GCSE

Design & Technology (Electronic Products)

General Certificate of Secondary Education **GCSE 1953**

General Certificate of Secondary Education (Short Course) **GCSE 1053**

Report on the Components

June 2008

1953/1053/R/08

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The reports on the Examinations provide 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 syllabus content, of the operation of the scheme of assessment and of the application of assessment criteria.

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REPORTS ON THE COMPONENTS

Chief Examiner's Report

As with last year there were few adjustments needed to marks on the Coursework element. The number of centres using CAD / CAM techniques continues to increase and as a result the standard of many pieces of work seen was very high. Candidates must remember though that design work carried out using CAD still needs annotation if all of the marks are to be accessed. In many cases it is quicker to print the work out and then annotate by hand.

A note of caution is needed on the balance between circuit ideas and designs for an enclosure to hold the circuit. If the full mark is to be attained a range of ideas for both aspects must be included.

Access to the circuit for moderators has in some cases been difficult this year and this is mentioned in the report on Coursework. It would be helpful if the centre could ensure that all of the chosen sample is opened prior to the arrival of the moderator.

The written examinations were in general well attempted with very few candidates missing out entire questions as has been seen in the past. Calculations again caused problems for many candidates even though the formulae were available in the body of the question. Candidates should be reminded prior to the exam that calculators will be required. The questions requiring a drawn response would for many candidates have been better tackled with the use of a ruler. This particularly applied to the completion of a PCB layout question.

The clear message to candidates for the 2009 examination should be:

- Take a ruler and pencil into the examination;
- Take a calculator into the examination;
- Make use of the printed formulae in calculation questions.

Internal Assessment

General Comments

It is pleasing to note that for the majority of centres few, if any, adjustments to marks were required.

The increasing use of ICT continues to add to the presentation of the design folders but many candidates need to consider how they annotate their work, in order to clearly show the relevance of each piece produced. Once again examples were seen having several pages of computer generated images with no headings or evaluative comments, making it very difficult to understand the relevance of the work presented.

It is important to stress that electronics is the essential element in this Specification; a fact that must not be overlooked. A number of candidates had spent a lot of time designing enclosures, but failed to offer more than one basic circuit idea. The implications of this are that they score low marks in both sections three and four as there is little opportunity for development work. The highest attaining candidates were those who had selected their own individual problems to solve and had generated a good range of valid ideas which were then carefully evaluated before a choice was made.

This year there were several instances when moderators were unable to view the candidate's circuits due to the case lids being permanently glued in place. To check the marks awarded in section 5 it is essential that cases are not sealed in such a way in future.

In order to prevent difficulties validating candidates work it would be helpful if centre generated sheets were clearly identified in some way. Marks are only to be awarded for the work of the individual candidates and this can be difficult to check when centre generated sheets may form part of the folder.

Finally, on a matter of administration, please ensure that if the candidates from your centre were taught by different members of staff that this is clearly indicated on the CWS form which is sent to the moderator.

Specific Comments on the Assessment Objectives

Objective 1: Identification of a need or opportunity leading to a design brief

There are still a few centres who allow their candidates to spend too long on this section to the detriment of later work. The identification of possible users of the product would benefit from consideration of: age range, gender, interests, nationality and ability/disability of the users. The use of digital images, extracts from magazines or papers, or brief statistics to support the need, is to be encouraged. Several candidates who had used the "client" format eg I have been asked to design…………… failed to explain the problem sufficiently. Design briefs in most cases were clear, but a number had included specification points.

Objective 2: Research into the design brief that results in a specification

Internet based research was widely used but candidates must evaluate the material in order to gain credit. Simply printing out web pages is a non productive activity.

Survey / questionnaire techniques, in many cases remained basic, resulting in information that was not of any great benefit to the candidate. Better examples, in which the questions were carefully framed to discover what the user required from the product, did in fact lead to information that was used to form the specification. It would be beneficial if candidates presented their surveys to potential users of the product which should result in more valid comments compared to the "school based" surveys. Work on existing products in the majority of cases was based on those products found on a website. For many candidates greater benefit would come from examining in detail products or components that have *similar* functions to their intended product rather than searching for those that are *identical* in function. Eg those including a number display could examine any item with a 7 segment display. This approach would give functional information; the website approach is only likely to give evidence of specifications and manufacturing process for the casing.

Specifications were generally well produced but the stumbling block is still the inclusion of relevant aspects for the, 'System to ensure control over the production of the product in batches'. This needs to refer to a system which would allow standardised products to be produced efficiently. Several instances were found where candidates explained in detail the different levels of production eg job, batch and mass production. This information is not required in this section although it is part of the Specification knowledge base.

Objective 3: Generation of design solutions

This is one area where the appropriate use of ICT can make a substantial impact. In the better examples this was certainly the case. The use of CAD packages and the Internet when used effectively are a very powerful tool but candidates must still evaluate each idea against the specification to ensure that the user's needs are catered for. A lack of realistic circuit ideas often coupled to a proliferation of case shapes illustrated the opposite end of the spectrum. We must not lose sight of the fact that this Specification is firmly based upon the <u>Electronics</u> element of the product.

Several instances were seen, particularly where centres had restricted their candidates themes, of generic sheets being used as part of the design work. It would be useful if these were clearly labelled to indicate their source.

Greater use was made of ProDesktop for case designs and whilst this is encouraged care must be taken to show specific detail, such as how the base would be fitted. The use of hand drawn sketches to investigate a range of case ideas prior to ProDesktop development still has its place and should not be overlooked.

Each idea for the circuit and case should be evaluated to determine the suitability. A more objective approach to this would be beneficial, checking to ascertain whether the design fulfils the requirements of the specification.

Decisions on which circuit and case are to be taken forward for development should be clear and supported by relevant information. This still remains an area of weakness. Communication was varied but in the best examples was excellent, with a wide range of techniques being used.

Objective 4: Product development

Extensive use of CAD for testing and good photographs of breadboards was seen. From the number of non-working circuits that were seen it would appear that CAD testing alone is not proving to give such accurate information for some candidates, and circuit breadboarding may give more reliable results.

When developing circuits and producing the PCB, artwork editing facilities offered by CAD could be used more to benefit the candidate. Centres offering PIC based projects should realise that credit is available for evidence of testing during simulation. A print of the screen image or a photograph of the test board would be suitable. A number of projects using PICs failed to explain how the program was developed and tested.

A wide variety of enclosures were seen, from bought in cases modified to suit the purpose to individually designed packages. Whatever approach is taken it is important that the final product represents as near a professional finish as is possible in the school environment. Some excellent cases were seen; particularly those produced using CAD/CAM facilities. PCBs should be correctly mounted as should batteries and the decisions on all these points should be included within this section. When modifying the case top to add, for example, a row of LEDs or a pattern of holes to let out sound, the use of a jig or template would allow the candidate to consider the implications for quantity manufacture. This is the area which is often overlooked.

Objective 5: Product planning and realisation

A large proportion of the available marks for this Objective are awarded for planning and there must be evidence for this in the folder, otherwise, the maximum that may be awarded is 3 marks. More action plans were seen this year, including tools and equipment used, health and safety issues, and quality control.

The most frequent cause of low marks in this section resulted from unfinished products. It is easy to underestimate how much time the practical work can take but in a 40 hour project we must allow a minimum of 20 hours, which is in line with the total marks available.

At the higher achieving level some excellent projects were seen with little increase in the number of PIC based products. Care must be taken when deciding to adopt a PIC based solution, as instances of inappropriate use can lead to unnecessarily complex solutions, when traditional alternatives would have been more suitable.

A small number of commercial kit based projects were seen and these are to be discouraged as they do not meet the spirit of this Specification which is for the candidates to design and build a marketable electronics product.

When awarding marks for this section, it must be remembered that there must be clear evidence in the quality of the practical outcome to support the assessment made. This remains the area where most moderation adjustments are required, usually as a result of high marks being awarded for unfinished or low quality work.

Objective 6: Evaluation and testing

The majority of candidates produced reasonable results in this section but unfinished products proved a problem for some. Even in these cases there were many features which could have been assessed against the specification eg if a PCB had been manufactured the tracks could be tested for continuity. Testing remains subjective in many cases, not covering the conditions in which the device was intended to operate. Numeric data collected as a result of testing is required at the higher level. Digital images of testing the final product produced useful evidence. Few candidates had commented upon the performance of the system used to control manufacture.

Presentation

It must be remembered that this section is concerned with the logical and concise nature of the folder and not simply the aesthetics. Separators for each section are to be encouraged as they demonstrate a logical order in the production of the folder.

Papers 1 and 2

General Comments

Once again the papers produced a wide spread of marks with the majority of questions being attempted by candidates in both tiers. It is important for candidates to recognise that a blank on their paper is a guaranteed zero. As in previous years there were a number of candidates in the Higher tier who would clearly have benefited from entry to the Foundation tier.

General points for candidates to remember are:-

- Read the question carefully
- Attempt all questions
- Do not repeat the question as your response

These points are basic examination techniques but in many cases were ignored.
Responses to the product analysis question appeared to be better than in previous years. In many cases the list of possible / allowable answers was quite extensive and allowed for wider thinking by candidates.

Legibility of the responses as usual gave cause for concern. Candidates should be reminded that they can use a ruler, particularly in the track routing type of question and, if changes are made to a response, it should be clearly indicated to the examiner which part they want marked.

Calculations continue to be a problem for many candidates. It should be stressed that use of a calculator is allowed and when tackling electronic calculations a calculator should definitely be used. All formulae for the question are now included in the question so the only requirement is the manipulation of the formula. Candidates would also be well advised to look at their answer to see if it is feasible. This would prevent the monostable calculations resulting in answers measured in years rather than seconds.

Knowledge of practical processes appeared to be better this year whilst those topics that would normally be dealt with theoretically were not well known.

Experimenting with simulation software is a good approach particularly for counter ICs as results can clearly be seen on the screen.

There were two minor printing errors on the papers that should be noted by centres intending to use the papers for a mock exam next year. In the overlap question 4a / 1a pads for the mounting pillars appeared in Fig 10 but not in Fig. 2. They should not have appeared in the Foundation paper. The resistor value used in the calculation at the end of question 5 / 2 appeared as 33R in Fig. 17 and 68R in Fig. 9. This made no difference for the candidates but it should be noted that both mark schemes will be required.

Papers 3 and 4

General Comments

All candidates were able to access the papers this year. More candidates appeared to have researched the pre-release material than in past years, although many still appear not to have taken advantage of the opportunity to prepare themselves thoroughly. Handwriting and grammar were poor in many cases, and this may have led to some candidates losing marks because of answers that were illegible or ambiguous. This was most noticeable in the Higher Tier where the communication skills of some candidates fell far short of what might have been expected. Foundation Tier candidates experienced difficulties with the logic questions, which might suggest this subject had not been covered in any depth by some centres. Likewise Higher Tier candidates failed to demonstrate the depth of knowledge of the 555 timer that might have been expected of them.

1053/01, 1953/01 Paper 1 (Foundation)

1 **(a)** **(i)** The opening part to the question was generally well answered with the majority of candidates gaining marks on it. Marks were lost mainly due to candidates not knowing the middle word, 'emitting'.

(ii) Again well answered with the most popular responses being size and shape as the ways in which LEDs differ.

(b) Most candidates gained a mark for knowing that a resistor will change the brightness of an LED; rather fewer gained the second mark, confusing reduction in voltage with the correct response of reduction in current.

(c) Knowledge of correct placement of an LED in a circuit was excellent with few candidates failing to gain the mark... The most common fault with these was not giving a full explanation. Eg stating that the legs are different lengths. To gain the mark a clear match of short leg to cathode or long leg to anode was required. Very few responses referred to using a multimeter or a breadboard, which were equally valid methods.

(d) This final part to the question demonstrated that the majority of candidates were comfortable with describing or sketching the practical process that they had used. The main cause of lost marks was failure to mention heating the joint before using a desoldering tool. Colloquial terms such as 'solder sucker' were accepted.

2 **(a)** **(i)** Placing the terms from the given list into a table was generally well done. Any confusion tended to be with the thermistor and reed switch. Only a small minority failed to gain any marks at all for this part.

(ii) The graphs given of the three sensor outputs presented a problem to many candidates. The response required referred to the shorter time taken for a reed switch to change state, and the increase in time needed for the other two sensors to react. Rather more marks were awarded for a description of the reed switch action than for the LDR and thermistor. Any reference to the reed switch being a digital device was also rewarded.

(b) **(i)** The potentiometer in the circuit was frequently recognised but the purpose of it was not stated. Reference to the setting of a threshold voltage or level for switching was required for the mark.

(ii) Very few candidates could describe the effect of a pull up resistor in terms of providing a voltage level when the transistor is switched off.

(c) **(i)** The majority of candidates gained at least one of the available marks, for putting the base connection in the correct box. A good number then went on to place the emitter and collector incorrectly,

(ii) The transistor pad was in many cases recognised as a method of preventing the legs from being bent, 'shorting' or being damaged. Rather fewer mentioned the prevention of damage to the pads that the legs are soldered to, which was an equally acceptable answer.

3 **(a)** **(i)** A surprisingly low number of candidates recognised the given wave form as a square wave. This wave form will have been used by many of them in astable or clock circuits and it is available on many electronics benches as a standard output.

(ii) In this part of the question considerably more candidates gained the mark for recognising the output as an astable signal.

(b) **(i)** The most consistently correct timing component was the variable resistor. For the second component very few chose the fixed resistor in series with the variable; instead going for one of the output components.

(ii) The requirement for this part was to mention the working voltage and the polarity of the capacitor; very few candidates got both of these. The question referred to the hazards and precautions taken, a number of responses showed that the candidate had not read or understood this part of the question.

(c) **(i)** A number of candidates failed to gain marks for completion of the breadboard connections due to either using a hole twice or confusing the base and collector connections. Candidates should be advised that in this type of question connections should be treated in the same way as either a real breadboard or a computer simulated breadboard when they are completing connections.

(ii) The initials SPDT were quite well known and a majority gained a mark for that part of the response. The 12V, which is the coil voltage, was not well known. Allowing candidates to make use of commercial catalogues can be beneficial in their understanding of component descriptions such as the relay.

4 **(a)** **(i)** The mark scheme included a range of alternatives for features of the layout that could be changed. Changes to pads and track widths were the most common correct responses. Marks were lost through failure to qualify the response, eg mention of a pad without stating that it could be enlarged, reduced or have the hole size modified.

(ii) Those candidates who were familiar with auto-routing were able to give valid stages such as the production of a schematic or choice of board size.

(iii) The majority of candidates who attempted this part gained at least one mark for routing a track. The most common error was in joining the right hand track to the wrong IC pad. There were just a few responses that simply showed a line drawn between the two points that needed joining.

(b) This part was well answered with most choosing mounting the board in a casing as the possible use of the two pads. Use of the holes for strain relief of the power cables was also an acceptable response.

(c) **(i)** The question on the benefits of blocking circuits together was well answered. The majority of candidates understood that the production time would be reduced and that quality would be consistent. This was another example of a question where it was important for candidates to qualify their responses. Those who referred to speed or cost only gained the mark if they went on to state how the speed was increased eg comparing blocking to individual circuit production.

(ii) Many candidates saw that the scored lines were intended to be used in separation of the boards. The use of a screen printed layer for component information was also widely appreciated.

5 **(a)** **(i)** In this product analysis question candidates should be advised to look carefully at the evidence before deciding on a production method. In this case there were areas of the novelty siren body that would be impossible to vacuum form; this should lead on to the choice of injection moulding as the most likely method. Ejector pin marks were visible on the underside of the wing and tail; this was an additional clue to the method used.

(ii) Even those who had incorrectly chosen the manufacturing method invariably gained a mark for stating that the colour or type of plastics could easily be changed.

(b) Many of the responses on the benefits of Chip on Board technology demonstrated clear, logical thought. The most frequent benefit given related to the reduced size of the circuit; this was followed by the reduced danger of damage to the IC during circuit construction.

(c) **(i)** This question differentiated well with only the better candidates realising that pressure on the contacts was controlled by the spring.

(ii) A number of almost correct responses were given to the reason for the shaped hole. To gain the mark there needed to be reference to the contact not being able to turn on the shaft.

(d) Those candidates who had read the question were generally able to gain at least one of the marks for this part. The most common mistake was in describing the consumers’ rather than the manufacturers’ role in reducing environmental damage.

(e) Very few fully correct solutions to the calculation were seen. The first step, reducing the voltage by 1.7V was frequently omitted. The result of the calculation then needed dividing by three for both marks. A number of candidates were unable to change the given formula to allow current to be calculated.

1053/02, 1953/02 Paper 2 (Higher)

1 **(a)** **(i)** The majority of candidates gained at least one mark on this opening part of the paper. The responses that failed to gain a mark were generally those that altered the basic layout of the circuit; candidates should be reminded to read the question carefully.

(ii) Responses to this part were generally more explicit than found in the Foundation tier. The stages mentioned often included the software that the candidate had used.

(iii) The question on track routing was well answered with careful drawing of the tracks making marking easier. The most common error was in joining the right hand track to the wrong IC pad. There were a number of papers where the question had not been attempted; candidates should be reminded that this guarantees no mark, whereas an attempted answer has a chance of gaining a mark.

(b) The response most encountered centred on holding the board to the casing; rather fewer suggested strain relief for power cables.

(c) **(i)** Benefits of blocking circuits for commercial production were well known though one mark was frequently lost for repeating the first benefit with slightly different wording.

(ii) Reasons for both of the features were correctly identified by many candidates. The descriptive level of the responses was, as expected, far better than in the Foundation tier.

2 **(a)** **(i)** Most candidates attempted this part of the question and the production method was well known.

(ii) The two accepted responses relating to colour and type of plastic used were chosen by the majority of those who attempted the question.

(b) The level of response was better than encountered in the Foundation tier with fewer candidates resorting to the ‘quicker, ‘cheaper’ style of response, for which no marks were awarded without qualification.

(c) **(i)** Apart from those who thought that the spring acted in reverse and pushed the contacts apart there was clear thinking shown by many candidates.

(ii) As with the Foundation tier a number of almost correct responses were given to the reason for the shaped hole. To gain the mark there needed to be reference to the contact not being able to turn on the shaft.

(d) The question on avoidance of environmental damage by the manufacturer produced a range of valid responses. Candidates were clearly aware of the biodegradable nature of some plastics. Marks were only awarded for those points that referred to the manufactured aspect.

(e) As with many calculation questions in the past, this part was not well answered. A number of candidates gained a mark for calculation of the total current flow; very few had divided this by three to give a result for each LED.

3 (a) (i) The question asked for specification points but responses were frequently written as a statement or question eg ‘size of circuit’ or ‘speed of sensing’. A number of candidates gained a mark for mentioning the ‘switch on’ temperature for the cooling fan; however the second mark eluded them as they repeated the given point concerning the minimum operating for the fan.

(ii) This part of the question was a good discriminator and those who had thought through the way the system operated spotted the problem with constant switching on and off and its potential effect on the life of the motor.

(b) (i) Reading and understanding the table was carried out well by the majority of candidates with many gaining both marks. Problem areas included mention of the thermistor resistance at 25°C. As the system operating temperature would be around 100°C, this fact would have little bearing on the choice.

(ii) Properties of epoxy resin were generally well appreciated.

(c) The calculation was a standard 555 monostable with the twist that two resistor values had to be added. One mark was awarded to those who had used 480K but got the calculation wrong.

(d) Benefits of PIC based systems were widely known, with the accuracy of timing and ability to alter values quickly coming up as the most popular responses.

4 (a) (i) This part was well answered with only a small minority not being able to interpret and complete the truth table.

(ii) The function of the AND gate in ensuring that both conditions were met before giving a positive output was well answered by most.

(iii) Knowledge of floating inputs was not wide. A number of marks were gained by those who followed the logic through and could see the result of connecting the floating input high.

(b) Very few candidates had any knowledge of a decoupling capacitor with most completed answers referring to timing and delays. Those who mentioned smoothing were awarded the mark.

(c) (i) Some good responses to this question were encountered. The ability to check the function of the circuit at a given point was what was required.

(ii) Rather more marks gained for this part than for the previous one. Mention of the visual element was frequent and removal of the need to use a logic probe was also a popular response.

(d) Marks were awarded for a correct transistor symbol and for valid connections. Those who could draw the symbol correctly generally gained at least one of the marks for connection. The most common fault was in joining the collector to the positive rail as well as to the LED cathodes.

5 **(a)** This question was not well answered. The requirement was for a method of debouncing the signal but a small minority of those who answered chose to clean it with a damp cloth! Methods of debouncing were not clearly explained; the majority of marks gained were for use of a Schmitt trigger, though the full circuit was not shown.

(b) **(i)** This question was aimed at A* candidates and it did discriminate well. Knowledge of pin function was not well known or described.

(ii) The 4 bit counter produced more correct responses than the BCD counter. A common error with the BCD counter was in thinking that it reset at 10 rather than 9.

(iii) The purpose of this part of the question was to test whether candidates knew that the maximum count for each IC should be multiplied. For this reason any responses from (ii) that were multiplied gained the mark. Few answers were correct in subtracting 1 from the product ie (10 x 16) -1 = 159.

(c) More candidates described the action of the NOT gate correctly while very few referred to the resets occurring on a low to high transition.

(d) A good number of candidates realised the shortcomings of reading binary values from LEDs. A few responses were based on use of LCD displays and rather fewer mentioned decoding to a seven segment display.

1953/03 Paper 3 (Foundation)

1 This question provided almost all candidates with a good measure of success, and the majority were able to gain well over half the available marks.

(a) The table was completed well with nearly all candidates able to correctly identify the components, and state whether they were input or output devices.

(b) (i) This part was not answered so well. Few candidates were able to correctly identify component materials for the parts of the transistor, despite having a list to choose from. A common error was to identify the transistor legs as being made from lead.

(ii) Only a very small proportion of candidates were able to appreciate that the transistor case should be able to withstand heat.

2 Question 2 showed up a surprising lack of the knowledge and experience that could be expected from candidates following a course in electronics that would require the use of soldering.

(a) (i) Correct answers were rare, few candidates appeared to be aware that tin was the metal alloyed with lead to make traditional 60/40 solder.

(ii) Most candidates made the correct response choosing lead free solder as being safer to use.

(iii) About half of candidates demonstrated some awareness of lead toxicity. Many responses alluded incorrectly to ‘lead fumes’, failing to appreciate that any fumes present are due to flux, and that physical contact is necessary with the lead content of solder for it to be harmful.

(iv) Surprisingly few candidates seemed to know that flux was present in ‘cored solder’, often giving lead as the substance producing fumes.

(v) Most responses appreciated that some form of improved ventilation would reduce harmful fumes during soldering, and masks were also correctly mentioned, whilst some candidates wrote about goggles. However, a significant number of candidates incorrectly thought that the solution was ‘to solder more quickly’, or to ‘use less solder’.

(b) (i) A number of correct answers here. Most substitutions were correct, but a few candidates failed with the multiplication and carried out an addition.

(ii) A surprising number of candidates were unable to appreciate that 24 volts is safer than 240 volts, and the reason for using 24 volt soldering irons is the reduced risk of electrocution.

(iii) Very few correct responses, most suggesting the disadvantages to be, that 24 volt soldering irons took longer to heat up, or operated at lower temperatures.

(iv) Only a few candidates correctly identified gas as a suitable alternative energy source to rechargeable batteries for use with portable soldering irons. A large numbers of responses incorrectly gave solar cells as an answer.

3 Question 3 exposed serious weaknesses about the candidate's knowledge of rudimentary 'logic'. This question was the most poorly answered by far on the foundation paper, with many candidates failing to score any marks at all.

(a) (i) A few candidates were able to correctly complete the truth tables for the AND and OR gates, many did not. Significant numbers of candidates seemed unaware of logic and their answers included a variety of numbers ie 2's or 3's.

(ii) There were some poor and meaningless attempts at arranging the switches into an OR gate. A small proportion of attempts did manage to draw a circuit which allowed one switch to function. But only a few candidates were fully successful and completed the OR gate arrangement.

(b) (i) It was rare to come across a candidate who recognised the NOT gate, and even rarer to find a candidate who could give 'inverter' correctly as an alternative name for the gate.

(ii) Few candidates were able to complete the diagram by correctly placing a PTB switch in the space. Many placed a PTM switch instead, whilst others simply copied the NOT gate symbol into the space.

(iii) Very few responses correctly identified the PTB (push to break) switch as being the correct type for use in the diagram.

(iv) Candidates experienced difficulty with being able to draw a NAND gate, although a few did manage to gain one mark. However most of these were unable to appreciate that it was necessary to tie together the two inputs to make the NOT gate to gain the second mark.

4 Question 4 suggested that most candidates did not have a sound grounding in materials. Where candidates had covered the subject, they did well in this question.

(a) (i) The majority of candidate's responses tended towards 'can be remoulded when heated', but a common misconception related to thermoplastics being 'able to withstand heat'.

(ii) It followed that those candidates who responded correctly in (a)(i) with 'can be remoulded when heated' then responded with 'cannot be remoulded when heated again'. It was pleasing to see some candidates give more detailed explanations involving cross linking.

(iii) The majority of candidates gained a mark through responses correctly suggesting that the letters identify the type of plastic. Surprisingly, quite a number of candidates seemed unaware of the significance of the symbols and letters.

(iv) The majority of candidates were able to gain two marks for suggesting benefits for the recycling of plastics. Those that failed here tended to give definitions for the meaning of recycling eg 'the plastic can be used again'.

(b) **(i)** Only a small proportion of candidates were able to gain the full four marks for completing the table correctly. This question highlighted the lack of familiarity most of the candidates had with plastics and their production processes.

(ii) Very few candidates were able to correctly relate the unsuitability of the products for batch production to the need for expensive moulds / dies, and machines. Many answers tended to ramble about ‘separate parts’ and difficulty of assembly.

5 Question 5 was the Product Evaluation question about mobile phones.
Although nearly all candidates were able to score well in the earlier sections, where their own experience would have helped, the knowledge that would have been gained from researching the pre-release material was lacking in many. Few candidates knew anything about the differences between analogue and GSM, or satellite phone systems.

(a) **(i)** Nearly all candidates were able to gain both available marks using a variety of acceptable answers.

(ii) The majority of candidates gained both marks by giving responses relating to ‘flip phone design’ and ‘key lock systems’. A few weaker candidates incorrectly suggested low profile keys.

(b) **(i)** Most candidates were able to correctly state at least one security weakness of early analogue phones, many relating to ‘hacking’ and ‘intercepting of calls’.

(ii) The vast majority of candidates failed to appreciate the fact that analogue systems switched to digital with the introduction of GSM.

(iii) Very few candidates understood anything about geostationary satellite systems. The few who did, appreciated that alignment and the size of equipment would be a problem for users. A few responses simply stated ‘they are expensive’ without qualification.

(c) **(i)** Nearly all candidates correctly identified the health risk associated with exposure to radiation.

(ii) About half of candidates incorrectly assumed that use of mobile phones in some way discourages personal contact. Others correctly identified real negative social issues such as bullying, filming fights, interrupting meetings and driving whilst using a phone.

1953/04 Paper 4 (Higher)

1 Question 1 showed most candidates to have a good grounding in materials with many able to gain most of the available marks.

(a) (i) The majority of responses tended towards ‘can be remoulded when heated’, but a common misconception related to thermoplastics being ‘able to withstand heat’.

(ii) It followed that those candidates who responded correctly in (a)(i) with ‘can be remoulded when heated’ then responded with ‘cannot be remoulded when heated again’. It was pleasing to see some candidates give more detailed explanations involving cross linking.

(iii) The majority of candidates gained a mark through responses correctly suggesting that the letters identify the type of plastic.

(iv) The majority of candidates were able to gain two marks for suggesting benefits for the recycling of plastics.

(b) (i) Less than half of candidates were able to gain the full four marks for completing the table correctly.

(ii) Very few candidates were able to correctly relate the unsuitability of the products for batch production to the need for expensive moulds/dies and machines. Many answers tended to ramble about ‘separate parts’ and the difficulty of assembly.

2 Question 2 was the Product Evaluation question about mobile phones. Although nearly all candidates were able to score well in the earlier sections, where their own experience would have helped, fewer demonstrated the knowledge that would have been gained from researching the pre-release material. Consequently only a limited number of candidates understood the differences between analogue and GSM, or satellite phone systems.

(a) (i) Nearly all candidates were able to gain both available marks using a variety of acceptable answers.

(ii) The majority of candidates gained both marks by giving responses relating to ‘flip phone design’ and ‘key lock systems’. A few weaker candidates incorrectly suggested low profile keys.

(b) (i) Most candidates were able to correctly state at least one security weakness of early analogue phones, many relating to ‘hacking’ and ‘intercepting of calls’.

(ii) Most candidates failed to appreciate the fact that analogue systems switched to digital with the introduction of GSM.

(iii) Few candidates understood much about geostationary satellite systems. Those who did appreciated that alignment and the size of equipment would be problems for users. Some incorrect responses simply stated ‘they are expensive’ without qualification.

(c) **(i)** Nearly all candidates correctly identified the health risk associated with exposure to radiation.

(ii) A few candidates incorrectly assumed that using mobile phones in some way discourages personal contact. Others correctly identified real negative social issues such as bullying, filming fights, interrupting meetings and driving whilst using a phone.

3 Question 3 challenged most candidates; knowledge of bistables was weak, as was that of PCB design. The latter possibly because of the reliance on PCB CAD software in schools. Many candidates seemed unable to understand that because copper and components were on different layers, tracks could pass underneath components.

(a) **(i)** The majority of candidates were able to correctly identify the NOR gate.

(ii) Few candidates appeared to know what was meant by a bistable circuit and the question was poorly answered, making it rare to find a response meriting the 2 marks. The most common correct answer related to a bistable having two stable states, but few candidates were able to relate these to the inputs bringing about change.

(iii) The logic levels appeared to have been guessed at with varying degrees of success by candidates, and it was only a rare and exceptional candidate who appreciated that the logic levels at ‘turn on’ were unpredictable.

(b) **(i)** Only a minority of candidates correctly identified the O/P as coming from pin 2 or 4 to complete the connection.

(ii) About half of candidate responses identified at least one reversed supply connection to the chip.

(iii) The majority of candidates gained at least one mark for suggesting that the PCB could be made more compact. There were a lot of incorrect answers and vague references to tracks going through resistors etc. It was unusual to find a candidate mention flooding the blank areas to save copper etching, putting text on the copper side or enlarging the pads.

4 Question 4 proved to be the most difficult on the paper for candidates. The average mark for this question was well below two marks, with many candidates failing to score at all. This was surprising as it might be assumed that the 555 timer would be a course staple in most schools. However, responses indicated most candidates to have only superficial knowledge of the device, without understanding of switching levels.

(a) **(i)** About half of candidates correctly identified the astable circuit, most of the remainder tended towards simply ‘555’ or ‘monostable’ as an answer.

(ii) It was disappointing to find that only a minority of answers were able to correctly identify a square wave waveform. It was common to find ‘digital’ as a response.

(iii) The time period was often incorrectly given as 0.3s, and most candidates failed to correctly state the correct time period of 0.6s.

(iv) This question tested the candidates understanding of the concept of frequency and its relationship to waveform time periods. Candidates at this level were expected to know that frequency was a measure of the number of complete cycles occurring within a time period of 1 second. Very few demonstrated this level of understanding to gain the available marks.

(v) There were few marks awarded to any candidates for the drawing of the waveform at the timing capacitor. This suggested that candidates did not fully understand the working of the 555 and switching levels at discharge and trigger inputs.

(b) Only a small minority of responses recognized that current flow would increase to such an extent as to cause damage to the 555, although many more responses did recognize that there would be an increase in current for a single mark, they incorrectly related the increase to either damage to the LEDs or affecting the output frequency.

5 Question 5 provided candidates with a moderate level of success. Understanding of 'logic' was sound for many candidates, as was knowledge about PICs.

(a) Generally quite well answered. Most candidates were able to draw the correct output waveform for the AND gate, and most of these then went on to complete the NAND output correctly, although fewer were successful with the NOR gate. Significant numbers of weaker candidates did not attempt this question.

(b) The XOR symbol was not well known by most candidates, with significant numbers incorrectly drawing XNOR gates instead. However the majority appeared to have little idea. Surprisingly some of those candidates who were unable to draw the XOR symbol were able to complete the truth table correctly.

(c) **(i)** Many candidates' responses indicated that they understood that computer simulations fall short of real life conditions and gained the mark.

(ii) Most candidates appeared confused by this question and gave a range of meaningless responses. A minority understood that high level languages are easier for people to use.

(iii) **(iv)** Well answered by the majority, when incorrect it was usually because candidates had ROM and RAM reversed.

(v) Approaching half of candidates correctly stated that PICs using flash technology could be reprogrammed, other responses showed little understanding eg 'they are shock proof' or 'smaller in size'.

Grade Thresholds

General Certificate of Secondary Education
GCSE D&T Electronic Products Short Course (Specification Code 1053)
June 2008 Examination Series

Component Threshold Marks

Component	Max Mark	A*	A	B	C	D	E	F	G
01	50	-	-	-	26	22	18	15	12
02	50	-	28	22	16	10	-	-	-
03	105	-	82	71	61	50	39	29	19

Specification Options

Foundation Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175	-	-	-	96	80	64	49	34
Percentage in Grade		-	-	-	65	15	10	0	5
Cumulative Percentage in Grade		-	-	-	65	80	90	90	95

The total entry for the examination was 27

Higher Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175	140	121	102	83	64	54	-	-
Percentage in Grade		0	0	0	50	0	0	-	-
Cumulative Percentage in Grade		0	0	0	50	50	50	-	-

The total entry for the examination was 2

Overall

	A*	A	B	C	D	E	F	G
Percentage in Grade	0	0	0	63.64	13.64	9.09	0	4.55
Cumulative Percentage in Grade	0	0	0	63.64	77.27	86.36	86.36	90.91

The total entry for the examination was 29

Statistics are correct at the time of publication.

General Certificate of Secondary Education
GCSE D&T Electronic Products (Specification Code 1953)
June 2008 Examination Series

Component Threshold Marks

Component	Max Mark	A*	A	B	C	D	E	F	G
01	50	-	-	-	26	22	18	15	12
02	50	-	28	22	16	10	-	-	-
03	50	-	-	-	25	22	20	17	15
04	50	-	25	20	15	10	-	-	-
05	105	-	82	71	61	50	39	29	19

Specification Options

Foundation Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175	-	-	-	96	81	66	51	36
Percentage in Grade		-	-	-	26.15	23.48	20.8	13.56	9.52
Cumulative Percentage in Grade		-	-	-	26.15	49.63	70.43	83.99	93.5

The total entry for the examination was 1765

Higher Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175	131	115	99	83	64	54	-	-
Percentage in Grade		12.66	22.08	28.79	22.44	10.53	1.73	-	-
Cumulative Percentage in Grade		12.66	34.74	63.53	85.96	96.49	98.22	-	-

The total entry for the examination was 2252

Overall

	A*	A	B	C	D	E	F	G
Percentage in Grade	7.11	12.41	16.18	24.06	16.20	10.08	5.94	4.17
Cumulative Percentage in Grade	7.11	19.52	35.70	59.76	75.96	86.05	91.99	96.16

The total entry for the examination was 4017

Statistics are correct at the time of publication.

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