

Design and Technology: Industrial Technology

General Certificate of Secondary Education **J304**

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

Examiners' Reports

June 2011

J304/J044/R/11

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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 second 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 an Ofqual 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 Ofqual 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 Ofqual 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.

It is obvious that Centres have benefitted from previous reports and training sessions available for the qualifications.

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 Control Systems
A522 Food Technology
A532 Graphics
A542 Industrial Technology
A562 Resistant Materials
A572 Textiles Technology

The overall performance and range of results for Unit 2 was similar to the last examination session - January 2011. It was pleasing to see that many candidates had been well prepared for the examination by Centres and clearly had a sufficient knowledge base to answer the questions. It has been encouraging to see that candidates have been able to access the higher marks. Performance however, across the 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

In **Unit 2 - Section A** of the papers 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. Centres are reminded that questions 1-15 cover the grade range from A* to U.

There was less duplication of circling answers seen during this examination session.

Important: Centres need to be aware that where a candidate has provided multiple answers to a single response question, no marks will be awarded.

Unit 2 - Section B of the papers showed a greater mixture of responses and teachers need to ensure they read the subject specific reports for further detailed feedback on specific issues and individual question performance.

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 full marks on the 6 mark extended response or discuss 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. Similarly candidates must not use certain terms as 'stock' answers. Such answers included:

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

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.

Centres are reminded that candidates are assessed 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 Control Systems
A524 Food Technology
A534 Graphics
A544 Industrial Technology
A564 Resistant Materials
A574 Textiles Technology

Candidates responded well to the Unit 4 examination papers across the Innovator Suite. The papers were accessible to the majority of candidates, although there was still a small minority of candidates who did not attempt any of the questions at all.

The overall performance of candidates varied considerably across the suite. It was encouraging to see however, that most candidates demonstrated a good understanding of the technical aspects of designing and making across the specifications.

Candidates need to:

- **Read through the complete question before attempting to answer.** The examination includes sufficient reading time for candidates to focus on the key points to address in their answers. It was pleasing to see that some candidates produced a 'plan of action' before giving their answer to the questions with a high mark allocation.
- **Look carefully at the mark allocation and available space for their answers.** Candidates need to be aware that there is a relationship between the space available and the length and quality of the expected answer, and thus the mark allocated.
- **Have a better understanding of the different command words used throughout the exam paper in order to respond appropriately to the questions.** Across the suite there were many answers that lacked detail and clarity. Terms such as 'cheaper', 'quicker' and 'easier' were often used and meant very little without qualification or justification. Practice of previous questions is extremely valuable to help candidates become more confident.
- **Become familiar with the quality of written communication questions marked with an asterisk*.** These questions 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. Simply repeating the same point several times will not lead to the award of marks. A list of bullet points does not represent an adequate answer and will compromise the higher marks. Practice of this type of question which carries [6] marks is strongly recommended.
- **Respond to specification and/or bullet points accurately.** In design-type questions this is important if the candidate is to achieve the maximum marks available.
- **Make their answers clear and technically accurate.** 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.

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 Control Systems
A521 Food Technology
A531 Graphics
A541 Industrial Technology
A561 Resistant Materials
A571 Textiles Technology

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

A513 Electronics and Control Systems
A524 Food Technology
A533 Graphics
A541 Industrial Technology
A563 Resistant Materials
A573 Textiles 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: Candidates producing paper portfolios should be entered for postal (02) moderation. Candidates producing their portfolio on a CD or memory stick should be entered for postal (02) moderation.

Centres must ensure that if candidates are entered through the repository (01), the portfolios must be uploaded via Interchange and **NOT** sent through to the moderator on a disc.

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 which may mean allocating marks across the assessment grid. For each of the marking strands, one of the descriptors provided in the assessment 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, especially in terms of the excessive research and inappropriate critical evaluation.

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.

Important: Centres are also reminded to ensure that the OCR cover sheet is included with 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.** 5.3.2 *Definitions of the Controls* section in the specification states: "The teacher must be able to authenticate the work and insist on acknowledgement and referencing of any sources used".

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 individuality, flair and creativity, and therefore achieve the higher marks. Centres should avoid over-reliance on writing frames for candidate's work which, while assisting struggling candidates, clearly will affect the ability of able candidates to show their skills and thus gain high marks.

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 need to ensure that all research work undertaken for units 1 and 3 is related to the chosen theme/starting point.

Centres need to be more vigilant when awarding marks for SPAG in the Critical Evaluation and allocate the available 8 marks accordingly.

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.

It is a requirement in the Making criteria that candidates "*demonstrate an understanding and ability in solving technical problems*". Centres must therefore ensure that problems encountered are written into the record of making, for the higher marks.

4.1 'Schemes of Assessment' clearly states that "*A Minimum of two digital images/photographs of the final product showing front and back views*" should be evident in the candidate portfolio. It is the centre's responsibility to ensure that photographs are evident, are of a good quality and are of the candidate's own work.

Unit 1 – specific areas of importance

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

It was evident this session that candidates are producing either too little research or too much research as an appropriate response to a brief. Care needs to be taken here.

Centres are to be commended on the quality of the work seen in this unit and the balance candidates have been able to achieve between the designing and making criteria.

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

Introduction

It was pleasing to see new centres coming on board for this session. The work presented by many centres showed that advice given from Moderators in January, and the comments made in the Principal Moderator's report for that session, had been acted upon.

For the first time this session, work has been submitted in all three formats; traditional paper folders for postal moderation, work uploaded into the Repository, and centres who chose to submit work electronically directly to moderators. Centres choosing to do the latter two options must ensure that the work is organised and presented in a form which can be easily moderated without disadvantaging candidates.

Some work submitted into the Repository for moderation could only be described as being a collection of unrelated, untitled documents and photographs. **Care must be taken here.** Centres choosing to upload work to the Repository must ensure that the work of each candidate is clearly identifiable and is a complete folio of work in an electronic format.

Examples of good practice to present work electronically for moderation:

- Work submitted electronically for moderation (02) would comprise a CD/DVD for each candidate entered. Each file needs to be clearly marked with the candidate name, number and the centre number
- Work is completed by presenting a complete folder produced using Microsoft PowerPoint
- Hand drawn sketches are scanned in and other work such as ProDesktop images are all embedded in the document.

It is understood that centres and individual teachers are working under pressure, but there were many addition errors on CSF forms, and transcription errors when transferring totals to MS1 forms. It is essential that these are checked by at least two individuals before submission to OCR.

Centres are again reminded that candidates should acknowledge the work of others in their folders and credit the sources of information obtained. Marks may be compromised if this is not evident in the candidate portfolio.

Many centres are still using writing frames to guide candidates through the Controlled Assessment task. This can disadvantage the more able candidates by restricting creativity and individuality in how a project is approached.

Centres must ensure that work completed is that of the individual candidate. It is too easy for candidates, with access to ICT, to exchange images and other aspects of work. Supervising teachers must continually be on their guard against this happening. Folders should be presented for moderation in an orderly, structured format.

It should be made very clear in portfolios where use has been made of pre-manufactured components. This wasn't always clear in folder work. For example, if a centre is providing a casting for candidates to design around, this should be highlighted.

Creativity

Some centres have encouraged candidates to restrict the amount of folder work produced, but many have not. There were several centres who submitted work that had allowed candidates to overburden themselves with work under this criteria heading.

Candidates need to consider the significance of trends in existing products in relation to their chosen product. Detailed analysis of two existing products is sufficient. Information should be presented concisely and the sources acknowledged.

The design brief needs to arise out of the findings from research. The analysis should clearly support how the candidate has come to this decision. This aspect is often not well done. Candidates produce pages of research and questionnaires etc. but draw no conclusions from this section of their work.

Those candidates who score well in this area show evidence of focused research which is evaluated and then used to inform their brief and specification. Centres need to try and discourage candidates from doing unnecessary research work. For example, many candidates routinely produce research on mechanisms, even if most will not be used. It is far better to research the mechanism that is required when the design stage identifies a specific need. Research must be focused in order to gain maximum marks. Pages of generic research will not be given credit.

Designing

The standard of work in this section varied greatly again this session, between centres and between individual candidates in each centre. Quality of sketches was not always good with many candidates producing the most basic of 2D sketches completely lacking in detail or annotation. It was difficult to comprehend how some candidates had progressed to making from the evidence that they had in their designing section.

Those candidates who did well in this section:

- Produced quality ideas showing a range of designs which were hand drawn using a range of presentation techniques.
- Supported designs with detailed design developments together with the appropriate use of ICT, which helped to give working and presentation drawings dimensional quality.
- Annotated work effectively, showing some level of detail and development in their designing.
- Evaluated their designs and offered reasons for the selection of a proposed idea.
- Used modelling as an aid to designing suitable solutions.

Making

Some very good quality work was submitted this session. Centres should, wherever possible, use appropriate materials (metals and plastics) for the work in this Specification. Those working predominantly in wood and manufactured boards may disadvantage candidates in Units 2 and 4 (written papers), where they are asked to demonstrate their knowledge and understanding of materials, tools and processes.

The forward planning of the making and the recording of the making were generally well done by many candidates, although it is clear that some are still including planning that has been completed retrospectively.

The record of making should be an annotated, photographic record of the making as it happens. What is **not** required here, as many candidates have done, was just to provide a photograph of the component after it had been completed and then offer some explanation of how it was manufactured. This section of the portfolio should be an on-going record of the production processes as they take place.

Candidates who are able to combine the planning, record of making and recording problems/modifications in one 'tabulated' format piece of work, are to be commended.

Centres are also reminded that all work should include at least **two good quality digital images** of the final prototype product. There were many portfolios where this was not the case, and images were of poor quality, out of focus or too small to be useful. Some candidates failed to provide any images of the completed final prototype. This can compromise the candidates' marks and delays the moderation process when centres have to be contacted and put under unnecessary pressure, to supply the missing pictures.

Critical Evaluation

Again, far too many candidates were evaluating the finished outcome rather than the process (designing, modelling and making stages).

Centres are reminded that a few marks are available in this section for the quality of written communication throughout the folder. The use of specialist technical terms was not always completed well. There were many examples of incorrect terminology being used, in some cases candidates' produced work almost completely lacking in technical terms.

Candidates must be encouraged to make comments showing how they could improve the modelling, designing and prototyping process. Candidates who only evaluated the finished item did not do well in this section.

A542 Sustainable design

General Comments

Candidates were able to access marks across the full range of questions. Section A was on the whole well answered, and all candidates were able to access most parts of Section B. A significant number of candidates exhibited a sound knowledge across the whole range of questions, and demonstrated a good understanding of sustainable issues. However, it was evident that there was not a widespread understanding of COSHH, CFC issues, or tertiary recycling.

Comments on specific questions

Section A

- 1 Virtually all candidates gave the correct answer as 'renewable'.
- 2 Most candidates gave the correct answer as 'anthropometrics'.
- 3 A majority of candidates responded correctly – planning the supply and demand of materials.
- 4 A majority of candidates stated the correct answer – hybrid vehicles.
- 5 Most candidates gave the correct answer as 'materials, energy and the environment'.
- 6 This question was quite well answered - repair or reuse. However, a number of candidates stated 'recycling' which did not gain a mark.
- 7 This question was well-answered - crude oil.
- 8 Most gave the correct answer as 'recyclable'.
- 9 Many candidates did not give the correct answer, as they made no reference to hazardous/toxic materials, or chemicals.
- 10 This question was well answered - carbon dioxide.

The majority of candidates answered the following true or false questions correctly.

- 11 ETI is a worker's union – false.
- 12 FSC wood is not sustainable – false.
- 13 Energy used in manufacturing is part of a product's carbon footprint – true.
- 14 Products at the end of their life span should be put in landfill sites – false.
- 15 Rechargeable NiCad batteries are toxic – true.

Section B

16 (a) This question required reference to advances in technology, since the portable cassette player was introduced.

Generally a well answered question, though in many instances one-word responses were not fully justified. One-word answers must be qualified with some reasoning.

Ergonomics was sometimes used as an answer, which was not a technological advance.

(b) This question concerned recycling a music player, and was well answered by the majority.

(c) This question concerned the advantages of repairing a product, and was very well answered by most candidates.

(d) Many candidates failed to identify hand held wind up generators or small solar cell packs. Some gave solar power as an answer, but this required further elaboration. There is a plethora of solar recharged battery lights on the market, which require no access to mains power.

(e) (i) The majority of candidates were able to identify renewable energy sources.

(e) (ii) Many candidates failed to identify the advantages for the user of sustainable energy.

(e) (iii) Most candidates were able to identify two disadvantages of using sustainable energy sources.

17 (a) (i) (ii) This was generally not a well-answered question. Many candidates tended to ask rhetorical questions, or made generalisations, rather than provide statements recognising how the 6Rs apply to the products concerned.

(b*) Most candidates were able to score between 1 and 3 marks. However, only a few candidates really grasped the issues, and provided extended discussion. A significant number of candidates gave a list of points, and did not discuss the issues of sustainability related to manufacturing.

(c) (i) Many candidates were not able to identify use of CFC's.

(c) (ii) A significant number of candidates failed to respond or were totally unaware of CFC issues.

18 (a) Most candidates were able to identify the materials and component parts, but few could draw the magnet symbol.

(b) (i) Only a small number of candidates realised that this symbol indicates that a product is made entirely from recycled material.

(b) (ii) The majority of candidates could identify two ways to recycle cardboard.

(c) A number of candidates simply stated worldwide as an explanation of a global company, which required further elaboration to gain a mark.

(d) (i) Most candidates were able to explain at least one advantage of manufacturing/packaging products in China, and the more able gave two good justified answers.

(d) (ii) Most candidates were able to explain at least one disadvantage of manufacturing/packaging products in China, and the more able gave two good justified answers.

A543 Making Quality Products

Introduction

This session saw the first entry for A543 portfolios and was, in general, successfully completed by most centres.

Candidates, who performed well on this unit, targeted the available marks effectively on the specification. The highest percentage of marks are awarded for designing and making with only 4 marks available for demonstrating a response to a brief and producing a design specification. Many candidates had clearly spent too much time on producing pages of research.

The greatest percentage of the available marks is for making (36 out of 60). This should indicate to centres and to candidates, where the largest proportion of time and effort should be allocated.

Work was submitted in a range of different formats; as paper portfolios for postal moderation, uploaded to the Repository or sent directly to moderators as e-folios. As with A541, some centres appeared to have uploaded many single files, mainly untitled images and with no guidance as to how these fitted into an overall portfolio.

The most suitable format seen was where a complete folder, with embedded drawings and images using software such as PowerPoint, were submitted either on a CD/DVD or uploaded to the Repository.

The hole punch and embossing tool themes/starting points were probably the most frequently chosen, but examples were seen for almost all of the available themes highlighted in the specification which was encouraging to see.

Centres need to ensure that where judgements are made by different members of staff, they are brought to a common standard before the marks are submitted. This can only be accomplished by rigorous standardisation procedures within the centre.

Designing

Designing was often well executed showing good techniques using a range of methods, fully supported by the appropriate use of ICT. Those candidates, who try to use ICT solely to produce their design ideas, often did not do well, as it is not an appropriate method for quickly getting ideas onto paper.

Time spent on fully developing design ideas enabled making to proceed more effectively. Candidates who used modelling, either 3D or computer generated, also benefited in this criteria section.

Many candidates used CAD effectively to produce dimensioned working drawings of high quality. Few hand drawn orthographic drawings were seen this session. Those that were included were often of poorer quality and not drawn to recognised conventions. Candidates should be evaluating their individual design ideas, as this then helps them to make decisions about aspects or designs to develop and take forward.

Making

Overall, candidates performed well in this section and far more use was made of appropriate materials in the production of final outcomes.

Good evidence was seen of quality, well made products using a range of appropriate materials and processes, ranging from laser cutting and aluminium casting to traditional hand working skills. The plan of making was generally better performed than on unit A541, with more detail and more evidence of the correct use of technical terms.

There was however, still evidence of candidates who simply photographed the finished component and then attempted to describe the making stages afterwards. This section should record various stages of the making as they happened. Where candidates are producing similar work, it is important that file sharing does not take place. **Images/photographs must be of the individual candidate's own work.**

Centres have appeared to be realistic in the allocation of the marks available for solving technical problems as they arose this session.

Critical Evaluation

Candidates generally did much better on this than in unit A541 as they are following a procedure much more familiar to them. Candidates appear to be much more at ease when evaluating the finished product and cross referencing the outcome back to their initial design specification.

What was often missing however was clear evidence that testing of the final product had taken place. Many candidates described how successful it was without showing any photographic or hard evidence that testing had taken place. For example, with the embossing tool, photographs of the embossing produced could be fixed into the evaluation section of the portfolio. Likewise, photographs of punched aluminium strip could be attached in the folder when attempting the hole punching theme.

The work of candidates submitted electronically, should include quality images of the results of thorough and meaningful testing. The important thing to remember here is that evidence must be included. A sentence stating that the product works well etc. is not sufficient for the higher marks. Candidates often recorded how well their product punched holes for example, when it would have been obvious that a conical shaped punch going into an oversized die, would not effectively produce cleanly punched holes in an aluminium strip.

Candidates often forgot to show or explain how their product could be improved. Some candidates found difficulties in evaluating against their specification because their points were too subjective and it was therefore difficult to measure success or failure against them. Guidance must be given to candidates here.

Successful Candidates

Common elements amongst candidates that performed well on A543 included:

Designing

- Evidence of focused work leading to a brief and design specification.
- Quality annotated freehand drawings of design ideas using a range of techniques are evident.
- Freehand work is supported by the appropriate use of ICT.
- Developed designs with evidence supporting their choice of ideas.
- Used modelling effectively.
- Had completed a dimensioned working drawing.

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Making

- Planned the making of their work effectively and used strategies to make changes as required.
- Recorded the making of their work as it happened.
- Produced a quality, functioning final product using appropriate materials.
- Included clear pictures of the finished product showing various views and detailed images.

Evaluation

- Evaluated work against their specification.
- Showed evidence of testing and made realistic suggestions for improvements.
- Demonstrated quality of written communication.

A544 Technical aspects of design and making

General comments

It was apparent that, in a number of cases, candidates had not read questions carefully, resulting in inaccurate or inappropriate responses. Ample time is allowed for candidates to answer all of the questions on the paper and it is most important that time is taken to read through the question paper thoroughly before attempting to answer questions.

Candidates' knowledge of processes used in the school workshop was rather limited in many cases, as was their ability to identify and name basic workshop tools. Responses to questions relating to industrial processes were quite varied, with some candidates demonstrating little knowledge of the types of processes used or their application.

Whilst the questions requiring sketches produced some good responses, the sketches themselves were often of rather poor quality and lacked clear annotation. Candidates must ensure that annotated sketches are produced to a suitable standard in order that examiners might interpret them easily and accurately.

Comments on specific questions

- 1(a)(i)** It was disappointing to see how few candidates were able to identify basic workshop tools. Whilst all candidates gained some marks for the question, in the majority of cases only the file and the drill were correctly named. A significant number of candidates confused the tap and the die, and in some cases both of these tools were referred to as taps. Very few candidates recognized the tin-snips (hand shears) and the simplistic response of 'shears' was accepted as being correct.
- (ii)** This question was generally well answered, with only a very small number of candidates failing to score any marks at all. In most cases the correct tools for the processes were chosen, although a number of candidates incorrectly suggested that the junior hacksaw might be used for cutting shapes out of 1mm thick copper sheet.
- (b)** Very few candidates gave High Speed Steel as the correct response for this question. This was particularly disappointing, since this material is used for many of the cutting tools used in the workshop.
- (c)** Only the more able candidates gave any sort of acceptable response to this question, and it was apparent that there was much confusion between the various heat treatment processes. Clear explanations were rare, but credit was given where a candidate demonstrated some knowledge of hardening and/or tempering.
- 2(a)** This question produced numerous instances of candidates not reading the question carefully enough before answering. The question asked for the stages needed to mark out the fixing plate ready for drilling, but most candidates included drilling as one of the stages. As a result of this, only a small number of candidates scored more than three marks for the question. As in question 1(a)(i), simplistic responses were allowed when naming the tools used.
- (b)** This question was well answered in the majority of cases, with candidates recognising the effects of not clamping work securely when drilling. Responses made reference to the danger of the metal spinning on the drill and the inaccuracy caused by the metal moving, both being perfectly acceptable answers. In some cases, both of these factors were mentioned in the response and most candidates scored full marks on the question.

- (c)(i)** Only the more able candidates gave two valid reasons why cast iron is a suitable material for a drilling machine table and base. The most frequent correct responses referred to its weight helping to make the machine stable, and its ability to be cast into awkward shapes was also mentioned. A significant number of candidates incorrectly suggested that cast iron 'resists being drilled into', and simplistic responses such as 'cheap' and 'strong' were also quite common. Responses such as these must always be qualified or justified to be worthy of any marks.
- (ii)** Knowledge of mechanisms was generally very limited, and more than half of the candidates scored no marks for this question, with a number not offering a response at all. The arrows on Fig. 3 indicated that the correct responses would be 'oscillating' and 'reciprocating' and, although 'rotary' and 'linear' were accepted, very few candidates scored full marks on the question.
- (iii)** Only a limited number of candidates correctly named a rack and pinion as the mechanism required to change the oscillating motion at A into reciprocating motion. Although this is the only practical solution, the use of a cam was accepted as being 'possible'.
- 3(a)** In order to gain full marks for this question, candidates were required to make reference to non-ferrous alloys being mixtures of metals not containing iron. A significant number of candidates scored just a single mark by mentioning only one of the two factors, and it was disappointing to note that many candidates either gave no response at all or failed to gain any marks for a response given.
- (b)** Responses relating to the sand casting process were generally quite weak and only the more able candidates gave two good reasons why sand casting would be suitable for making the number plate in the question. The best responses gave reasons such as the ability to make shaped parts easily and the suitability for batch production, but very few candidates scored full marks on the question.
- (c)** This question was also poorly answered and a number of candidates gave no response to it at all. There were again indications that some candidates had not read the question carefully, as a number of responses related to features of a casting mould rather than those of the pattern used to make the mould.
- (d*)** A large number of candidates did not attempt this question, and many of those that did scored quite low marks. In general, the differences between sand casting and die casting were not clearly understood, and high order responses relating to issues such as volume of production, changes to factory layout and equipment were very rarely seen. In addition to the candidate's technical knowledge, this question also assessed the quality of their written communication, and many responses were quite poorly presented.
- 4(a)** Knowledge of industrial manufacturing appears to be quite limited in many cases and it was disappointing to see so many candidates unable to identify injection moulding as the most suitable process for making the polypropylene bin in large quantities. Whilst most responses did give processes suitable for plastics, some, such as line bending and vacuum forming, were entirely unsuitable for the bin shown in the question.
- (b)(i)** This question was generally well answered with the most frequently stated reason why polypropylene is suitable being the fact that it can be easily moulded into shape. Other acceptable responses referred to it being easy to clean and lightweight.
- (ii)** Most candidates were able to give a suitable finish for the mild steel bin, and it was pleasing to see 'galvanizing' appearing amongst the correct responses. Marks were not awarded for simplistic or unsuitable responses such as 'polishing' and 'cleaning with emery cloth'.

- (c)** Most candidates attempted this question, but few scored full marks on it. The best responses made reference to speed of production and the fact that the bin could be made in 'one shot', but a number of candidates made the mistake of suggesting that the main factor was polypropylene being cheaper than mild steel. The more able candidates gained full marks by including reference to the time taken to make the mild steel bin and the labour required for the processes used.
- (d)** Most candidates gained at least one mark on this question, the most common correct response being the fact that the symbol shows the material to be recyclable. It was less common for the significance of the number five to be known, however, with some responses suggesting that it referred to a products life span or the number of times it could be recycled.
- (e)** Although the standard of sketching was quite poor in some cases, most candidates scored well on this question, a significant number gaining full marks. Where marks were lost, it was often due to the fact that only one of the two faults had been addressed, again indicating a failure to read the question carefully before answering.
- 5(a)** To gain full marks for this question, candidates needed to relate their explanation to the three important elements of CAD/CAM; designing on CAD, making with CAM and, most importantly, the link between these two elements. Whilst most candidates offered a response to the question, only a limited number covered all three elements and either one or two marks was the most frequent outcome.
- (b)** Some very good responses to this question were seen, but it was disappointing to note that a significant number of candidates did not attempt it. Many candidates scored full marks for the question, although in some cases the standard of sketching was rather limited and annotation minimal. Where marks were lost, it was most commonly as a result of the candidate failing to include the stage of heating the plastic to soften it before forming.
- (c*)** This question was generally not well answered at all with very few candidates scoring more than half marks on it. Most responses made it clear that candidates were not familiar with 'rapid prototyping' or its use in developing new products. In many cases only the fact that it was quicker than conventional methods was mentioned, and this was often related to actual product manufacture rather than prototyping. In many cases it was the candidate's quality of written communication, rather than their application of technical knowledge, that accounted for most of the marks they scored on the question.

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