

GCE



**Chief Examiner's Report**  
**Technology and Design**

Summer Series 2017





## Foreword

This booklet outlines the performance of candidates in all aspects of CCEA's General Certificate of Education (GCE) in Technology and Design for this 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](http://www.ccea.org.uk).



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## GCE TECHNOLOGY AND DESIGN

### Chief Examiner's Report

#### Assessment Unit AS 1 Core Paper

This was the first examination for the revised specification in Technology and Design. All questions in the examination paper proved accessible with no evidence of any questions eliciting a low response rate from candidates. A range of marks were awarded from Questions 1 to 5. This was to be expected as these were similar in format to the legacy specification. However, candidates did not perform, in many cases, to a high level in Questions 6 and 7. Question 6 required an extended writing response and assessed Quality of Written Communication. Question 7 presented candidates with two design thinking exercises. Teachers and candidates must review their approaches to these two last questions in the light of the outcome from this series of examinations.

In response to specific questions the following comments are relevant.

- Q1** Most candidates displayed knowledge and understanding of the term “tolerance of a component” although a number restricted their response to the tolerance of a resistor. A surprising number of candidates were not aware of the term “factor of safety”.
- Q2** Candidates who scored well in this question provided two properties of stainless steel which make it specifically suitable for use in cutlery. Some candidates provided generic responses which were not specific to stainless steel. A large number of candidates displayed knowledge and understanding of the reasons for electroplating of cutlery.
- Q3** The same comment can be made about this question as that for Question 2. Candidates were asked to provide main advantages of plywood and MDF as reasons for their suitability in the application identified in response to the question. In a number of instances generic advantages were suggested by candidates.
- Q4** In response to Part (a) most candidates were able to explain the difference between thermoplastic and thermosetting plastics. In Part (b), the best answers provided properties of ABS which make it suitable for the application referred to as opposed to other polymer materials.
- Q5** This question was well answered by a large number of candidates who provided annotated sketches of the extrusion process with appropriate detail. Some candidates confused extrusion with injection moulding.
- Q6** This question was not well answered by a large number of candidates. To obtain high band marks candidates must use technological vocabulary to make relevant points referring to the bullet points contained within the question. This must be done in a coherent and logical manner using good spelling, punctuation and grammar. Some candidates referred to the effect on the environment of the material chosen whilst the question asked about the effect of the environment on the choice of material.
- Q7** In response to this question a number of candidates provided solutions which contained insufficient detail to ascertain their appropriateness or otherwise. In Part (a) the method of attachment had to be quick and easily adjustable, which was not evident in some of the responses. In Part (b) some candidates produced solutions which could not be fitted to the tubular frame whilst others provided overly intricate solutions which would have proved impossible, or at least very difficult, to realise in practice.

## Assessment Unit AS 1 Paper 2

### Option A Electronic and Microelectronic Control Systems

- Q1** (a) The majority of candidates provided the correct answers for Parts (i) and (ii) of this question. A surprising number of candidates used the wrong formula for the time constant in Part (iii). In response to Part (iv) most candidates drew the correct waveform for the charging of the capacitor and discharge after a time period of 2 seconds.
- (b) The calculation of resistor value in Part (i) of this question was well attempted. However, this was not the case with the calculation required in Part (ii). Some candidates appeared not to be aware of the correct formula, whilst others had difficulty manipulating the numerical values in order to arrive at the correct final answer. The output waveform required for Part (iii) was well drawn and a large number of candidates provided correct answers to Part (iv). Some candidates in responding to Part (iv) confused advantages and disadvantages of using PICs rather than 555 timers as required in the question.
- Q2** (a) In response to Part (i) of this question a number of candidates identified the two resistors as pull down resistors but did not state their purpose in the circuit. Part (ii) was generally well answered but some candidates had difficulty in providing the correct logic values for all four of the output conditions.
- (b) The explanation of the principle of operation of a solenoid valve in Part (i) was not well answered in a significant number of cases. Some candidates provided explanations of the operation of a relay in response to this question. The calculation of base resistor required in Part (ii) was not well answered. This calculation is stated in the specification and candidates must practise the procedure required. The circuit required in Part (iii) was well answered.
- (c) Most candidates were able to draw the NAND gate arrangement for an SR flip flop in Part (i). Part (ii) was a challenging question requiring candidates to demonstrate their knowledge and understanding of how to incorporate components and systems to meet specified criteria. A number of candidates were unable to show how the two switches would be connected to provide the function specified in the question but were able to explain how the position of the magnet relative to the reed switch would determine the output state.

### Option B Mechanical and Pneumatic Control Systems

- Q3** (a) This question was answered correctly by almost all candidates.
- (b) This question was generally well answered although some candidates did not provide sufficient detail on the names of the components used or the routes of air flow.
- (c) This question required candidates to design a mechanical system in response to a specified problem. A key component of the question was the 2cm movement of the vibrating plate. Some candidates provided responses which would vibrate the plate but not by the required amount. Whilst scale drawings were not required an attempt should have been made to indicate the sizes of components used to provide the necessary movement.
- (d) This question was well answered.
- (e) This question was generally well answered although some failed to provide the correct answer. In these cases, marks were awarded for method where possible. Candidates are encouraged to practise calculations of this type.

- (f) Most candidates correctly drew the shuttle valve and piping for OR logic in this question. Most correctly drew the components and piping for a time delay. However, a significant number of candidates did not complete a signal for valve C instead creating an A OR B AND C circuit.
- Q4** (a) Part (i) of this question was well answered. In response to Part (ii) the majority of candidates correctly drew and annotated a mechanism to join the shafts. Some candidates did not demonstrate that these should provide a velocity ratio of 1. There was a variety of responses to Parts (iii) and (iv). Candidates are to be encouraged to show the working out of calculations such as these so that method marks can be awarded even in those instances where the final answer is incorrect or missing.
- (b) Candidates mostly demonstrated knowledge and awareness of safety issues associated with mechanical systems although some had difficulty in identifying three separate points.
- (c) In response to this question most candidates correctly located 3/2 valves with an appropriate actuation at instroke and outstroke locations. Candidates demonstrated the ability to pipe these to the 5/2 valve. Most candidates used unidirectional flow control valves to control the exhausting air although some used these in the wrong direction. A minority of candidates correctly added a safety feature to control the circuit.

## Option C Product Design

- Q5** (a) A significant number of candidates answered the Combine part well although some failed to achieve full marks by providing limited answers. The term Reverse was not understood by a large number of candidates.
- (b) A surprising number of candidates were not able to provide a sufficiently detailed explanation of a specific characteristic associated with a patent in response to this question.
- (c) This question was answered reasonably well, with most candidates achieving 1 or more marks.
- (d) The two main characteristics of JIT were well answered but some candidates repeated the same answer for both in a slightly different format. Right first time was generally well answered.
- (e) A significant number of candidates failed to answer this question to the standard required to achieve high band marks.

Candidates could benefit from the use of enlarged drawings to clarify their ideas and from clearly showing how parts are connected together.

A number of candidate's design solutions did not connect the two support brackets together. For the Part (ii) of this question, the solutions presented, in some cases, were not practical or likely to be functional.

- Q6** (a) Both parts of this question were answered well by candidates demonstrating a clear understanding of the nature and use of secondary research.
- (b) Candidates displayed a sound knowledge of the 3D printing process and most scored well in this question.
- (c) This question was answered well. However, some candidates repeated the same answer for the second characteristic.

- (d)** This was another question that was answered well showing a clear knowledge and understanding of the use of a Gantt chart. As in Part (c) some candidates repeated the same answer for both characteristics.
- (e)** A large number of candidates provided a response to this question which dealt with the actual testing products as opposed to selection of products for testing using statistical methods.
- (f)** This question was well answered by the vast majority of candidates.
- (g)** The points mentioned in relation to Question 5(e) also apply to this question. A number of responses lacked detail and clarity. Some concentrated too much on redesigning the actual handle of the ball thrower as opposed to designing a means of securing it to the wrist of the thrower.

# Assessment Unit AS 2 Coursework: Product Development

## Principal Moderator's Report

### Overview

Most centres have continued to adhere to the necessary procedures for assessment, administration and moderation with labeling and layout of work, and annotation of Candidate Record Forms which have been adopted from the legacy moderation procedures. With a significant increase in centre error in relation CRS completion some centres were reminded that Candidate Record Forms have been renewed for this revised unit and all centres are reminded that the A2 coursework for the incoming series will, in turn, have a new layout Candidate Record Form. Centres are thanked for the warm welcome extended to moderators during the moderation period and for their continued professionalism in relation to the moderation process.

In broad terms, the number and scale of adjustments is reflective of the introductory nature of this specification and centres are encouraged to make use of support events, visits and agreement trials as appropriate throughout the year.

Support Events, Visits and Agreement Trials continue to provide invaluable opportunities to assist teachers in becoming familiar with appropriate product selection and standards within this revised specification. Attendance at Agreement Trials annually is of paramount importance and presents teachers with the valuable opportunity to review the work of candidates, first hand, in an effort to support continued communication of standards and approaches to the delivery of this unit.

### Investigation and Analysis

An understanding of the requirements of this section has been well inherited from the legacy specification with a majority of candidates' work continuing to be in the medium or high bands. Centres are reminded to reiterate to candidates the importance of precise attention within this section to the selection and analysis of a suitable product with an appropriate capacity for redevelopment.

Sustainable design and development can be understood to be that which meets the needs of the present, without compromising the ability of future generations to meet their own needs. Obviously, analysis of sustainability issues should extend beyond 'recycling', as featured in isolation in some centres and could focus upon areas such as dematerialization, multi-functionality, durability, packaging and transportation considerations. It is clear that some centres have encouraged candidates to address the area of sustainability in sufficient detail, however, it is equally apparent that a minority centres have been oblivious to the nuances of this change to the legacy specification. It should also be noted that efforts should be made to use the information gleaned from the investigation and analysis, to inform the design and development process, in the forthcoming sections of the unit.

### Re-design Solutions and Development

The quality and number of specification points continue to vary significantly across centres with some centres continuing to support candidates to produce only superficial specifications comprising a list of general points in relation to their identified product. This is an unacceptable candidate oversight as GCE level. The specification must include quantifiable/measurable/specific points which will assist candidates when they come to design, test and evaluate the product. The key points in the re-design specification should reflect the areas candidates intend to develop. This must be a primary area for development for some centres.

Imperatively, within this section, innovative design thinking must be evident and nurtured to support the design, development and forthcoming manufacture of an innovative redesign solution. As already indicated, candidates' initial product selection, crucially, must be focused upon its capacity for innovative development in order to excel within this section and ultimately this unit. Many of the design developments presented by candidates lacked innovation and suitable annotation. Candidates are not consistently presenting a high quality, detailed sequence of redesign developments. In too many cases, candidates are simply moving from concept presentation to final design and a meaningful design pathway is, often, not truly evidenced or even considered. Some good modelling has been evident this year, but many candidates are not yet using this process effectively to inform design nor are they demonstrating how the modelling has influenced their design thinking. Assessment differences within this section have most significantly contributed to centre adjustments.

In some cases, more care should be taken to improve the standard of graphical communication and the value of the design thinking to be communicated rather than a formulaic approach to completing design pages which do not innovatively develop the existing product. A good mix of hand graphics and Computer Aided Design (CAD) skills continue to be used across most centres. Guidance should be given to candidates which encourages them to develop their skills in relation to design communication, but also ensures they showcase their design thinking most coherently, working strategically to accumulate credit within this section in a manner which best suits their developing strengths.

In broad terms, the standard of working drawings and plans for manufacture is varied. Some centres provided excellent working drawings, including individual parts lists, while others provided drawings with unrealistic measurements and were often hard to distinguish. A number of candidates also used Gantt Charts ineffectively, with these taking up a majority of an A3 page, with the working drawing squeezed into the remainder. Care should be taken to maximize the efficient use of the limited number of A3 design pages within this unit. Candidates would benefit of being reminded of this fact. Care should continue to be taken to ensure the dimensions on these drawings are achievable by the candidate within the school environment.

### **Making**

Given that innovation is inherently embedded within the redesign work in the previous section of this unit, it follows that manufactured outcomes need to reflect and realise this innovative design thinking, especially to access marks within the high band.

Quality of Making was broadly comparable with that of Manufacturing in previous years however some centres are producing work that would be considered more of a problem solving or a design and make activity. This does not align with the re-design aspect of this unit.

The use of 3D printing and laser cutting was evident in most centres, while also being supported by other workshop processes. It remains the case that a minority of centres seem to believe that an outcome that incorporates a large number of processes should automatically fall into the top mark band. This is not always the case and imperatively, high quality outcomes cannot be considered to be achieved, where the outcome has failed to be an improvement on the original design and/or where the outcome lacked quality of finish and detailed consideration to aesthetics, ergonomics or functional characteristics.

It would appear as though some centres still encourage candidates to produce a 'storyboard' of manufacture. This is not required and photographed work in this section should be used to highlight any aspect that may be easily overlooked during moderation, for example, internal machined parts. Storyboards are rarely a particularly effective mechanism for recording modifications made during making and candidates would benefit from endeavouring to include this aspect within the plan for manufacture.

Centres are reminded that candidates should complete manufacture within their own school or college and attention is drawn to section '7.2 Setting the tasks' of the specification:

'Teachers should give guidance in the planning and realisation of each internal assessment task to ensure that: [...]

- tasks do not contravene Health and Safety at Work legislation; and
- the candidate's school or college can facilitate the design and realisation of the task.'

Care should be taken to ensure candidates do not complete work for which they cannot receive credit.

### **Testing and Evaluation**

The quality of this section invariably depended greatly on the quality of specification generated in Section 2. In some centres the final product was not photographed being tested in situ and had limited evidence of realistic testing. Future modifications were often an afterthought and provided to fulfill the section requirements, rather than inform actual high-level modifications. Some centres did provide good quality modifications and this was mostly through CAD drawings. Overall it was the lack of future modification drawings that was noted as a weakness in this section.

All too often this section appears rushed. Testing of the product is not only an extended written aspect of the unit but is an essential part of verifying that the re-design solution has been designed and realised to the specified standard. Too often poor specifications are used to evaluate the outcomes. Future modifications are in many cases only suggested, lacking any real detail. Best examples of future modifications are produced when students present their new ideas with detailed annotation. This section gives candidates the opportunity to showcase their work and point out finer details and meaningful opportunities for future work to the Moderator.

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