GCSE

Design and Technology: Electronic and Control systems

General Certificate of Secondary Education **J301**

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

OCR Report to Centres

January 2012

J301/J041/R/12J

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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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OCR REPORT TO CENTRES

Overview

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 third 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, ie 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:

The overall performance and range of results for Unit 2 was better than the last examination session – June 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.

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.**

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. The response to the banded marked question this session was pleasing, with several candidates obtaining full marks, Candidates have benefited from centres preparing them for this type of question.

It was noticeable this session, that where extra paper was required to continue a question response, many candidates failed to reference the question number. It is important therefore, that centres teach candidates how to highlight where they are continuing an answer on a different page in the examination document.

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 all six subject specialisms:

Candidates responded reasonably 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.

Important: It was noticeable this session that candidates were relying upon knowledge from Unit 2 based around sustainable design, rather than technical understanding. This led to confused answers often compromising the higher mark.

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.

Important Note: 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.

- **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 response 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

This examination series has seen portfolios for all six subject specialisms being submitted for Unit 1 both through postal and repository pathways. Unit 3 entries have only been seen in A521, A531, A541 and A561 this session. 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. It is helpful if centres also include a record of the marks allocated to each candidate, for each of the marking criteria sections.

Important Note: Candidates producing paper portfolios should be entered for postal (02) moderation and 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".*

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.*

Resits – Centres must remember that the theme, starting point and research aspects of the portfolio can be maintained. However, the remaining portfolio and final prototype should be redeveloped for submission.

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. For Food Technology one digital image/photograph is required. **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**.

A511 Introduction to Designing and Making

General Comments

- There is still some confusion about the amount of work the candidate should produce for each section of the portfolio. As a rough guide look at the marks available in the mark criteria.
- Some centres are leading candidates with prepared sheets, these do not allow for creativity and individual responses.
- At the end of the portfolio the candidate should use a bibliography showing all the sources of information used in the project.
- Photographs are needed to display the prototype system and illustrate the level of quality of the construction. At the lower mark levels where the candidate may not produce sufficient pictures, themselves, it is the Centre's responsibility to provide good quality photographs.
- Centres who used the 'Flash from Trash' starting point/theme had difficulty creating a systems project from this source, it is not advisable to use this starting point in future.

Creativity

Mind maps are used to connect to the starting point/theme, some Centre's seemed confused by putting the project title in the centre of the mind map. Research for project information appeared rather random at times, with some candidates finding all they could on the subject without discerning which material was useful.

Situation, Need, Users and Design Brief were completed well and illustrated what the candidate intended to do.

Looking at existing products many candidates just recorded what they saw in the secondary source photographs or what they found on the internet. Few completed an analysis which examined the technologies used or the product trends. Therefore these products did not inform the design process by summarising the products on the market to solve the need. Stand-alone design studies of people are not required.

When carrying out a product analysis it is vital candidates have firsthand experience of a product, if the parts can be handled and disassembled the candidates can really identify the 'working' elements. A good photographic analysis can be made with added annotation to explain the structure. Adding a sustainable design element allows the candidate to look further than the immediate product and examine the further areas in this course. The life cycle of a product is more than the expected life time, candidates should look at energy used in making and using. It is the stages a product goes through from conception to decomposition.

A general survey with questions rarely gathers useful information. A better activity is to interview a person in the user group, asking about the need and function.

Summary of research needs to bring together the data candidates have found which is important for the design activity.

Successful candidates

Connections were made to the theme through a mind map and mood board. The candidates thoroughly understood the situation and problem area. Data was shown to illustrate the importance of the problem. Similar products were analysed for function and the technology used. Trends were noted in the style and design of the products.

The integration of sustainability and product analysis was noted and gave better information. When carrying out a task analysis the use of the '5Ws' focussed information.

Designing

The specification for the prototype system is well understood. Candidates sometimes have difficulty confining themselves just to the system and its function.

At the start of ideas, many centres completed a system block diagram – either focussed on the specification or just listing all the possible combinations.

A few centres started with a small research page showing circuits found for the problem. Most centres used library systems where the candidates explained how the system worked and how it fitted the need. There were a few candidates who went for a level of complexity which they did not understand or were not able to explain and scored few marks, marks were awarded for the illustration only. If centres can introduce candidates to putting together circuits in blocks, the resulting design activity will be more successful.

Selecting the best points from three or four systems was poorly completed and at the worst ignored, with only the final design appearing. Using a chart with numbers or symbols for selection is just a visual exercise with little meaning; a discussion is needed where the candidates consider the function of a system and the need of the user.

When modelling a system, a response is needed which is more than just creating the idea; it is expected that changes and improvements will be made to improve the idea.

Conversions to PCB masks, or final mechanisms details, were well completed, leaving little doubt of what the candidate is going to make. It is also useful to add a final parts list.

Successful candidates

Specifications which included measurable targets or even listed the test, made a successful evaluation. When producing circuit or system ideas, appraisals and comments carried out at each stage with sketches, produced a flow of ideas which grew together. Completely separate and sometimes unrelated ideas did not work so well, in these cases there was less use of library circuits and a better understanding of how systems worked. Development of the final idea brought real improvements and modifications, followed by discussion on parts and components. Final working drawings and PCB masks were refined to produce a quality working prototype.

Making

Production plans are now well established, but candidates do need to look closely at the detail required. A large amount of detail appears when making the PCB, but insufficient information is given when assembling the PCB. Most candidates make products to a good standard, but quality indicators are in the assembly and fitting of parts. The question to ask is; is the system likely to fail because of poor assembly, such as insulating and wire connections?

At the middle and lower levels it is useful to have a teacher statement about the actual function of the system.

Solving Technical Problems

A method of recording technical problems by the Centre is vital, Moderators cannot assume a fully functioning system has solved all the technical problems. Illustrations of technical problems can start with the production of the PCB mask. At the high level intuitive corrections are made, but these need recording by candidates to gain the higher marks.

Record Key Stages

A photo diary now appears in most folders, the candidates own, specific detail allows for differentiation. Library pictures can be used for some sections, but information on the actual project is needed. Pictures need comments to explain what is happening, assembly stages are most important, showing parts going together.

Successful candidates

Clear planning charts which break down the stages and give good detail at the assembly stage. Materials, components and tools were listed, there was some consideration of quality checking. Construction of the prototype was of the highest order, all parts are tidily fitted with care taken for insulation, cable clamps and when parts are moving in mechanisms fitting has taken place. The system fully functions and is robust enough for a client to try it.

Evaluation

When the system is complete, simple testing should be carried out to demonstrate the function and improvements, modifications are best illustrated at this point.

The key activity is to reflect and review the modelling and making activity. Too often the old style of appraisal was seen, concerned with problems when making the product and the functioning of the product. Moderators often found ‘snag’ information buried in the evaluation, but were still able to reward this section.

Successful candidates

Candidates consider the stages of designing and improving the final design by modelling. Stages of making the prototype have been reviewed and alternatives suggested possibly by using a modified production plan. Comments have been made on the simple testing which has been carried out, viable and detailed improvements have been proposed.

The project folder has been well organised in a logical way. There has been good use of technical language when describing the system and how it works.

A512 Sustainable Design

Most candidates were able to achieve marks over a wide range of questions. There was little evidence of candidates running out of time or being unable to attempt the majority of questions. It was disappointing that some candidates were clearly not reading the question fully eg failure to provide environmental responses to Q16(a) and (d).The legibility of candidate responses was improved slightly on previous sessions although a number of candidates used pens which 'bled though' the paper. It is essential that examiners can read what a candidate has written.

Questions 1–15 (Section A) consisted of 1-mark responses and they were generally well answered with very few nil response.

1 Contribution to global warming was recognised in a product – b – emits a green house gas during use. – well answered.
2 Environmentally friendly packaging is – c – made of sustainable material – well answered.
3 Chip and Pin was fairly well known as – electronic security measure.
4 A worn out alkaline battery is – b – taken to battery bank – this was confused with all the options.
5 Coin cells were not well known with all the options used, the most common incorrect answer being (a) Pay for themselves during use.
6 The symbol was not recognised as the 'Recycle now' but many connected it with recycling which scored the mark.
7 Sustainable energy sources was well answered.
8 The abbreviation of Alu was well known as aluminium.
9 The consumers should not buy a product – refuse, was recognised in about half the answers. As is common on these questions, a variety of non-6Rs words were offered.
10 The reuse of a functioning mobile phone was not well answered. Missing the key phrase 'fully functioning' probably contributed to this.
11 The Fairtrade organisation and how they work was well recognised.
12 Use of the room thermostat and reducing energy bills was well known.
13 Timber from a rain forest was only partially understood as not sustainable.
14 Financial savings with a bottle bank being false was mainly understood.
15 Coal fired power stations contributing to global warming was well known.

Q16 (a) The changes to televisions brought many points, most common were related to size and attendant reduction in 'plastics' or 'components'. The explanation and connection to an environmental benefit was less well understood, indicating perhaps that the question had not been fully read and understood. Many answers were accepted where a candidate was able to give a benefit of the change listed. This was a high scoring question.

(b) The materials and components in the television brought many common answers – glass screen, plastic, wire, speakers. The reuse statements brought forth some excellent answers suggesting realistic re-use, others simply repeated statements like' melt down to remould'. It was a well answered question.

(c) Televisions left on 'standby' were well understood as wasting energy.

(d) Digital photo frames were well known with all candidates answering the question but the environmental disadvantage proved more difficult. Most recognise an electricity connection and using energy, with a few considering consumption of resources in the manufacture, greater complexity in eventual recycling and difficulties in separating the electronic parts.

17(a) The specification points of the rechargeable toothbrush was not well completed with a significant minority not appreciating the requirement for specification points. Some mentioned basic points such as 'must brush teeth, fit in mouth'. Many candidates just listed a description of the picture.

(b) The use of the NiMH cell was not fully understood and just gave benefits of rechargeable cells related to the cost of buying alkaline cells. Few referred to primary cell manufacture or environmental pollution issues relating to disposal.

(c) The failure of the cell in the toothbrush brought a range of discussions, but few included the fact that good working parts have been wasted, most commented on throwing away the brush (many directing it to 'landfill' although occasional responses did mention WEEE or appropriate recycling) and having to buy a new one, or the transport costs of having to return it to the manufacturer.

(d) The symbols were well recognised, although the green dot brought confusion between recycle and reuse.

(e) (i) The user group of 'children' was the most common response, some answers including 'over 3 years of age', or a higher specified range.

(e) (ii) The benefit of this toothbrush should have been related to the fun use with children, with most answers making the connection.

(f) The sketches of a 'tooth brushing timer' varied from very creative to inappropriate and weak. Most drawings used annotation which identified mainly child friendly points in the design. Environmentally friendly points were not as well completed with 'made of recycled plastic' or 'recyclable' being common responses. Generally, most marks were gained by a good text/description embellishing a weak sketch.

18(a) (i) The two ways of using the energy generated on a PV solar panel when camping brought many answers about lighting, watching TV and recharging small items like mobile phones and mp3 players, but there was some confusion on the likely power available, with answers including kettles and cookers that went beyond the power of the solar cells. Very few candidates displayed knowledge of storing the energy (eg re-charging the caravan batteries) so that it was available for use in the evening.

(a) (ii) The need for careful positioning of the cells in the sun was well understood.

(b) Most candidates were able to state that the solar panels were expensive to buy, but the pay-back in energy saving was not fully understood.

(c) Secondary recycling was poorly understood, with many candidates thinking it was about the number of times things were recycled; the breaking down into components and reuse of the parts was rarely mentioned.

(d) The processing of electronic waste was generally seen as hazardous or toxic to the environment. Very few candidates thought about the valuable metals to be recovered from waste components.

(e) The discussion about 'rapid developments in electronic products' brought a range of answers. Some good points mentioned that new products were about style and new technologies, with markets created by manufactures creating the need. Many pointed to rapid developments helping the environment (smaller, less materials, more energy efficient etc) ignoring the vast numbers, increased use and waste.

Some referred to more general developments in products such as cars and wind turbines whilst weaker candidates just went for the global pollution, waste of power, greenhouse gases and very general comments which were not related to the development of electronic products. The importance of reading the question and answering what is required rather than what the candidate would like to write about remains paramount to achieving high marks in this type of question.

A514A 01 Electronics Paper

Many candidates were familiar with the electronic components in questions but not always aware of how these components operated in a circuit. Practice in matching components that are used together eg reed switch and magnet, LED and resistor, would help to overcome this problem.

Symbols used in many responses showed familiarity with computer simulation software but not with the IET component symbols. Marks are awarded where there is clarity of meaning but it should be reinforced to candidates that knowledge and use of the IET set of component symbols would leave no doubt in the examiners' mind.

The standard of writing in a number of cases was poor, to the point where some words were totally indecipherable. The need for clarity in the responses should be stressed to candidates as they will lose marks if their answer cannot be read.

In both questions that tested the quality of written communication there was a general improvement in the level of response and in the way that facts were presented. More able candidates showed, particularly with the question on LEDs, that they could present a balanced argument justified with accurate facts and examples of use. The question on the use of modular components was in many cases answered less well, with an imbalance between benefits and problems in the response. A few candidates used bullet points to present their responses. This restricts the number of marks available and should be discouraged. It is essential that candidates are aware of the significance of the '*****' within the question number. Use of the '*****' is included within the 'Information for Candidates' on the front cover but ideally should be made known to all candidates as part of their preparation for the examination.

Questions related to practical work provided a good opportunity for all candidates to show their knowledge of processes. The majority of candidates gained marks for those questions related to the use of test instruments to detect a dry joint.

A few candidates failed to complete the majority of the questions, leaving the response space blank. Candidates should be advised to go through the paper carefully to ensure that they have answered all of the questions that they can. Candidates are reminded that the paper is no longer structured to give an incline of difficulty through the paper; there is more of a mix in the level of difficulty, both within individual questions and throughout the paper.

Section A

1 (a) (i) The majority of candidates correctly identified all three switches; where marks were lost it was through confusion between the reed switch and the DIL switch.

(ii) Very few correct answers were seen for this question. The question was asking for the extra component needed to operate one of the switches. The only switch that could not be operated by hand was the reed switch which requires a magnet.

(iii) Candidates generally knew the full wording of 'DPDT' but sketches used to illustrate the configuration would have benefited from standard component symbols.

(b) (i) This question was not well answered with only the more able candidates providing clear benefits and problems of using surface mount components.

(ii) Reasons for using a relay were not widely known. In the better responses there was recognition that it will isolate different parts of the circuit but in a number of cases the question was not attempted.

(c) (i) Most candidates were familiar with the terminal block and gained at least one mark for giving reasons for its use.

(ii) The fact that the screws in the terminal block could be adjusted with either a cross head or flat head screwdriver was noted by many candidates. Some candidates failed to read the question carefully and stated the reason for using a screw to hold the wire, ignoring the type of screw head used.

2 (a) Responses to this question were generally good with clear knowledge of the LED. Some candidates failed to gain marks through the ambiguity of their answer. 'One long leg and one short' was a typical example. The candidates knew that there is a difference in leg length but did not state which leg was associated with the cathode.

(b) This question was very well answered with many responses gaining all three marks.

(c) The fact that too high a value of resistor would dim the LED or cause it not to be seen was recognised by many candidates.

(d)* The quality of written communication was varied but there were many candidates who clearly understood the benefits of using LEDs. Energy efficiency came through as one of the more common benefits, with working life, colour shape and size all appearing in the responses. To achieve the highest Level it is important that specialist terms are used and that there are examples brought into the discussion. It is not necessary or expected that all twenty lines in the paper will be filled but in most of the papers with high marks at least half of the available space was used. Concise responses with clear examples and justification should be the aim; repeating parts of the question does not gain extra marks.

3 (a) (i) Reasons for using a DIL socket in a prototype circuit gained marks if they referred to either protection or easy replacement of the IC.

(ii) The fitting procedure should have referred to orientation of the socket and holding in position whilst soldering. Some candidates failed to read the question properly and went on to describe the soldering process, gaining no marks.

(iii) Some clear responses were seen, correctly stating that damage can occur to the IC if it is not pulled out straight. Very few noted that extracting an IC by hand poses a safety hazard as the pins will often end up bent and stuck in a finger.

(b) (i) Only the more able candidates showed that they knew of the dangers of static electricity when handling CMOS devices; others gave the delicate nature of ICs as a reason for precautions being taken. If there was no mention of static electricity in the response no mark was given.

(ii) Amongst the correct responses of earth straps, conductive foam for storage and earthing of the body before handling there were a few who incorrectly gave personal protective equipment such as goggles and gloves. Again, reading the question carefully would have given a clue as to the type of answer required.

(c) (i) Three marks were available for showing how connections can be tested for dry joints. Visual inspection was not accepted but a physical test for movement in the joint did gain a mark. Most responses showed a multimeter but fewer had the test leads in a suitable position or the multimeter on a resistance setting.

(d) The logic probe being used to test power connections was correctly interpreted by the more able candidates, though few had included the output of both LEDs in their response. Marks were allowed for stating which LED was lit for each test.

4 (a) (i) This question was not well answered, with few candidates noting that the track layout would be less complex and would allow for routing a track between the pads used for the switch. Both marks were awarded for a single well explained point.

(b) Completion of the PCB layout required interpretation of both the circuit diagram and the transistor pinout. There were few totally correct responses but some candidates gained either one or two marks. It should be noted that the track from speaker to positive rail should have been routed to the switched side of the positive rail rather than directly to the +6V input which would remain live after the circuit was switched off.

(c)* The reason for using modular components was not fully understood by some candidates. There was a common error in assuming that the pins on the computer memory module or soundcard would have to be individually soldered into a circuit. Use of surface mount components and the benefits was noted in a few cases as was the possible need for a larger casing to house the module. As with the written communication question in part A there was a tendency to steer away from using specialist terms and once again bullet point lists featured in a few responses.

5 (a) (i) This question was generally well answered with the majority of candidates gaining at least one mark. Fewer responses were seen this time that used numbers other than 1 or 0.

(ii) Reasons for using only one type of logic gate were not widely appreciated. Reduction in stock levels was stated in a few responses but the most common reason given was reduced manufacturing cost.

(iii) The reason for removal of two gates from the design was appreciated by the most able candidates who generally included the fact that the two gates removed were cancelling each other out. Very few responses mentioned the fact that NOR gates with connected inputs become NOT gates or inverters; that fact being crucial to the understanding of the question.

(b) (i) Few candidates recognised that it is good practice to tie unused gate inputs to a logic level. A few of those who did get close to the answer stated that pins 12 and 13 were connected to 0V, which was not the case.

(ii) Completion of the table was accurately carried out by most candidates.

(c) There was a general improvement in the way that the calculation was carried out, with a significant number of candidates gaining at least one mark. Unfortunately, many of the candidates failed to note the units involved in the calculation and the fact that dividing volts by resistance would give the current in amps. The result should have been multiplied by 1000 to give the answer in milliamps but in many cases was not.

(d) The better responses gave functional reasons such as the need to write programs for a PIC IC or that once the system was working there would be no need to change it. There were a few marks lost few referring to the logic system being cheaper but not giving any reason for the reduction in cost

A514C 03 Mechanisms Paper

General Comments

Despite a very small entry the questions were accessible to most of the candidates. All candidates seemed to have sufficient time to complete the paper and attempted most of the questions.

Question 1

(a) (i) Most candidates were able to offer two benefits of using human power to operate a product including 'more reliable'.

(a) (ii) & (iii) Most candidates were able to name suitable plastic materials and usually an appropriate reason was given for the choice of that material.

(b) (i) & (ii) The calculation of velocity ratio was well answered and relatively few candidates confused the driver and driven gears.

(iii) The speed, concept and reason(s) of/for gearing down were well answered by many candidates.

(c) Where attempted, the sketches for joining the motor and drum gained some credit for the majority of candidates. A variety of unrealistic solutions were also offered, indicating a lack of understanding.

Question 2

(a) The majority of candidates were able to suggest two appropriate safety precautions when using a powered rotary wire brush.

(b) Very few candidates were able to give the advantages and disadvantages of the methods of preventing steel from corroding.

(c)* The properties of steel and aluminium and how these properties influenced their use in industry was generally well answered at the appropriate level.

Question 3

(a) (i) & (ii) The identification of the Load, Fulcrum and Effort and the class of lever was well answered by most candidates. (iii) & (iv) Stainless steel was a suitable material for the nutcracker jaws and 'grip' or an ergonomic reason was popular for the use of wooden handles.
(b) (i) The calculation of the force applied by the hydraulic jack to the load hook was not well answered. Candidates did not understand the principles of clockwise and anticlockwise moments. The majority of candidates used many different ways of manipulating the numbers with very few of them correct.

(ii) & (iii) The R clip/spring clip was also not generally well known although the principle of quick release/no tools needed was.

(iv) & (v) Reasons for using nylon for the wheels was well answered as was one benefit to the manufacturer, with the most popular answer related to saving storage space.

Question 4

(a) & (b) The order of lever used in the mechanism was well answered as were the movement arrows for the pecking chicken.

(c) The principle of using a jig and the sketching of an appropriate solution was not well known with only a few candidates achieving marks for this question. Some candidates did not give any answer at all.

(d) (i) & (ii) The issue of safety for children under 36 months was well answered as was the reason for lead paint being banned in the UK.

Question 5

(a) (i) & (ii) The brake caliper and disc were well known and correctly identified as were the reasons for holes in the brake disc.

(b) The RFID proved difficult with many answers believing it to be capable of tracking as might a GPS equipped device. Lost, injured or cheating competitors were often mentioned rather than relating to the reliable timing and identification of competitors as they passed the start/finish line.

(c)*The discussion of the use of mechanisms in everyday products was answered at an appropriate level with a good range of responses according to the ability range of the candidates. The more able candidates included numerous examples and applications of mechanisms in their answers, while weaker answers were usually short on content and length.

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