OCR
RECOGNISING ACHIEVEMENT

GCSE

Design and Technology: Electronic and Control Systems

General Certificate of Secondary Education **J301**

General Certificate of Secondary Education (Short Course) **J041**

Examiners' Reports

January 2011

J301/J041/R/11J

Oxford Cambridge and RSA Examinations

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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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EXAMINERS' REPORTS

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. ie 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 Electronic and Control Systems
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 Electronic and Control Systems
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 Electronic and Control Systems
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.

A511 Introduction to Designing and Making

General comments

Centres have used a good range of starting points and themes and most centres were seen to appropriately manage the types of investigation and design activities undertaken by candidates. There was some evidence of repetitive material from some centres, where candidates' original input was difficult to see. Postal moderation requires all evidence to be included in folders in order that the marks given can be confirmed by the moderator.

Creativity

Many centres are now comfortable starting research from the given themes and mind maps and mood boards show the candidates are thinking broadly. There was also evidence that user needs are being considered.

Existing products are being identified but centres are not showing the connections to the types of technology and changes between the products. Comments about good design contained within these products were rarely made; centres need to encourage this more.

Product analysis was confused and many candidates did not give sufficient detail in the study of a product, sustainability was not well covered.

Little research data was used to inform the specification, when a user had been identified an interview would have developed the needs.

Designing

Most candidates were able to produce a good specification for a prototype system, but only a few went on to talk about a product.

Many centres used a systems approach for their ideas, with strands showing possible component connections. Centres really do need to use a computer graphic package to show circuits and not use pencil drawings. The lack of quality causes problems for candidates who then struggle to explain the function. Many centres are using circuits from a library source, the candidates should then explain the function and how it matches the need instead of relying upon the secondary resource.

Mechanism design does not suffer the same problems; functions are clearly explained with calculations, which is to be commended.

Appraisal and selections were not well carried out; many comments were very subjective and not related to the user or the need.

Most developments and modelling were carried out correctly with improvements shown from the original ideas. Candidates then moved onto pcb design, at the highest level, changes and improvements concluded with a finished mask for etching. Component lists showed the candidates were ready to start production and are to be encouraged.

Making

Most centres are able to show a manufacturing plan, at the higher level the detail included – stages, materials/components, tools, quality check points. When looking at the process of manufacturing the prototype for electronics, a major stage is adding the different types of

components to the board and the testing. On most candidate plans these stages were not expanded sufficiently.

The quality of the prototype systems made by the candidates was very high. Centres must ensure this quality is reflected in the photographs.

Solving Technical Problems

Centres are beginning to recognise how this element can be presented in the candidates folders. When candidates are constructing the prototype system problems are being encountered and solved. The use of a snag sheet would be helpful in collecting and collating this information. Another technique could be a modified planning chart where stages are listed then snags recorded along with solutions.

Record Key Stages

Most centres are now producing a good set of images with comments. Candidates must ensure the images are correct for their prototype, as this provides more evidence of the quality of the constructed product.

Evaluation

There is still confusion when carrying out the critical evaluation; comments must be based on the making process only. If a detailed manufacturing chart has been used, adding extra columns to the chart allows comments on the stages to be made, this is very useful. It is also useful to have some testing of the prototype. Meaningful comments are needed on the modelling and prototyping process which then leads to further modifications.

Most folders were well organised and orderly, although a few rely on the evaluation to display technical problems.

A512 Sustainable Design

General Comments

The overall performance and range of results was much better this examination session. Candidates were able to apply knowledge learned during their study of the component. Comprehension skills, or the lack of reading the question in the first place, held some candidates back and the incorrect use and understanding of terms basic to this Unit, such as "green source of energy," was disappointing.

The use of one word non-justified responses was a common reason for some candidates not getting full credit eg Q16b. A number of less able candidates confused the roles of customer/end user and manufacturer in some of the longer questions.

Generally the legibility of handwriting and clarity of diagrams was not a problem, but a useful reminder would be that somebody else has to be able to read their handwriting in order to award credit. Improved annotation on drawings, when relevant, would help in awarding due credit. A number of candidates lost marks almost certainly due to miss-reading the question, or simply writing about what they wanted to.

Fundamental to good achievement in this examination is to provide information that the examiner has asked for, not to write general information about 'sustainable design' issues. It was good to see a number of candidates used the empty space at the bottom to plan their answer. It appeared that most candidates had sufficient time to complete the question paper.

Comments on Specific Questions

Section A

Question 1
This was answered well by most of the candidates.

Question 2
Not as well attempted as the other multiple choice questions.

Question 3
This was answered well by most of the candidates.

Question 4
Most candidates were able to gain credit here.

Question 5
Most candidates were able to gain credit here.

Question 6
Most candidates were able to gain credit here. The crossed bin was mainly recognised but a few thought it meant not to use the bin.

Question 7
Not as well answered as the other multiple choice questions.

Question 8
Most candidates were able to gain credit here but a disappointing number resorted to blind guessing. Some fascinating combinations were offered.

Question 9
Reduce was well understood with many qualifying points. However many responses were too vague or hopeful for credit.

Question 10
The majority were able to gain credit here. Christmas Trees were made into virtually any wood product, however unsuitable, but the most common incorrect response was "paper." Some missed the need to consider "natural" trees.

Question 11
Was answered well by most of the candidates, although a significant number thought that driving faster would save energy.

Question 12
Most candidates were able to gain credit here.

Question 13
Was answered well by most of the candidates.

Question 14
Was answered well by most of the candidates.

Question 15
Was answered well by most of the candidates.

Section B – Questions 16 – 18:

Question 16

(a) A poor response with some candidates misreading "who" as "what". Common wrong answers included "homeowners".

(b) Good response apart from candidates who used one word answers.

(c) Some candidates confused "the product life cycle" and "the manufacturing cycle" but a good number thought manufacture or recycling would use the most energy.

(d) Most candidates were able to gain some credit here.

(e) Poor response to the "Advantage" but a good response to the "Disadvantage." Some good answers but many gave advantages that were not environmental.

(f) Most candidates were able to gain some credit here but there were some wild suggestions eg recycling steam.

(g) Poor response with answers marred by vagueness, lack of justification and confusion between the needs of end user and manufacturer.

(h) A good spread of marks but some candidates did not provide answers which were "environmental" considerations.

Question 17

(a) Most candidates were able to gain credit here. Some incorrect responses related to components rather than specification points and to ideas not related to the visually handicapped.

(b) Surprisingly not that well known. Common errors related to secondary sources as stand-by or back-up supplies.

(c) Most candidates were able to gain some credit here. Candidates should be encouraged to provide more annotation to their drawings. A number simply re-drew the existing features and almost certainly missed the requirement for "Additional features.....suitable for the deaf".

(d) The majority were able to gain credit here, however a significant number felt that wind power would be suitable, illustrating perhaps that they had not fully understood the question.

(e) The mark scheme provided sufficient scope for most candidates to achieve credit here. Strong candidates provided "text book" answers.

Question 18

(a) This was well answered by the more able candidate. Weaker candidates suggested a number of unsuitable or unlikely features or properties.

(b) Most candidates were able to gain some credit here but overall understanding was poor as shown by the degree of vagueness in responses.

(c) Was answered well by most of the candidates.

(d) The extended writing answer was well answered with sentences and paragraphs discussing the environmental impact. Many candidates did not show their own points, but just repeated information from previous questions. Although the mark scheme recognised the type of argument and discussion, it was expected to be related to the environmental impact of electrical and electronic products.

This question provided appropriate differentiation to allow candidates the full range of marks. Candidates had the opportunity to show their knowledge and understanding of the environmental problems relating to electrical products. Less able candidates were exposed by poor comprehension skills although they were able to recall a number of very general energy saving tips and some elements of sound environmental practice, often with very little of it relating to the question. A small number demonstrated knowledge of Energy Ratings or potential software control of products. Considering most will own a product with power saving options it was surprising. A good knowledge of alternative energy sources was shown but not the cost implications (making this option unrealistic for the vast majority) and there was little suggestion to use Green energy suppliers.

A514A 01 Electronics

A number of candidates had failed to follow the Instructions to Candidates on the front of the paper. Many failed to read the questions carefully. In a number of cases the response did not match the question and as a result marks were lost. The responses to questions assessing quality of written communication showed that practice of this type of question is essential. Those candidates who responded only with bullet points were awarded marks in the lower band. It should be remembered that in addition to good grammar and spelling a range of accurate facts are also needed.

The answers to questions requiring sketching as a response were, in many cases, encouraging. It is important that the available space is used for sketches rather than reducing the scale which can lead to a lack of detail.

Section A

1 (a) (i) Knowledge of wire types and the colour codes that can be applied was not widespread. In a number of cases the polarity of anode and cathode had been confused leading to an incorrect choice of colour.

(ii) Those that chose the correct wire, black 7/0.2mm, generally gave the colour being related to negative rather than the flexibility of the wire as the reason for choice; either response gained a mark.

(b) (i) Benefits of heat shrink sleeving were well known and the majority of candidates gained at least one mark for this part of the question.

(ii) Very few candidates failed to gain at least one mark for knowing the procedure for dealing with burns. Application of cold water was well known, informing the teacher was often missed out.

(iii) The application of heat shrink could have been carried out in anyone of three places, this gave one mark. The other parts of the process had to be in the correct order for the second mark. This was often a missed mark due to putting the heating stage first.

(c) (i) The uses for the dimensions on the screw terminal drawing were not well known. Those who understood the importance of them generally gained both marks. Recognition of the need for spacing components was often clear when the need for precise spacing of pads to accept the pins was not mentioned.

(ii) At least one quality control check was known by most candidates. In some cases marks were lost through not reading the requirement of the question carefully. The checks had to be visual to gain marks.

2 (a) (i) Benefits of the two display types were often mixed up with the brightness of the LED display being applied to the LCD display. Despite this, the question was generally well answered with clear knowledge being shown of the two types.

(ii) Lower achieving candidates frequently thought that the highest number in decimal number meant that a decimal point was being asked for. Higher achieving candidates generally gained the mark.

(b) The need to increase the maximum count was understood by the majority of candidates who had read the rubric and understood the context of the question.

(c) **(i)** Many answers to this part correctly referred to either speed of fitting the resistor network or to reduced space needed on the PCB.

(ii) The function of a transistor driver was not known to many candidates. The required response was recognition that the open collector of the Darlington driver would supply OV and this would be connected to the display cathodes, thereby requiring the positive connection through a common anode.

(iii) The resistance across the common pins could be expected to measure On. Any value below 30 was accepted, this was because resistance on the multimeter probes could affect the result.

(iv) Higher achieving candidates who had experience of working out connections with a multimeter generally gained at least one of the available marks.

(d) Some good explanations for the use of an infra red sensor were seen. Many candidates realised that whatever was used as a sensor should not disturb the birds, others noted that it would be unaffected by daylight.

3 **(a)** The thinking behind responses was generally sound but in some cases it was not well expressed. The fall in voltage available for charging was the critical point that should have been mentioned. Only a few candidates made the mistake of thinking that a separate light sensor would be used.

(b) Those who had not read the previous part carefully which mentioned the re-chargeable battery did not generally gain the mark. The LED causing a drain on the battery charge was the required response.

(c) **(i)** Some very good responses were seen for this part, showing clear understanding of the reasons for using a bayonet fixing.

(ii) The ergonomic reasons for a clockwise movement were understood by nearly all candidates. A few candidates made reference to the physiology involved in the wrist movement.

(d*) The required facts for this part of the question were often known to the candidate but marks were lost for the use of badly constructed grammar or poor spelling. The renewable nature of solar power was widely appreciated along with the lack of effect on the environment. It is important though for candidates to provide some balance in their response when both benefits and drawbacks are required. The main drawback mentioned was that little voltage is produced in low light levels. There were a few candidates who had confused solar powered hot water systems with photovoltaic cells. Many candidates did not gain access to the higher band of marks through lack of specialist terms in their responses.

4 **(a)** The power saving qualities of a latching solenoid were recognised by the majority of candidates who attempted the question.

(b) The reason for extending the length of pulse was to accommodate any tolerance in components that would have resulted in a pulse that was too short. A number of candidates showed understanding without actually mentioning tolerance in components, all were awarded the mark.

(c) **(i)** Only higher achieving candidates gained marks for the calculation. Mistakes were made in a number of cases with the subunits involved, with 60ms being read as 60s.

(ii) The required variable resistor was 100K; candidates who had got the calculation correct generally chose the correct variable. Any who had an incorrect result for the calculation were allowed the resistor that matched their result. In a number of cases a variable value was chosen which did not allow for any adjustment.

(iii) The addition of a switch and resistor generally resulted in at least one mark. Placing the components the wrong way around with respect to the power rails was a common fault. Only a few had placed the components against the output pin (3).

(iv) The problem of re-triggering if the switch remained pressed was correctly stated in a few cases but the majority who had attempted the question described the resulting continuous output from the timer. The mark was given if understanding of the problem was evident.

(d) Very few correct responses to the output pulse graph were seen. Candidates should be made aware that the device will trigger at the commencement of the negative pulse and the positive output pulse will end when the 60ms time period has elapsed. There were a few who gained a mark for a correctly shaped pulse but these were in the minority.

(e) This question was aimed at higher achieving candidates; the RS latch shown would set when a small pulse invisible to the eye occurs. As it had latched the LED would remain lit to show that the pulse had occurred. Few fully correct responses were seen, though marks were gained for mentioning that the pulse would be extended.

5 **(a)** The requirement to transfer a design from schematic to a PCB should be familiar to all candidates. In many of the papers seen the question had not been attempted though. Candidates should be advised to look for the marked component positions on the PCB, such as the input, capacitor and FET. These should have given the clues to connections required. The one that many had correct was the motor + to positive rail. The inset drawing of the FET provided information for the other connections.

(b) The sketches and notes response for this part was in some cases lacking in detail, others examples were well drawn with full detail. Mounting a PCB is a technique that many will have encountered in the controlled assessment units; this knowledge did not always come through though. The better responses showed recognised methods such as mounting pillars and self adhesive slots; the more basic responses only showed the PCB held to the panel with screws and no spacers. It should be remembered that annotation is an important aspect of this type of question.

(c*) This part of the question was poorly answered by the majority of candidates. The question called for discussion of the benefits of each PCB production method. Far too many simply gave descriptions of the photoetch process or went on to describe the drawbacks. The use of conductive inks, which is a modern process, was not widely understood. The fact that the circuit could be printed onto a range of not necessarily rigid materials was not appreciated. Suitability of the process for low volume as well as high volume production was also missed in most cases. As with the earlier `discussion' style question marks were on occasions lost through poor use of grammar and spelling.

A514C 03 Mechanisms

General Comments

There was a very small entry from just a few centres. There were relatively few candidates who simply left answers blank. All candidates seemed to have sufficient time to complete the paper and less able candidates attempted most parts of all the questions.

1 (a) This question was well answered by the majority of candidates. Those who failed to gain marks generally did so by suggesting that the electric motor itself was rechargeable.

(b) More able candidates offered the correct answer, although friction was the most commonly suggested wrong answer.

(c) (i)(ii) The best candidates provided text-book answers to both parts of the question, weaker candidates did better in part (ii).

(d) (i) Approximately half the candidates were able to correctly indicate the pitch of a chain.

(ii) Most candidates were able to name a grub screw.

(iii) Only a few candidates were able to correctly identify the feature and then describe its purpose. A number of mechanical terms were used by the remainder.

(iv) Generally well answered although a number of candidates thought that the holes were a weight saving feature.

2 (a) The majority of candidates correctly identified the square thread form.

(b) Most candidates correctly identified the advantages of handle A. The best included 'ease of adjustment in restricted space/close to a bench' or similar, possibly indicating first-hand experience of the situation.

(c) (i) A number of possible materials were accepted for this question.

(ii) A similar response to 2(c)(i), able candidates often matched the material and method (eg 'Cast iron'; 'Sand casting').

(d) Well answered by the majority, with many showing evidence of thinking the process through and writing down the arrangement of the three classes of lever.

(e*) The majority of candidates were able to score appropriate marks for a reasoned discussion of the issue surrounding mechanisms made of mixed materials.

3 (a) The majority of candidates were able to describe a turning force in some way and gain credit.

(b) Most candidates found this question difficult, but many made some attempt at organising the numbers in a variety of incorrect relationships and so at least produced something to write down. It perhaps points to a lack of practical experience in this area.

(c) **(i)** Generally well answered.

(ii) Clearly alloying was better understood than the principles of forging.

(d) **(i)** This question was generally well answered by all but the weakest candidates.

(ii) 'Chrome' (or 'Chromium') was the most popular choice although less able candidates offered unsuitable metals or materials.

(e) **(i)** Only a very small proportion of candidates answered this correctly.

(ii)(iii) The majority of candidates scored well on this question. Able candidates in particular made clear the operational differences and answered the question well.

4 **(a)** A large number of candidates were unable to state the name despite being drawn to it 'by turning handle X', the majority choosing to suggest it was a cam of some sort.

(b) Well answered.

(c) This question was also well explained, perhaps indicating that practical work with cams is a significant part of most centres course activity.

(d) Most candidates were able to correctly link the cam shape to the motion it produced.

(e) Most candidates produced workable solutions in varying degrees of clarity and potential for the required movement. A number produced excellent, clear annotated drawings.

(f) A number of ingenious solutions were offered to prevent the slippage, including the use of bevel gears. Since these would have worked in the original Fig. 10, credit was given.

(g) A high proportion of candidates were able to score full marks on this part, drawing a variety of tri-lobed shapes and showing a suitable centre.

5 **(a)** **(i)(ii)** Most candidates were able to state what CAD and CAM stood for.

(b) The majority of candidates understood the purpose of a jig. The majority of candidates were able to suggest at least one valid reason.

(c) Some candidates were able to name the type of nut and provide a detailed description of its operation.

(d*) A wide range of responses with most candidates able to score some marks. Those candidates who responded only with bullet points were awarded marks in the lower band.

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