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 2013

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

OCR will not enter into any discussion or correspondence in connection with this report.

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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 fourth year for the 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 need to remember the following change in the Innovator Suite:
This is the last year of a January and June examination series. This specification will only examine in June from 2014 onwards.

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 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 generally the same as seen in the last examination series – June 2012. There are variations within the subject specialisms and Centres would benefit from reading the individual subject reports for this unit. 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. There was also a significant improvement in the written response style question (*) this session, with candidates giving detailed answers combining good subject knowledge with an ability to produce a structured response.

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.

Candidates generally demonstrated an improved understanding of sustainable design, but were still hampered by poor exam technique. Misunderstanding or misinterpreting the question, or not reading the question carefully enough was evident throughout the suite of papers. Candidates must be encouraged to take notice of the key word in the stem of the question to identify whether the question requires them to explain, describe, discuss, state, name or give.

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

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- '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. There has been a significant improvement in the written response style question this session, with candidates giving detailed answers combining good subject knowledge with a clear, structured response.

It was noticeable this series, that where extra paper was required to continue a question response, many candidates failed to reference the question number thus compromising marks. 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 need to be aware that questions may appear on the back page of the examination document and candidates should be encouraged to check carefully that they have completed ALL questions.

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.

The overall performance of candidates was varied across the suite once again this series. Principal Examiners noted that candidates appeared to be better prepared for the written paper and there were several positive aspects evident in the January series:

- Candidates generally demonstrated sound knowledge of school-based processes and techniques;
- There were some very good answers to the Quality of Communication questions, where candidates combined their technical knowledge with an ability to present the information in a structured and coherent manner.

There were some very good answers to questions addressing specific areas across the Innovator Suite, including:

- *Modern Materials* [Textiles].
- Sound n*utritional knowledge* [Food].
- Good knowledge of the *benefits of CAD* [Industrial Technology].
- The techniques associated with *line bending* [Resistant Materials].

However, there are some areas which Principal Examiners have highlighted as being in need of improvement:

- Candidates should try to attempt every question.
- It is important that candidates read the questions carefully to determine exactly what is required before attempting an answer. It can be helpful for candidates to highlight what they consider to be the 'key' words or instructions.
- In those questions that require candidates to produce sketches and notes, it is essential that answers are made as clear, detailed and technically accurate as possible.
- Knowledge and understanding of industrial processes compared with school-based processes was considerably weak.
- There were many instances where examiners were unable to decipher illegible handwriting and poor quality sketches.

Controlled Assessment – Units 1 and 3

Most centres have been prompt in the dispatch of documentation to OCR and moderators, which is to be commended. **It is important that Centres return the request for portfolios within three days.**

Centres are reminded to forward form CCS160 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. Candidates producing their portfolio on a CD or memory stick should also 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. The preferred format of files presented for this type of moderation needs to be PowerPoint, PDF or Word, with work saved in ONE file only and numbered, not as individual sheets saved in different files.

In general, Centres have been successful in applying the marking criteria for both Units 1 and 3. Centres are reminded to apply the mark scheme on a 'best fit' basis which may mean allocating marks across the assessment grid. Marks should be positive, rewarding achievement rather than penalising failure or omissions.

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.**

JCQ documentation on Controlled Assessment (September 2011 – August 2012) clearly states that any guidance given to candidates must be clearly recorded. *4.5.2 When marking the work, teachers/assessors **must not** give credit in regard to any additional assistance given to candidates beyond that which is described in the specification and **must** give details of any additional assistance on the appropriate record form(s).**This includes providing writing frames specific to the task.** (eg outlines, paragraph headings or section headings).*
In light of the information given above, Centres need to take care when using writing frames in the controlled assessment portfolios.

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.

Important: 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.** Marks were compromised here this examination session.

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**.

A511 Introduction to Designing and Making

Comments

Centres helped to make the moderation process run very smoothly this session with work arriving within a few days of the deadlines. It was pleasing to note that photographic evidence was complete and Centres are now familiar with the requirements of the course, and the correct paperwork to be submitted.

Some projects however did not seem to be at the relevant GCSE standard eg Darlington Pair circuits or basic cam toys.

There was still little in the way of assistance from teachers on whether a circuit functions fully.

Creativity

The connection to the set themes now seems well established. Most candidates produced a mind map to show possible areas of problems and possible projects. There is no need for candidates to cover a number of themes – just work with one.

Analysis of similar products are still causing concern, many candidates are finding a product then repeating the sales information or describing the product.

There was little recognition of the technologies used and then there was no comment on the trends seen in a number of products.

Product analysis was rarely done in depth, it was usual to see descriptions rather than analysis. It is vital that candidates are given the opportunity to handle and disassemble products to reveal the technologies and systems.

When candidates have identified the need and problems, research is more focussed in these areas. Research was once again poorly completed and conclusions rarely seem to justify and conclude this section.

Successful candidates

Expanded the theme to show a wide range of problems and solutions. A mood board showed the area the candidate was thinking about and the influences on their design work. There were clear points showing the user and the situation.

Existing products were selected which were close to the stated need. There was a range of products from different manufacturers to illustrate the trends. The technologies were recognised with good technical language.

A design brief was drawn from the situation and need leading into an action plan for research.

A product had been disassembled and presented using a range of photographs, where functions and systems were recognised. Comments used technical terms to describe components and assemblies. Sustainability points were referenced and a life cycle energy use was added.

Research data was gathered to help with designing, this included component function, pertinent function points and ergonomic data. It is brought together in bullet points.

Designing

Where Centres use headings that cover a product for the specification, candidates loose the purpose of this section. Quite often the function details are lost amongst general points. Candidates should show their technical knowledge when adding system details.

Most Centres are now showing a system block start, with either components or functions for the system, but there is a next stage of component function details. Some Centres incorrectly used the blocks as the design stage.

As the unit is 'Introduction to Designing and Making' many Centres work from resources for systems, especially circuits, but the candidate must reference the source. For all circuits it is expected the commentary will have a function section to indicate the candidate understands the total system. Too often there is only a description of the components.

When candidates have produced a range of ideas there should be a selection page where comments relate back to the original need. Selection should not rely on the availability of components or complexity of the circuit.

When modelling, either on breadboard or in virtual circuits, real development should take place with improvements to match the need. In many cases modelling is just a repeat of the final idea. There should be some comments about the changes.

Final design does appear as a definite page leading to the pcb planning. This section is completed well, with a good range of CAD packages used and both auto routing and hand placed components. The same is true of mechanisms designs which mainly lead to laser machining.

Candidates have now appreciated the detail needed for the final drawing, with components lists and part detail.

Some Centres are including lesson notes and manufacturers specification sheets which do not demonstrate understanding by the candidates. These sheets are not required.

Successful candidates

The specification contains detailed function information for the prototype system. There is good use of technical terms.

A range of ideas are focussed on the functions required. Each proposal has the system described successfully showing complete understanding.

The range of proposed control systems are clearly above Key Stage 3 and appropriate for GCSE.

Selection of the final design is made using information from the need and situation. Modelling of the final idea leads to real improvements in the behaviour of the system, where the candidates use their knowledge and understanding. Calculations may be used to justify choice of components.

Circuits have an accurate components list. A pcb has stages of development with justified decisions. The final mask is shown, which may have components marked on or a real life image of component layout.

Making

Planning charts are generally well produced, but there is still insufficient detail of assembly of the circuits or mechanisms. It is necessary to split up many of the stages when adding components.

On the whole candidates are constructing high quality prototypes which function to meet the needs of the user. On circuits candidates are now recognising insulation problems and cable connections.

Solving Technical Problems

High marks are still being awarded when there is no evidence of problem solving. Centres must ensure a snag sheet is completed throughout the making processes. If it is left until after construction false statements are made, sometimes class based. Evidence is still found in other sections of the folder.

Record Key Stages

The photographic diary is now being completed to a good standard. If the manufacturing plan contains all the stages, candidates are more likely to think about illustrating all the points. There are occasional story boards of pictures that contain no comments; it is important to describe the processes. This section is very important to back up the final pictures to demonstrate the range of processes and the quality of the final prototype product.

Successful candidates

Construction planning is detailed for all the assembly stages. Materials, tools and processes will be included on the chart, possibly with quality control checks.

Candidates complete the control system prototype to a high standard and it is fully functioning. Quality indicators are care with insulation and how wire connections are made. Candidates demonstrate a range of skills to construct and assemble the prototype.

A credible snag sheet is written which does follow the construction processes and record all the points and solutions. These may be minor points the candidate has solved during construction phases.

A full photographic diary follows all the construction stages with a commentary describing the processes.

Evaluation

Most Centres have now realised candidates should comment on the designing and making processes. Many folders start with comments on the modelling stages, recording problems and changes. Making stages show problems, rarely do candidates record stages that went well.

Simple testing is important to see if the system meets the original needs. Comments are then made for improvements in system functions, these are rarely well completed. It would be useful if the Centre added teacher comments about the success of the system.

Successful candidates

Candidates will go back to designing and modelling to describe the stages and decisions made. A series of comments will be made on the construction stages; quite often this will be the original planning chart with slightly different headings.

Alternative processes will be considered.

Testing the function of the system will be recorded and how it meets the original need.

Realistic proposals will be made for improvements and modifications for the next prototype which addresses lack of function.

Throughout the folder there will be demonstration of technical terms used correctly
The folder will be organised in a logical way showing how the candidate has worked. Spelling and use of language will be of a good standard throughout the portfolio.
References will show where resources have been used to help the completion of the unit.

A512 Sustainable Design

A good number of entries this January saw the continued trend of well-prepared candidates who were able to access the full mark range. There were noticeable improvements at the lower to middle range of responses and some improvement in those achieving the highest marks too. There was no evidence of candidates running out of time, with the majority attempting all the questions with varying degrees of success. Considering the specific focus of the paper it was disappointing to read ill informed accounts of basic recycling eg the nature of electrical goods sent to landfill. Weaker candidates remain prone to repeat the question stem, especially if several lines were available for their answer. They have perhaps been told to try and fill the space, but there are never any marks for repeating the initial question. Legibility was an issue with a small number of responses but the choice of pen for writing their answers had improved with little evidence of bleed-through.

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

Q1 Cardboard packaging from electronic products: c; was well answered.

Q2 Carbon nano-tubes are: d ; produced a scattered response.

Q3 Electronic products should be soldered with lead free solder because: b, a surprising number chose alternatives.

Q4 When an aerosol can is empty, you should: d; the majority answered correctly.

Q5 Overheating electronic circuits: a; was generally chosen.

Q6 The re-cycling logo was well known.

Q7 Most candidates scored this mark, however a number simply answered ‘fossil fuels’ which was not accepted. **One** source of energy was asked for, almost certainly a case of ‘read the question’.

Q8 A number of poor or weak responses with very few using key words like evaluation or function. The majority offered general descriptions about looking at a product to see how it could be improved.

Q9 Which of the 6Rs means that consumers should use less of a product was well answered.

Q10 The Ethical Trading Initiative was very poorly answered; the most creative incorrect answer was ‘Extra- Terrestrial’.

Q11 Poor response with most thinking this was a false statement.

Q12 – 15 were well answered.

Q16 – 18 involved a variety of 1,2,3,4 and 6 mark part questions.

Q16a(i) was well answered with the majority choosing solar and wind as expected.

Q16a(ii) Weaker candidates spotted the word environmental and trotted out the same answers used in a(i). The idea of providing a 'back-up' was not well understood although the best responses suggested storing excess energy (solar was popular) in batteries and connecting to the mains as options. Some answers suggested only powering the unit when traffic was detected which is what usually happens. The question did not ask for this, pointing to poor reading or understanding of the question.

Q16b Generally good with most mentioning low power consumption and long life but only the very best achieved 4 marks.

Q16c Well answered with the majority choosing 'less chemicals' and to a lesser extent 'less travel/fuel used'.

Q16d A wide range of responses, many very general, not focusing on the consequences of toxic materials. There were a good number of technically comprehensive answers and far more candidates than previously scored the full 6 marks.

Q17a This was generally well answered but some of the responses were too general and not specific to the given context ie a hand held stopwatch. A few candidates did not show an understanding of the nature of Specification Points, a few just gave a list of questions for the designer. Simplistic answers centered on the screen and buttons.

Q17b Very well answered with the majority of candidates selecting appropriate modifications.

Q17c Most candidates were able to gain some credit here but unsupported claims such as 'will run out faster' were in evidence. Non-rechargeable cells were recognized as disadvantages but the reasons were more difficult, most scored 1 or 2.

Q17d Replacement of the cell was understood with most recognising the problems of using a tool; either cost, difficulty, locating it or the time involved.

Q17e A suitable modification was well known (a sliding, clip/snap or even hinged cover) but inadequately communicated by drawings or notes. The clip was a common solution but incompletely described by not explaining the need for the bottom retaining latch. A number suggested replacing the lithium coin cell with a single AA(A), possibly missing that (a) this was not asked for and (b) the voltage differences between the two chemistries.

Q18a The energy monitor was well read from the photograph and suggestions for reducing the energy used in the household were good. Some thought it controlled electrical items itself, or somehow 'told' or 'warned' the household what to do or which items to switch off. Most scored two marks; extras were gained where they thought about it in more depth and gave valid examples and suggestions.

Q18b Was well answered although some candidates named sustainable energy sources.

Q18c A surprising number mentioned static or electrified stock control fences, however most candidates were able to gain credit, mainly giving malfunctions and poor behaviour with mains power as reasons. Non technical responses such as "broken wires" were too much in evidence.

Q18d The comparison between the two lamps was completed well for half the marks. LED general points did not provide the answer, although environment-related problems were allowed. Most answers focused on the size and ability to work in distant places. A common error was to repeat earlier answers relating to the general properties of LEDs. This question proved to be a good discriminator enabling more able candidates to achieve full marks.

A514A 01 Electronics Paper

Results from the January examination showed a general improvement. There were fewer candidates who had failed to attempt a question or part question and in cases where the answer was not known some clear reasoning was shown which in some cases gained marks. The message to candidates should be that it is always worth making an attempt to answer the question.

The first question showed that a number of candidates were unsure of circuit symbols and shapes of actual components. A lot of learning is now carried out using simulation software which can only approximate the shape of a component; it is important that candidates gain the opportunity to see or handle real components in addition to the simulated 'on screen' versions.

The questions involving a design element were generally well answered with clear illustrations; knowledge gained from controlled assessment tasks had clearly been used. In all but a few cases the legibility of scripts was better than in the past. In the questions assessing quality of written communication the higher level responses showed clear signs of having been planned, this ensured that all relevant aspects were discussed. There were fewer candidates who had used the 'bullet point' approach which was pleasing to see. Balanced arguments justified with accurate facts and clear examples were seen in many cases.

Section A

1(a) The majority of candidates recognised the transistor symbol though very few noted that it was an NPN transistor. The diode was correctly drawn by many candidates though there was a significant number who drew the shape of an LED. The LDR was correctly drawn in about half of the responses. A number of candidates had drawn a photodiode and in a minority of cases a phototransistor was shown.

1(b)(i) This question was well answered by almost all candidates.

1(b)(ii) Higher achieving candidates recognised that there is no set position for ordering components and gave sensible reasons for this. Those who stated that the stage could go anywhere did not gain full marks as it has to be after design and before manufacture. Some responses noted that components could already be in stock.

1(b)(iii) There were some general answers to this part; solder should have been referred to at some point in the response. Those who did not recognise that information would be related to the risk posed by use of solder did not gain marks.

1(c) The majority of candidates answered this question well with most identifying pliers, wire cutters or strippers as suitable tools. Where candidates answered incorrectly this was due to the misconception that a soldering iron was required.

2(a) At least one benefit of rubber pad based switches was given by the majority of candidates. The ease of manufacture with reduced number of parts was recognised though a number of responses reduced this to a single word, 'easier' or 'cheaper'. Candidates should recognise that if terms like that are used they should always be justified. Few candidates related the reduced number of parts to the fact that there is less to go wrong.

2(b) The majority of responses gained at least one of the available marks. Insulation was a common property which was allowable either for heat or electrical insulation. The toughness and waterproofing of the material were also valid answers.

2(c) Higher achieving candidates recognised that IR light is not visible to the human eye, which is the reason for it not being useful as an indicator.

2(d)* A number of the responses seen had appreciated that the response should cover all of the areas mentioned in the question. Those who had restricted their response to the use of PPE had also restricted their mark to the lower bands. The number of responses that were based on the misunderstanding that machine guards were people assigned to guard the machine was worrying. There were a number of well structured responses that gave reasons why the training of operators was often not effective.

3(a)(i) The reason for using 3D views was given correctly by many candidates as visualising the product or clearly showing how internal parts will operate. Higher level responses recognised that data could be exported directly to CNC machines.

3(a)(ii) Use of 2D views was not as well understood as the 3D views in part (i).
There were a number of vague responses that referred to 'seeing the product more clearly'. In this type of question candidates should try to give a direct benefit of the method being used. In this case the direct benefit is that dimensioning and assembly detail can be seen clearly.

3(a)(iii) Those candidates who had experience of using acrylic and of the difficulty of drilling holes to get a clean finish generally managed to gain marks on this part. Correct responses referred to reduced stress on the acrylic and to the accuracy of positioning of the holes. Both marks were available for those who had clearly explained a single point.

3(a)(iv) The precaution for use of solvent cement could have mentioned whether the danger to the user or the possible damage to the surface of the acrylic from spilled cement. This question was generally well answered, with most candidates identifying the risk to the user.

3(b) The comparison between laser cutting and vacuum forming should have recognised the speed of production offered by vacuum forming. A number of responses appreciated the lower cost of equipment required for vacuum forming. Very few commented on the rounded edges that would normally be produced by a vacuum forming.

3(c) The majority of solutions to the problem of fitting and adjusting a circuit board were based on the use of screws. Very few solutions clearly showed the method of adjustment once the screws were in place. There were a few examples seen where slotted plates were used inside the casing to hold the circuit board.

3(d)(i) The reason for using stranded wires was generally recognised as relating to the flexibility of the wire. The other possible response could have been to mention that the stranded wire shown in the illustration had a white stripe on one of the wires that could be used to identify which wire had been connected to the positive terminal of the speaker.

3(d)(ii) The question asked for stages in soldering the speaker wires to the connections; a number of candidates failed to gain both marks because they had given 'soldering the speaker wires' as a stage. The soldering process should have included tinning wires, heating the joint, feeding solder into the joint or similar parts of the process. The majority of responses gained at least one mark for recognising that each wire had to be threaded through the hole on the speaker terminal.

Section B

4(a)(i) The circuit symbol was correctly identified as a microphone by the majority of candidates.

4(a)(ii) The connections needed to give the required resistance value involved one series and one parallel connection. This part differentiated well between candidates. The majority of candidates gained 1 mark for the parallel connection.

4(a)(iii) A number of candidates recognised that use of real components will sometimes give a more accurate evaluation of the operation of a circuit. The better responses mentioned that the level of sound needed to test the circuit would be very difficult to simulate.

4(b) The majority of candidates gained at least one of the available marks for adding tracks to the layout. The main error seen was to connect the collector to the same track as the base.

4(c)(i) The larger voltage range offered by the 555 IC was the answer most commonly encountered. There were a few candidates who gained marks for realising that only one input and output were needed for the circuit.

4(c)(ii) There were a number of responses to this part that could have gained marks. For the given circuit the most important would be the accuracy and variation in time delay that would be offered by a PIC IC. The ability to program and edit the program for a PIC was also valid.

4(d) There were few fully correct connections seen for the Darlington Driver circuit. A mark was gained by a number of candidates for connecting the diode cathode and one motor terminal to the positive rail. Those who had connected the collectors together had often missed the connection to the motor terminal and diode.

5(a)(i) A number of correct solutions to this question were seen, reflecting an understanding of the given binary value.

5(a)(ii) The fact that all cathodes are connected in a common cathode display was known to many candidates. Mention of a connection from the common cathodes to a 0V supply was often missed.

5(b)(i) The correct value from the given datasheet was identified in a large number of cases. Those that were incorrect had generally used values from the correct row but an incorrect column.

5(b)(ii) Those candidates who could substitute into the formula generally arrived at the correct solution. There were still a number of candidates who failed to convert the units for current, reducing their mark. There were also a number of candidates who had not attempted this part of the question.

5(c)* A basic understanding of ergonomics was evident in many of the responses. There was some confusion with aesthetic or functional features but the candidates who had used these features in their response had generally included some genuine ergonomic features as well. There were a few candidates who had used a bullet point approach to their response. This is not in their interest as the question is looking at ability to write in complete sentences as well as using grammar and punctuation correctly.

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