. However, it needs to be emphasised that there is no requirement for CAM use in this section, and moderators saw top-band work in centres that did not have access to CAM machinery.

Centres need to ensure that templates, jigs, and formers are set out for moderation alongside the final prototype, as well as any models made during the development of the solution. It is important to note that centres following a systems approach need to ensure that candidates are securing PCBs inside their housings and heat-shrinking wires to achieve top marks in this section.

Evaluation

It is important that there is evidence of reflective evaluation, including fitness for purpose, testing against the specification, and valid modifications suggested and sketched to access top-band marks in this section. Some candidates have clearly struggled in this area, either omitting it completely or making only a limited attempt. Centres need to encourage candidates to leave enough time after manufacture to complete this section to ensure they have access to the full range of marks available.

Some candidates are still copying the specification from earlier in the portfolio, which should be strongly discouraged, as it leaves little room on the page for meaningful evaluation. The most able candidates have used the specification as a starting point to conduct in-situ testing on their product and have then used this testing to produce analytical and reflective evaluation points that demonstrate higher-order thinking skills.

Moderators observed that in many centres, excellent testing and evaluation were being carried out, with the more able candidates producing photographic evidence that was then analysed and evaluated in detail, leading directly to meaningful and innovative modifications. However, modifications are an area where many other candidates struggled, often producing superficial sketches that did not differ significantly from the final prototype. Other candidates were able to suggest relevant modifications, but these were not well justified in their annotations.

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