

Design and Technology: Industrial Technology

General Certificate of Secondary Education **J304**

General Certificate of Secondary Education (Short Course) **J044**

Examiners' Reports

January 2011

J304/J044/R/11J

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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.

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Chief Examiner's Report

This report provides an overview of the work seen in the written examination Units 2 and 4 and the Controlled Assessment Units 1 and 3, for candidates who took the examination during this series. It precedes a more detailed report to centres from each subject area within the Innovator Suite and highlights general issues that have occurred across the suite of specifications.

This report has been prepared by the Chief Examiner, Assistant Chief Examiners, Principal Examiners and Principal Moderators and covers all specifications within the Innovator Suite. It should be read in conjunction with the examination papers, the mark schemes, and the marking criteria for assessment given in the specification booklets.

This is the first examination series in the second year for the new Innovator Suite.

A reminder: An important point for teachers to note about the Terminal Rule in relation to this suite of specifications and re-sits:

The terminal rule is a QCDA requirement. Candidates must be entered for at least two units out of the four (full course) at the time that they certificate. i.e. the end of the course.

Please be aware that the QCDA rule states that marks scored for terminal units will be the marks used in the calculation of candidate grades. Therefore, if one of the candidate's terminal units is a re-sit and the mark is poorer than the original mark, the poorer mark will be used to calculate the final grade for that candidate.

Obviously, the terminal unit marks are then added to the highest marks scored in the other units making up the certificate.

Centres are reminded that it is also a requirement of QCDA that candidates are now credited for their accurate use of spelling, punctuation and grammar across all four units.

It is pleasing to see that centres and candidates have continued to respond well to the new style of examination approach. Centres are to be commended for this.

Written Examination – Units 2 and 4

Unit 2 – For this examination series of the GCSE Innovator suite entries were seen from all six subject specialisms:

A512 Electronics and Systems Control
A522 Food Technology
A532 Graphics
A542 Industrial Technology
A562 Resistant Materials
A572 Textile Technology

Entries were significantly increased this session giving a more realistic idea of candidate performance. The overall performance and range of results for Unit 2 has improved. Performance however, within subject specialisms is still varied.

Many of the candidates demonstrated a general awareness of the main points and issues linked to sustainable design and the 6Rs.

Unit 2 – Section A: Most candidates across the suite attempted to answer all questions, with few candidates giving no response (NR) answers. It was noticeable that, at times, candidates had not read the instructions correctly and centres would benefit from explaining the correct examination requirements to the candidates. Candidates need to be encouraged to give an answer for the multiple choice style questions even if they are uncertain that they are correct. There was less duplication of circling answers seen during this examination session.

Unit 2 – Section B: A greater mixture of responses was seen and teachers need to ensure they read the subject specific reports for further detailed feedback on specific issues and individual question performance.

In general, candidates lacked the specific knowledge and understanding required to answer some questions in depth. Many candidates did manage to use subject specific 'terms' in their answers, but at times these lacked sufficient depth and tended to be generally weak.

Candidates need to be made aware of the importance of the wording of each question and they need to understand the difference between terms like 'name', 'discuss' and 'explain'. Many candidates did not score marks on the explain questions, because they gave a list of unrelated points instead of developing one of these.

Important: Candidates need to be careful that they do not repeat the question in their answer or write the same answer for several questions. Such answers included:

'Environmentally friendly' and 'better for the environment' or 'damages the environment'.
To 'recycle' and 'recycling' is good for the environment.

The questions marked with an asterisk * provided candidates with an opportunity to give a detailed written answer combining good subject knowledge with an ability to produce a structured response. Few candidates were able to do this really well, but most candidates did score two or more marks from the six available for this question.

Hand writing at times was difficult to decipher and candidates need to be prepared to make an effort with their hand writing, particularly on the banded mark question * and questions requiring a detailed explanation or discussion of points.

Centres are reminded that candidates are marked on spelling, punctuation and grammar on the banded mark scheme question. It is also important to note that candidates need to ensure that they write legibly and within the areas set out on the papers.

Unit 4 – For this examination series of the Innovator suite entries were seen from the following subject specialisms:

A514 Electronics and Systems Control
A524 Food Technology
A534 Graphics
A544 Industrial Technology
A564 Resistant Materials
A574 Textile Technology

The overall performance of candidates varied considerably across the suite of subjects for Unit 4. However, it was encouraging to find that many candidates did demonstrate a good understanding of the technical aspects of designing and making in most of the specification areas this series compared to last year.

Areas of Unit 4 which Principal Examiners highlighted as being of particular concern are:

reading questions carefully – the majority of candidates attempted all the questions this series. It is important that candidates do read the questions carefully to determine exactly what is required. It can be helpful for candidates to highlight what they consider to be the 'key' words or instructions before completing their answer.

clear and accurate answers – in questions that require candidates to produce sketches and notes, it is essential that answers are made as clear and technically accurate as possible. Marks may be compromised through illegible handwriting and poor quality sketches.

It is apparent this series that candidates need to be practiced in examination technique; reading the questions carefully, responding to the instructions given in the questions and having an awareness of the full range of question formats.

Centres are to be reminded that questions marked with an asterisk * provide candidates with the opportunity to give detailed written answers combining good subject knowledge with an ability to produce structured, coherent responses and accurate spelling. A list of bullet points does not represent an adequate answer. Practice of this type of question which carries [6] marks is strongly recommended. There are two of these type of questions within Unit 4.

Controlled Assessment – Units 1 and 3

Unit 1 – For this examination series of the Innovator suite entries were seen from the following subject specialisms:

A511 Electronics and Systems Control
A521 Food Technology
A531 Graphics
A541 Industrial Technology
A561 Resistant Materials
A571 Textile Technology

Unit 3 – For this examination series of the Innovator suite entries were seen from the following subject specialisms:

A524 Food Technology
A533 Graphics
A563 Resistant Materials
A573 Textile Technology

This examination series has seen portfolios for all subject specialisms being submitted both through postal and repository pathways. Most centres have been prompt in the dispatch of documentation to OCR and moderators, which is to be commended. It is important that centres forward form CCS160 in particular to moderators.

Important Note: Centres must ensure that if candidates are entered through the repository (01), the marks must be downloaded onto the OCR site and **NOT** sent through to the moderator on a disc. This is classed as being a postal (02) moderation.

In general, centres have been successful in applying the marking criteria for both Units 1 and 3. However, it is still noticeable that some candidates were being awarded full marks for work that lacked rigour and depth of analysis. Words highlighted on the marking criteria grids such as 'appropriate', 'fully evaluated', 'detailed' and 'critical', which appear in the top mark band, were not always adhered to.

Centres are reminded to apply the mark scheme on a 'best fit' basis. For each of the marking criteria, one of the descriptors provided in the marking grid that most closely describes the quality of the work being marked, should be selected. Marks should be positive, rewarding achievement rather than penalising failure or omissions.

It was still evident that a significant number of portfolios, particularly for Unit 1, resembled the legacy format. Care must be taken here to ensure that the marking criteria and format of the Innovator suite is not confused with the legacy approach.

It is important that centres encourage candidates to organise the portfolio according to the different marking criteria strands as it enables the candidates to produce work that clearly shows an understanding of the controlled assessment requirements. Portfolios should be clearly labelled with the Candidate and Centre name and number, with the unit code and title also evident. (*Specification – 5.3.5 Presentation of work*) This is particularly important when the Centre submits work via the OCR Repository, where individual files are used to store portfolio work. Centres need to ensure that candidates clearly label each file using the marking criteria section headings; this facilitates a more effective completion of the moderation process.

Centres are also reminded to ensure that the OCR cover sheet is evident on each portfolio of work, **outlining the theme and the starting point** chosen by the candidate.

Many candidates included a bibliography or referenced their research sources, which was pleasing to see. It is good practice to ensure that candidates acknowledge sources of information used for the development of their portfolio work.

There was still some evidence this series of strong teacher guidance influencing candidate portfolios. Where this was evident it greatly hampered the candidate's ability to show flair and creativity, and therefore achieve the higher marks. Centres should avoid over-reliance on writing frames for candidates work.

Centres are to be reminded that the '*controlled assessment task must NOT be used as practice material and then as the actual live assessment material. Centres should devise their own practice material using the OCR specimen controlled assessment task as guidance.*' *Specification – Section 5.2.2 Using Controlled Assessment Tasks.*

It was noticeable that where candidates had scored the high marks, they had used specialist terms appropriately and correctly and had presented their portfolio using a structured format.

Centres are to be commended on the amount of work produced for the portfolios in Units 1 and 3, which has been realistic in terms of the amount produced and the time allocated to each unit – 20 hours.

Unit 1 – specific areas of importance

Centres are to be reminded that Themes for Unit 1 are based around environmental awareness and sustainable resources/processes. Therefore, it is considered good practice for teachers to encourage candidates to consider Eco-design and sustainability when making decisions and combining skills with knowledge and understanding, in order to design and make a prototype product. This knowledge base also acts as a 'spring board' to active learning for Unit 2.

It was evident through the portfolio that candidates struggled with the critical evaluation section of the marking criteria. Unit 1 requires that the candidate evaluates the processes and subsequent modifications involved, in the designing and making of the final prototype ONLY. Too many references were made to the performance of the prototype against the specification, which meant that candidates' marks were compromised. (Not applicable to Food Technology)

Unit 3 – specific areas of importance

Due to the low number of entries for this unit specific guidance is limited. However, centres need to ensure that candidates complete a quality product for Unit 3. The weighting of marks available for the making section therefore, must be reflected in the time available for the candidates to complete a quality product.

A541 Introduction to designing and making

Overall Comments

There was only a small entry of candidates for this January series. No centres used the Repository or submitted work electronically, with all centres choosing to submit work as traditional paper folders for postal moderation. Folders were generally well organised but some centres are still not making use of the Controlled Assessment Cover Sheets. Comments made on the sheets prove very useful to moderators to justify how centres have awarded marks in each section.

Centres are reminded of the importance of clear photographs that are a suitable size for the moderator to be able to judge the quality and suitability of the completed prototype. Some centres are still using a writing frame approach in this unit and there is clearly much evidence of teacher led lessons, particularly in the early parts of the folder. Whilst this can be useful, particularly to the less able candidates, it can stifle creativity in candidates who would be expected to perform at higher levels within the assessment criteria.

Centres are reminded that MS1 mark sheets, CCS160 Authentication Form and Controlled Assessment Cover sheet should all be sent to the moderator with the sample of work (it would also be helpful to complete the CSF form for all candidates, although this is optional). It would be helpful if a CSF form could be submitted showing the mark breakdown for ALL candidates at the centre, not just for those in the selected sample. It was pleasing to see that most centres have taken on board the time requirements of the new specification and have cut down on the amount of paperwork submitted. Fine tuning of this still needs to take place in some cases. Centres are reminded to look closely at the marking criteria and produce work that specifically targets the marks available. Most candidates chose to investigate the Can Crusher in this examination series.

Centres are reminded that candidates should acknowledge the work of others in their folders and the sources of information obtained.

Creativity

Candidates are still producing large quantities of research, but are not filtering and processing it effectively. Centres need to encourage candidates to target research work more precisely and to make reasoned conclusions at the end of the research. For example, how will what they have found out influence their design thinking?

Candidates need to draw conclusions at the end of any research in order to put into context what they have found out. Candidates who produce pages of unrelated annotated research do not score highly. Typical examples of this are where candidates produce quantities of research on pre-manufactured components and mechanisms, including illustrations and notes with no conclusions drawn as to how this may influence their design outcomes.

Where candidates did attempt to analyse their research it was not always used effectively to help in their following design stages. Centres are reminded to look at the folder as a whole before making mark allocations in this section. Has the work produced here led to creative designing and making later?

Designing

This section proved challenging to the majority of the candidates. Creative ideas were lacking and the standard of drawing was poor in many candidates' work. Too many candidates were producing very basic two dimensional drawings with little or no construction details, or annotation evident to support ideas. Often their designs were copies of the ideas from their existing product research.

Modelling, either computer or 2D/3D was almost entirely absent from all candidates portfolios. ICT work to support designing and modelling was noticeably absent. Most candidates had attempted the Can Crusher option, where modelling would have been useful, if not essential, in the design stages for linkages etc.

The transition from design ideas to making could have been done better. Candidates really need to finish their designing stages with some brief conclusions. For example, which idea they are choosing to develop/proceed with and why? There was little evidence of development of a final design into a workable outcome in many folders. Working drawings in any sort of format showing full dimensions for making were also lacking in many candidates' work, thereby limiting access to marks.

Making

Centres need to be reminded that candidates are expected to produce a **working prototype, not a model or mock-up**. For this reason the selection of an appropriate material(s) for making must be paramount. Many candidates were producing outcomes in unsuitable materials. Whilst MDF may be appropriate for a prototype can crusher, Corriflute is not. Likewise, it is not appropriate to make a hole punching device from Pine and MDF. Centres need to look carefully at how candidates approach practical work. Whilst clearly the time element must be considered, centres must try to develop strategies that allow meaningful work using appropriate materials in the time allowed. Successful candidates approach this by providing an LM4 aluminium casting of a machine vice as a 'Pre Manufactured Component'. Candidates design around this component and improve or modify it for a more specialised task. This facilitates meaningful design and practical work using suitable materials in an appropriate time frame.

Recording of key stages during the making was done well by many candidates. Successful candidates produced a competent sequence record, well illustrated with clear digital photographs and with a brief but effective written commentary.

Descriptions of their attempts to solve technical problems during the making were less satisfactory. Many candidates had no evidence of this in their portfolios or the attempts at describing the problem and effective solution were vague. Due to the material chosen by many candidates for their prototype, they had little opportunity to demonstrate the use of anything other than a most basic range of tools, processes and materials.

Critical Evaluation

Many candidates did not perform well on this section, with few scoring marks in the higher band. Centres are once again reminded that candidates should not be evaluating the function of the prototype but the designing, modelling and making stages. Many candidates used the majority of this section to evaluate the function of the completed prototype and therefore scored less marks. The correct use of specialist terms was also weak in many candidates' work.

In summary, candidates who did well had:

- Evidence of research which was evaluated and informed the production of their brief and design specification.
- Generated a range of well drawn and thought out ideas which were annotated and showed a good level of detail.
- Evaluated ideas in detail which then gave the opportunity to show evidence of design development with reasoned conclusions.
- Proposed an effective final working drawing, with dimensions.
- Shown evidence of a realistic work plan.
- Made a complete working prototype in suitable materials and recorded the making process effectively, highlighting problems encountered and how these were overcome.
- Evaluated the designing and making processes effectively and not the function, finish and use of the prototype.

A542 Sustainable design

General Comments

The overall performance and range of results reflected candidates' awareness of the main points and issues linked to sustainable design. Many candidates exhibited a sound knowledge across the whole range of questions, which was pleasing and demonstrated an excellent understanding of sustainable issues.

The question marked with an asterisk* provided candidates with the opportunity to give a detailed written answer, combining good subject knowledge with an ability to produce structured, coherent responses. While there were some excellent individual points made, none of the candidates achieved full marks. It should also be noted that the use of bullet points is not an appropriate way to answer this question, and such answers will be awarded marks in the lower range.

Section A

Question 1

This question was quite well answered. The correct answer being - Global company.

Question 2

This question was often answered incorrectly. The correct answer being – Restrictions on the use of hazardous substances.

Question 3

This question was well answered. The correct answer being – Miniaturised products.

Question 4

This question was quite well answered. The correct answer being – Carbon footprint.

Question 5

This question was well answered. The correct answer being – Solar energy.

Question 6

This question was fairly well answered and a significant number of candidates gave the correct answer, which was product life cycle.

Question 7

This question was very well answered – recycling.

Question 8

Very few candidates gave the correct answer, which was non-renewable.

Question 9

A majority of candidates gave the correct answer, which was polystyrene. However, several candidates put recyclable plastic, which was not correct.

Question 10

A significant number of candidates gave the correct answer – bio-degradable.

Question 11

This question was well answered by the majority. False - thermosetting plastics can be recycled.

Question 12

This question was well answered by the majority. False – a product that can be reused has built in obsolescence.

Question 13

This question was well answered by the majority. True – waste from production should be reduced.

Question 14

This question was well answered by the majority. True – planting trees will offset carbon footprint.

Question 15

This question was well answered by the majority. True – modular design is better for servicing and repair.

Section B

Questions 16 – 18

These questions required candidates to respond with more extended writing, sketches or notes. Fifteen marks were available for each full question.

Question 16

- (a) This question required an understanding of the following 6Rs – recycle, reuse, repair, rethink.

The question was extremely well answered with most candidates gaining at least three marks. The only part to cause a problem for some was rethink of the nylon lines.

- (b) (i) This question related to a reduction in packaging for a hammock. It was generally well answered with most candidates gaining at least two marks. Many gained full marks.
- (ii) This question involved describing a sustainable packaging method for a hammock. This was generally poorly answered with few candidates gaining both marks. Vague references to using biodegradable materials were common.
- (c) (i) This question related to the impact of manufacturing polythene and polystyrene packaging on the environment. This was generally poorly answered with many candidates giving vague reference to pollution caused by oil-based products. Often the examples given were not related to manufacture.
- (ii) This question looked at the impact of polythene and polystyrene packaging disposal. This was well answered by the majority with most gaining at least two marks out of the three.

Question 17

- (a) (i) The majority of candidates gave the correct answer as chair B (hardwood chair), being made from a renewable resource.
- (ii) Most candidates were able to identify injection moulding and bending as two processes used for making the polypropylene chair. However, many just wrote moulding, which was not acceptable.

- (iii) Many candidates gave the correct answer – anthropometrics.
- (iv) The majority of candidates stated correctly that BS stood for British Standards.
- (b) Many candidates were able to explain the concept of sustainable sources.
- (c) The majority of candidates were able to describe what is meant by recycled materials.
- (d*) This question required a detailed written answer, combining good subject knowledge with an ability to produce a well structured, coherent response. However, none of the candidates achieved full marks and the majority gained an average of two. This seemed to be largely down to candidates not having a detailed knowledge of the ETI, which caused a great deal of repetition. Many candidates also wrote only a few lines, which limited the marks they could achieve. Candidates should also be made aware that the use of bullet points is not appropriate in this question, and will result in a maximum of Level 1 marks being awarded.

Question 18

- (a) The vast majority of candidates gave the correct answer as kinetic energy for winding the torch.
- (b) This question was well answered by most candidates who demonstrated a good understanding of the benefits of rechargeable batteries.
- (c) Many candidates failed to give specification points that related to the sustainability of the materials, which was the requirement of the question.
- (d) Most candidates gained at least one mark for realising that injection moulding produces little waste.
- (e)
 - (i) Most candidates were able to identify the causes of carbon footprint but failed to link the point to manufacture.
 - (ii) Candidates often failed to gain full marks, because they did not realise that the operation of the torch is carbon neutral.
- (f) The majority of candidates did well on this question, and were able to identify disassembly of the component parts prior to recycling.

A544 Technical aspects of design and making

General Comments

It was evident that, in a number of cases, candidates had not always read questions carefully, resulting in inaccurate or inappropriate responses. It is most important that candidates take time to read through the question paper thoroughly before attempting to answer questions.

Responses to some questions indicated a considerable variation in candidates' knowledge and understanding of engineering processes used both in the school workshop and in industry.

Where a question requires candidates to produce a sketch as part of the response, it is important that the sketch is clear and suitably annotated. Sketches used in the design questions were often of rather poor quality, making interpretation more difficult for examiners.

Comments on Specific Questions

- 1 (a) (i) Very few candidates scored well on this question, with the grub screw and wing nut very rarely being named correctly. Simplistic responses, such as 'screw' and 'bolt', were accepted as suitable in the context of this question.
- (ii) Despite being unable to name the grub screw in part (a)(i), most candidates answered this question correctly, recognising the allen key as fitting the hexagon socket in that component.
- (b) This question was answered reasonably well, with a number of appropriate responses being seen, including the use of locknuts, thread sealant, and locking washers. The suggestion that the nuts could be soldered or welded was not accepted as a suitable response.
- (c) Very few candidates gave a good explanation in this question, with most simply referring to the lower cost of pre-manufactured components. Better explanations included reference to the advantages of standardization and/or the savings brought about by a manufacturer not having to make the components.
- 2 (a) Most candidates were able to give at least one reason why mild steel was a suitable material for the hosepipe support, but a significant number seemed to think that it was corrosion resistant. Responses such as 'strong' and 'cheap' needed to be qualified to gain marks.
- (b) This question was generally well answered, with the majority of candidates identifying iron as the main constituent in a mixture of metals.
- (c) Few candidates scored full marks on this question, although the use of jigs did seem to be better understood than has been the case in previous examination sessions. In most cases the limiting factor was the need for all the supports to be identical. Marks were awarded for each specification point met in a clearly workable design.
- (d) Most candidates scored marks here, with simple and effective triangulation being the most common approach. Increasing the thickness of the steel was another frequently seen acceptable response, but marks were often lost through elements of repetition in the two methods shown.

- 3**
- (a)** It was apparent, from responses to this question, that some candidates had little or no experience of the lathe, or processes carried out on it. It was disappointing to see this, particularly as candidates might be expected to use a lathe in their project work during the course. In many cases, the standard of sketches used in responses to this question was poor.
 - (b)** This question was well answered, with the majority of candidates giving three appropriate safety precautions. The most popular safety precautions given related to the use of goggles and guards, but covering loose clothing and providing a safe working environment were also mentioned. Most precautions given were generic rules for workshop machine use, but their relevance to lathework was fully acceptable.
 - (c)** A number of candidates were able to give two factors for deciding centre lathe speed, but few gave three that were relevant. The need to use different speeds for different operations was not often mentioned as a factor to be considered.

- 4**
- (a)**
 - (i)** The majority of candidates correctly gave CAD as standing for Computer Aided Design.
 - (ii)** Most candidates scored at least two marks on this question, the most common benefits to the designer being given as the ease of making changes and saving designs. Reference to CAM was only accepted if this related to the use of a Rapid Prototyping system within the design stage
 - (b)** This question asked for the names of two specific plastics suitable for the charging station, and ABS and HIPS were frequently given. The use of generic terms such as 'Thermoplastic' was not acceptable as a response to this question.
 - (c*)** Good explanations were rarely seen in the responses to this question, and it discriminated well across the ability range. This type of question is a very good example of the need to read through the question carefully in preparation for producing a suitable response.

Most responses seen made brief reference to batch/mass production or the making of awkward shapes in plastic, but very few detailed responses were produced.

Marks were awarded for well-written answers, despite technical content often being weak (QWC).

- 5**
- (a)** Most candidates scored well on this question, but a number named machines rather than the hand tools asked for in the question.
 - (b)** Plastic/powder coating and varnishing were the most frequently given responses to this question. A number of candidates, however, failed to take account of the fact that the arrow was made of aluminium alloy, and suggested galvanizing as a suitable finish.
 - (c)** Knowledge of industrial processes appeared to be quite limited in many cases, and responses to this question were disappointing. Very few candidates scored full marks on the question, with many only being able to give 'pressing/stamping' as a process that could be used.

- (d*)** It was again apparent that knowledge of industrial production was limited, with a significant number of candidates being unaware of 'high-volume production' as a manufacturing method.

A few candidates made reference to the cost of machines or changes to the workforce, but most responses lacked any real technical content. In some cases candidates related the term 'high-volume' to the amount of noise in the workplace.

Marks were again awarded for well-written answers, despite technical content being weak (QWC).

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