OCR
RECOGNISING ACHIEVEMENT

GCSE

Design and Technology: Electronic and Control systems

General Certificate of Secondary Education **J301**

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

Examiners' Reports

June 2011

J301/J041/R/11

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This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the Examination.

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EXAMINERS' REPORTS

Chief Examiner's Report

This report provides an overview of the work seen in the written examination Units 2 and 4 and the Controlled Assessment Units 1 and 3, for candidates who took the examination during this series. It precedes a more detailed report to centres from each subject area within the Innovator Suite and highlights general issues that have occurred across the suite of specifications.

This report has been prepared by the Chief Examiner, Assistant Chief Examiners, Principal Examiners and Principal Moderators and covers all specifications within the Innovator Suite. It should be read in conjunction with the examination papers, the mark schemes, and the marking criteria for assessment given in the specification booklets.

This is the second examination series in the second year for the new Innovator Suite.

A reminder: An important point for teachers to note about the Terminal Rule in relation to this suite of specifications and re-sits: The terminal rule is an Ofqual requirement. Candidates must be entered for at least two units out of the four (full course) at the time that they certificate. i.e. the end of the course.

Please be aware that the Ofqual rule states that marks scored for terminal units will be the marks used in the calculation of candidate grades. Therefore, if one of the candidate's terminal units is a re-sit and the mark is poorer than the original mark, the poorer mark will be used to calculate the final grade for that candidate.

Obviously, the terminal unit marks are then added to the highest marks scored in the other units making up the certificate.

Centres are reminded that it is also a requirement of Ofqual that candidates are now credited for their accurate use of spelling, punctuation and grammar across all four units.

It is pleasing to see that centres and candidates have continued to respond well to the new style of examination approach. Centres are to be commended for this.

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

Written Examination – Units 2 and 4

Unit 2 – For this examination series of the GCSE Innovator suite entries were seen from all six subject specialisms:

A512 Electronics and Control Systems
A522 Food Technology
A532 Graphics
A542 Industrial Technology
A562 Resistant Materials
A572 Textiles Technology

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

Many of the candidates demonstrated a general awareness of the main points and issues linked to sustainable design and the 6Rs

In **Unit 2 – Section A** of the papers most candidates across the suite attempted to answer all questions, with few candidates giving no response (NR) answers. It was noticeable that, at times, candidates had not read the instructions correctly and centres would benefit from explaining the correct examination requirements to the candidates. Candidates need to be encouraged to give an answer for the multiple choice style questions even if they are uncertain that they are correct. Centres are reminded that questions 1-15 cover the grade range from A* to U.

There was less duplication of circling answers seen during this examination session.
Important: Centres need to be aware that where a candidate has provided multiple answers to a single response question, no marks will be awarded.

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

Candidates need to be made aware of the importance of the wording of each question and they need to understand the difference between terms like 'name', 'discuss' and 'explain'. Many candidates did not score full marks on the 6 mark extended response or discuss questions, because they gave a list of unrelated points instead of developing one of these.

Important: Candidates need to be careful that they do not repeat the question in their answer or write the same answer for several questions. Similarly candidates must not use certain terms as 'stock' answers. Such answers included:
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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. Few candidates were able to do this really well, but most candidates did score two or more marks from the six available for this question.

Centres are reminded that candidates are assessed on spelling, punctuation and grammar on the banded mark scheme question.

It is also important to note that candidates need to ensure that they write legibly and within the areas set out on the papers.

Unit 4 – For this examination series of the Innovator suite entries were seen from the following subject specialisms:

A514 Electronics and Control Systems
A524 Food Technology
A534 Graphics
A544 Industrial Technology
A564 Resistant Materials
A574 Textiles Technology

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

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

Candidates need to:

- **Read through the complete question before attempting to answer**. The examination includes sufficient reading time for candidates to focus on the key points to address in their answers. It was pleasing to see that some candidates produced a 'plan of action' before giving their answer to the questions with a high mark allocation.

- **Look carefully at the mark allocation and available space for their answers**. Candidates need to be aware that there is a relationship between the space available and the length and quality of the expected answer, and thus the mark allocated.

- **Have a better understanding of the different command words used throughout the exam paper in order to respond appropriately to the questions.** Across the suite there were many answers that lacked detail and clarity. Terms such as 'cheaper', 'quicker' and 'easier' were often used and meant very little without qualification or justification. Practice of previous questions is extremely valuable to help candidates become more confident.

- **Become familiar with the quality of written communication questions marked with an asterisk***. These questions provide candidates with the opportunity to give detailed written answers combining good subject knowledge with an ability to produce structured, **coherent** responses and accurate spelling. Simply repeating the same point several times will not lead to the award of marks. A list of bullet points does not represent an adequate answer and will compromise the higher marks. Practice of this type of question which carries [6] marks is strongly recommended.

- **Respond to specification and/or bullet points accurately.** In design-type questions this is important if the candidate is to achieve the maximum marks available.

- **Make their answers clear and technically accurate**. In questions that require candidates to produce sketches and notes, it is essential that answers are made as clear and technically accurate as possible. Marks may be compromised through illegible handwriting and poor quality sketches.

Controlled Assessment – Units 1 and 3

Unit 1 – For this examination series of the Innovator suite entries were seen from the following subject specialisms:

A511 Electronics and Control Systems
A521 Food Technology
A531 Graphics
A541 Industrial Technology
A561 Resistant Materials
A571 Textiles Technology

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

A513 Electronics and Control Systems
A523 Food Technology
A533 Graphics
A543 Industrial Technology
A563 Resistant Materials
A573 Textiles Technology

This examination series has seen portfolios for all subject specialisms being submitted both through postal and repository pathways. Most centres have been prompt in the dispatch of documentation to OCR and moderators, which is to be commended. It is important that centres forward form CCS160 in particular to moderators.

Important Note: Candidates producing paper portfolios should be entered for postal (02) moderation. Candidates producing their portfolio on a CD or memory stick should be entered for postal (02) moderation.

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

In general, centres have been successful in applying the marking criteria for both Units 1 and 3. However, it is still noticeable that some candidates were being awarded full marks for work that lacked rigour and depth of analysis. Words highlighted on the marking criteria grids such as 'appropriate', 'fully evaluated', 'detailed' and 'critical', which appear in the top mark band, were not always adhered to.

Centres are reminded to apply the mark scheme on a 'best fit' basis which may mean allocating marks across the assessment grid. For each of the marking strands, one of the descriptors provided in the assessment grid that most closely describes the quality of the work being marked, should be selected. Marks should be positive, rewarding achievement rather than penalising failure or omissions.

It was still evident that a significant number of portfolios, particularly for Unit 1, resembled the legacy format, especially in terms of the excessive research and inappropriate critical evaluation.

It is important that centres encourage candidates to organise the portfolio according to the different marking criteria strands as it enables the candidates to produce work that clearly shows an understanding of the controlled assessment requirements. Portfolios should be clearly labelled with the Candidate and Centre name and number, with the unit code and title also evident. (*Specification – 5.3.5 Presentation of work)* This is particularly important when the Centre submits work via the OCR Repository, where individual files are used to store portfolio work. Centres need to ensure that candidates clearly label each file using the marking criteria section headings; this facilitates a more effective completion of the moderation process.

Important: Centres are also reminded to ensure that the OCR cover sheet is included with each portfolio of work, **outlining the theme and the starting point chosen by the candidate.**

Many candidates included a bibliography or referenced their research sources, which was pleasing to see. **It is good practice to ensure that candidates acknowledge sources of information used for the development of their portfolio work**. *5.3.2 Definitions of the Controls* section in the specification states: *"The teacher must be able to authenticate the work and insist on acknowledgement and referencing of any sources used".*

There was still some evidence this series of strong teacher guidance influencing candidate portfolios. Where this was evident it greatly hampered the candidate's ability to show individuality, flair and creativity, and therefore achieve the higher marks. Centres should avoid

over-reliance on writing frames for candidate's work which, while assisting struggling candidates, clearly will affect the ability of able candidates to show their skills and thus gain high marks.

Centres are to be reminded that the '*controlled assessment task must NOT be used as practice material and then as the actual live assessment material. Centres should devise their own practice material using the OCR specimen controlled assessment task as guidance.*' *Specification – Section 5.2.2 Using Controlled Assessment Tasks.*

It was noticeable that where candidates had scored the high marks, they had used specialist terms appropriately and correctly and had presented their portfolio using a structured format.

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

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

Centres are to be commended on the amount of work produced for the portfolios in Units 1 and 3, which has been realistic in terms of the amount produced and the time allocated to each unit – 20 hours.

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

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

Unit 1 – specific areas of importance

It is considered good practice for teachers to encourage candidates to consider Eco-design and sustainability when making decisions and combining skills with knowledge and understanding, in order to design and make a prototype product. This knowledge base also acts as a 'spring board' to active learning for Unit 2.

It was evident through the portfolio that candidates struggled with the critical evaluation section of the marking criteria. Unit 1 requires that the candidate evaluates the processes and subsequent modifications involved, in the designing and making of the final prototype ONLY. Too many references were made to the performance of the prototype against the specification, which meant that candidates' marks were compromised. (Not applicable to Food Technology)

Unit 3 – specific areas of importance

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

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

Centres need to ensure that candidates complete a quality product for Unit 3. The weighting of marks available for the Making section therefore, must be reflected in the time available for the candidates to complete a quality product.

A511 Introduction to Designing and Making

Comments
The wide range of responses from centres shows the difference between those who have been to training sessions and those who are trying to interpret the specification without attending Inset.

Some centres had used too many central resources for candidates with common material appearing in the folders. Although the unit is called Introduction to Designing and Making it is expected that each folder is unique with candidates making a significant contribution to centre supplied materials..

Creativity
The connection to the published theme must be clearly indicated and demonstrated with a mind map. Some centres used a mood board with little specific research to illustrate the users' wants and needs. Existing products were well covered but centres did not pull out the technologies or discuss the quality of the product's design. A product analysis looks in greater detail at a product which is relevant to the theme area. It is so much better to have first hand experience of a product which the candidates can handle and take photographs to illustrate points. Many centres relied on web searching making it difficult to see the work of the candidate. Some candidates selected their line of interest and produced a design brief, but did not always state an action plan for specific research.

Designing
Specifications were well understood but there are still candidates producing a list for a whole product not just the system prototype.

It is good to see most candidates are now starting with a systems diagram to help with producing a range of ideas. Although most candidates are using a library to find ideas it is important they show understanding of the system by stating input, process, output. When considering the ideas candidates should always refer to the user and specification, tick sheets are not appropriate.

In most folders the final design is clear and some modelling takes place. At this stage of development candidates should make improvements to refine the design to better match the user needs. Most folders contained a final drawing of a pcb or details of mechanisms but there were often jumps in the thinking with the final details suddenly appearing. Candidates must show sufficient information which specifies what they are going to make.

Making
Planning sheets are well established and should be continued, breaking down all the expected stages the candidates will use to make the prototype system, especially the populating of the pcb. A diary of making does not replace the planning activity. The high quality of the product is used to indicate a higher level of marks. On a pcb this is shown by how components are fitted, together with how cables and connections are treated. Insulation is important with off board components.

Solving Technical Problems
The candidates must produce evidence in the folder as notes or pictures with comments. Often a phrase is hidden in the evaluation. In the making activity the candidate is always problem solving, these need recording on a snag sheet

Record Key Stages
Most centres are now organised for this section with photographs of the candidate actually working. Where centres use library pictures for the early stages unique pictures must appear

when the candidate is putting together the pcb or mechanism. The moderators rely on the quality of the photographs at this stage to have confidence in the quality of the finished system.
A number of photographs of the finished system prototype should be of a quality to judge the construction. It is the teachers' responsibility to ensure the photographs 'sell' the level of quality to back up the marks awarded.

Evaluation
The critical evaluation is about the designing and making process, comments could start with the modelling and final design and certainly should talk about the making activity. If there is a structured planning sheet, extra columns could be added to make the comments of change or improvement.

Simple testing of the prototype needs to be carried out to allow the candidate to propose modification and improvements.

Spelling, the correct use of technical language and organisation of the folder are awarded 1 mark in each of the strands of ability.

A512 Sustainable Design

The upward trend in entries continued this summer with a significant number entering the examination at the end of a two year course. With a number of candidates achieving over 50 marks, the majority fell in the range of 10-51. Most candidates were capable of achieving 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 to find that some candidates were unable to provide any responses from the 6 Rs, with others inventing their own variants. The legibility of some candidate's responses was also a cause for concern.

Questions 1-15 (Section A) consisted of 1-mark responses and they were generally answered well. A common incorrect answer to Q4 was "natural gas". Q6 showed a pleasing number of correct responses, the remainder either guessing various combinations relating to health and safety or simply making no response.

Q16 (a) Candidates were required to identify four specification points relating to the design of a bicycle rear light. A good number of candidates scored marks on this question with the main failure being to offer generalised or points observed from the sketch. Suggestions for two different coloured lights, or a white light, perhaps indicated that they had not read the whole question. The danger of one word answers needs to be highlighted – they very rarely warrant a mark in this type of question.

(b) (i) A disappointing response to this question. 'Vacuum forming' or 'injection forming' were the most common incorrect responses.

(ii) The majority of candidates gave a correct answer with the remainder unable to offer a valid 6R.

(iii) Well answered with most candidates achieving credit here with comments about using energy from the cyclist (or the bicycle motion in some way), adding a solar panel, using rechargeable cells or some sort of wind-up add-on.

(c) Candidates often placed too much focus on IT benefits rather than genuine electronic ones but a number of candidates suggested additional product functionality, power saving options and other valid improvements. Answers related to both the bicycle light and electronic products in general. Weaker candidates suggested electrical enhancements, once again pointing to perhaps not reading the question thoroughly before embarking on their answer.

(d)(i) & (ii) Few candidates had a working knowledge of carbon offsetting principles and methodology. The majority gave a poor response. Many incorrect responses focussed on energy saving rather than offering examples of practical carbon offsetting.

Q17 was well answered by the vast majority of candidates.

(a) Most candidates were able to gain credit here.

(b)(i) Generally answered well but with some showing a lack of understanding of the principles of this unit.

(ii) This question had a number of 'no response' answers.

(iii) Most candidates were able to gain credit, although a number suggested that the imports were restricted to limit the carbon footprint of the product or to preserve jobs within the EU, suggesting some awareness of social issues but a lack of understanding of the toxic nature of cadmium.

(c) Well answered by many candidates making reference to the ease of service, ability to replace the cell and continue to use the product 'for another 4 years' or to be able to replace just the broken part rather than 'throw the whole thing away'. Reuse as a container was suggested by a number of candidates.

(d) Reuse was well-understood in this question and was answered well.

(e) Notes and sketches varied from the comprehensive and outstanding, achieving the full four marks down to identical sketches of Fig.5 that were not worthy of any credit. However, most candidates were able to gain some credit here.

Q18 (a) (i) Symbol function was worked out by a majority of candidates but some were unable to express their intentions clearly e.g. incorrectly offering "at home".

(ii) Most candidates achieved credit here with a good number carrying on their explanation under the line to help get their point across.

(b) (i) Some confusion here with the heat energy dissipation, a number had clearly re-visited their answer in light of their response to (ii).

(ii) Most candidates achieved credit here.

(c)Most candidates were able to gain credit. Common incorrect answers involved energy production and not saving, along with repetition such as (i) turn off lights and (ii) turn off electrical appliances.

(d) Most candidates were able to gain one mark here but many invented or stated incorrect properties for LEDs. A significant number offered properties described in a different way, e.g. 'uses less energy' and 'produces less heat', effectively saying the same thing twice.

(e) A wide range of responses to this question with a good proportion detailing the advantages and disadvantages of the two locations, comparing the capital cost with payback time and the vagaries of wind power generation. Reference to the saving of fossil fuels and the potential damage to habitat, wildlife, use of farming land or the need to clear trees, spoiling 'the view' and other factors were mentioned by some candidates

A513 Making quality products

Comments
Centres are much more familiar with the format of this unit which led to folders being clearer but many had too much material. Centres need to match the marks available to the time given on each section.

Designing
Most centres gave a connection to the theme with a mind map and identified the area of working. Research needs to be quite focussed on the user needs leading to the design brief. Investigation of the brief is about collecting information and data for designing. It is useful to use bullet points leading to the product specification. This section should be completed in 4 or 5 pages.

It is still useful to start the designing stage with system diagrams leading to ideas with clear annotation about the function. It is important the level of designing is clearly higher than A511 because their level of understanding will have improved. On the casing or structure the candidates should show how the system will be part of the overall design.

The final design will have been selected by referring to the user and specification. Modelling is expected to show improvements not just a repeat of an idea. Final working details should finish this section, with full information for the construction of a product.

Making
A production plan should be a little more detailed than on A511. The techniques and skills used for the construction need to ensure a functioning quality product. Signs of quality are in the detail of fixing and finishing of the system and how it integrates with the case or structure.

Photographs of the finished product must be sufficiently detailed to show the system and casing/structure both inside and outside. Please remember this is the moderator's view of the candidates work.

Solving Technical Problems
Candidates should be problem solving all the way through construction, these points should appear on a snag sheet with information of how the problem was solved. This was the most poorly completed section of the folder. Distinct evidence must be shown rather than having to search through to find material.

Record Key Stages
The diary of making with photographs and notes is a section that candidates are proud to produce, since it shows how they work. The centres' library of images must be carefully used to ensure the key stages are unique to the candidate. It is important an accurate record is kept, with postal moderation this record gives confidence in the awarding of the making marks.

Evaluation
Candidates should be confident of using the specification to check if the final product meets the needs of the user. Detailed testing should find the limits of function of the product leading to meaningful conclusions and proposal for modifications.
1 mark is awarded in each strand of ability for the correct use of English and organisation of the folder.

A514A 01 Electronics

The more able candidates completed all questions and gained marks through clear explanations and considered responses. At the other end of the spectrum responses reflected failure to read the questions carefully and in many cases candidates were not secure in their knowledge of the basic processes associated with electronics. The standard of sketching was, in general, sufficient to illustrate ideas to the examiners and annotation was clear and relevant. However, in some cases there was confusion between circuit symbols and drawings of the real component. For the majority of candidates who were taking this unit at the end of their course the symbols of basic components such as capacitors and transistors should be well known.

Unusually there were a number of candidates using outdated symbols, particularly for the capacitor. This practice undoubtedly stems from the increasing use of websites for information, many of which do not use the latest symbols.

The IET set of symbols which have been in use for many years are the ones which are used in the preparation of unit papers and candidates should be made aware of these.

The questions testing quality of written communication gave plenty of scope for candidates to provide examples to illustrating their response. It should be remembered that repeating a point more than once will not gain extra credit. A minority of responses were in the form of short bullet points; this will automatically restrict the number of marks that can be awarded to Level 1 and candidates should be reminded of this when preparing for the unit.

There were a number of papers where candidates had failed to complete the majority of the questions, leaving the response space blank. As has been stated in previous sessions this practice can only result in no mark for each missed answer.

Section A

1 (a) (i) The majority of candidates gained the mark for referring to the plastic 'melting' or having 'a low melting point', only a few used the term 'thermoplastic'. Those who referred to the plastic being moulded into shape did not gain the mark as this could also have applied to any of the thermoforming processes such as vacuum forming.

(a) (ii) The most common responses referred to the accuracy of the injection moulding process and its suitability for volume production. A number of candidates answered generically with 'quick' and cheaper' with no qualification of their comment. This type of response failed to gain marks. Very few candidates used the ease of changing colour as one of their benefits.

(b) This part of the question was generally well answered and the majority of candidates gained at least one mark. Most answers included the size, quantity and polarity of the batteries or referred to the disposal / recycling of the product once finished with.

The key part of the question was that the information should be of help to the user. Those who gave the country of manufacture were not rewarded with a mark.

(c) Few responses showed full appreciation of the benefits *to the manufacturer* of using a chip on board (COB) construction. The compact size of the unit and ease of construction were the most commonly noted features but very few had made reference to the DIL and surface mount alternatives shown in the diagram.

(d) The most common response was 'LDR', which gained one mark. The second mark was most often awarded for 'solar panel', very rarely did any candidate mention phototransistor or photodiode. The term 'light sensor' is generic and as such did not gain a mark.

(e) The candidates who understood the term 'ergonomics' generally gained one or both marks for this part. Those responses referring to testing should ideally have specified children as being the user group for the test to check the size or comfort in the hand of the product. Other valid answers included checking the ease of use of the switch and checking the casing for sharp edges.

2 (a) Many of the responses referred to safety points *when* using the soldering iron, rather than *before* use, which the question asked for. Use of personal protective equipment did not gain marks. The required answers were related to checking the cable and plug of the soldering iron. PAT testing, which is a requirement for all electrical equipment in schools, was rarely mentioned.

(b) Few candidates gained full marks for the question. The most common response referred to applying less pressure on the handle. This would work and it gained a mark but most of the commonly found wire strippers do have some form of adjustment. There were a few candidates who had used specific trade names in their response. These were credited but candidates should be advised against this.

(c) (i) This was well answered with most candidates using either the unit setting or setting to zero as a check before use.

(ii) The question related to an alternative tool for finding a very small drill size. Few candidates gave a suitable response; the majority using a steel rule, which would not be suitable for a small size. Outside calipers could have been used to give a comparative measurement but these were not often mentioned.

(iii) Those familiar with a signal diode generally got the mark; the main reason for failure to gain the mark was confusion with the methods used for an LED.

(d) (i) Most candidates will have come across this problem in their own practical work but very few could clearly describe the possible causes. The most common cause for this problem is uneven heating of the component leg and the pad, the alternative was 'dirt' or oxide on the pad.

(ii) Those who had answered the previous part correctly generally gained marks for potential solutions to the problem. These included: the solder had not adhered to the pad, which should have been cleaned before attempting to resolder or applying the iron to both leg and pad. Those who suggested a desoldering tool and removal of the component were adding extra stages that gained no mark.

(e) The majority of candidates gained a mark for drawing a multimeter with probes going to a PCB track and a soldered joint. Very few went on to gain the second mark for showing the type of test to be carried out. There was generally confusion about the value being tested and units used. Resistance, which includes a 'beep setting', noted in a few responses, was the most suitable. If a battery was shown connected to the PCB being tested then a voltage check could be carried out. A current setting would not normally be used for checking soldered joints.

3 (a) Where candidates gained marks on this question they generally gave a description of a use in a product: for example, controlling the brightness or flashes on an LED / light for the pre-set potentiometer. For the microswitch a common use was as a 'trigger' or to 'turn on a circuit'. The preset would be unsuitable for use in a dimmer switch or as a volume control and the microswitch could not be used as a main on / off switch to a product.

(b) This question was generally well answered with the majority of candidates noting the on / off indicators on the rocker switch and the length of the toggle switch making for ease of use.

(c) A clear annotated sketch was the key to success on this question. There were some very good examples of this. The most popular method was to use a removable strip of wood or plastic to rest the LEDs on and set the height for soldering. Methods which relied on setting the height one at a time were restricted to a single mark.

(d*) Responses to this question frequently related to the toxic nature of lead, the health risks linked to working with it and the environmental impact of disposing of it. Some candidates, (particularly those giving higher level answers) talked about the increased melting point and greater expense of 'lead free' solder. Most candidates answered using paragraphs of varying lengths, outlining the benefits and difficulties. There were a few candidates who had related their answer to use of lead in water pipes or as a roofing material rather than in solder.

4 (a) (i) This part was generally well answered with most candidates correctly referring to the need to prevent overheating in the component.

(ii) A variety of unsuitable materials for the heat sink were given, including: 'steel', 'silicon' and 'plastics'. Those who knew about the heat conducting properties of materials generally gained the mark.

(b) (i) This question was not well answered. Very few candidates knew the correct symbols to use for the polarised and non polarised capacitors. A number of candidates then went on to place the capacitors directly onto the given tracks.

(ii) The mark for correct placing of both pads and tracks was rarely given. The mark for use of a polarity symbol, which could have been either '+' or '–' was gained rather more frequently.

(c) The first problem to be overcome by a significant minority of candidates was accurate reading of the question. Too often, responses referred to mains powered products when the question asked for comparison between the use of batteries and mains power *adaptors*. Responses commonly referred to the 'disposal of batteries and their environmental impact', 'cost of replacing batteries as they run out frequently', 'portability' when using batteries and the impact on the 'physical size' of the product. Those gaining more marks also made reference to 'safety' of batteries compared to using mains electricity and the 'falling level of voltage' on batteries and the problems this causes. There was a tendency on this question for candidates to repeat themselves when comparing and contrasting; writing about the opposite argument to the one they had already made.

5 (a) The majority of candidates attempting this part gained at least one mark for identifying the resistance value to use; correct substitution into the formula gave a second mark. There were a significant number who then went on to give the correct answer for the third mark. Those who failed to show working but gave the correct answer were given full marks but candidates should always be advised to show full working in a calculation.

(b) (i) The most frequently occurring correct answer referred to use of an op amp or comparator. There were a number of incorrect references made to logic gates and 555 timers.

(ii) The difference between analogue and digital values appeared to be well known. Descriptions of digital signals on a few responses referred to 'on and off' rather than logic levels; whilst these were rewarded candidates should be reminded to use '1 and 0' or 'high and low' when talking about logic levels.

(c) (i) This part was generally well answered; as mentioned in (i) use of '1' and '0' are preferable to 'on' and 'off' when dealing with logic.

(ii) Few candidates realised that when the temperature fluctuates around 4°C this will cause rapid fluctuation of the output; consequently the mark for stating the cause of the problem was not often given. The concept of an LED having to be on for more than a millisecond was appreciated rather more often to give the mark for the consequent effect.

(d) The wiring of a relay was not well known. A few candidates gained the mark for connecting the relay common terminal to the positive rail but too often the common was connected to the coil. Rather more responses gained the mark for the coil connections; this was often spoilt though by connecting the coil negative either straight to 0V or to the signal from the PIC output. Use of a transistor to provide the current needed for activating the relay coil was rarely seen. On the few occasions that the transistor had been included a protective base resistor had been omitted.

A514C 03 Mechanisms

As a result of an increased entry there was a wide range of responses to the paper.

1(a) Many of those candidates who gave universal joint/flexible coupling merely repeated the stem in response to the description, missing out on the mark for answers relating to shaft alignment. A high proportion of candidates suggested that the flexible coupling was a dog clutch, however, the description they then offered of the purpose was rarely adequate.

(b) Mostly correct answers with a range of interesting objects drawn in the correct place.

(c) The majority of candidates managed one mark. However, some answers repeated the stem in pursuit of the second mark.

(d) The majority of candidates thought that the purpose of the idler was for tensioning.

(e) Many incorrect guesses or vague references to stretch or tension. This was surprising given the common occurrence of these belts in automotive applications.

(f) Reasonably well answered. Although not asked for and no marks were awarded, there were many attempts to name a material.

(g) Very few candidates correctly named the feature and even fewer had any idea how a clutch plate operates along the shaft. The second part, explaining what a spline allowed the clutch plate to do, proved a challenge.

Question 2 focussed on simple levers and candidates had clearly been well prepared for this topic.

2(a) Most candidates were familiar with and were able to identify the key points of a pair of pincers.

(b) A large proportion answered correctly.

(c) This part question required a deeper understanding of levers and a number of candidates misplaced the fulcrum.

(d) There were many attempts to think of a word that means 'joined together' but few candidates actually knew the correct word.

(e) The majority who gained two marks gave oscillating to reciprocating. There were a significant number of candidates who gained one mark.

(f) There were few correct answers and many guessed 'corkscrew' from part (g).

(g) This question was generally well answered.

3(a)(i) Only a few candidates got this question completely correct; the most common correct answer was to identify the sealed bearing as being suitable for dusty conditions.

(a)(ii) Generally correct.

(b)(i) A reasonable number of correct answers. However, many candidates repeated selected bits of the question or stem i.e. lightweight or slow speed.

(ii) Very few candidates actually noted that the question was asking about the drive between shaft and sprocket and looked carefully at the photo. Most answers described the action of the chain on the sprocket.

(c*)This question was generally well answered if the candidates kept their answers focussed on the scheme. Some candidates produced rambling answers about global warming, the cars being despatched wholesale into landfill sites and the potential for harm to wildlife and the wider environment posed by their suggestions. However, there were some very thoughtful, relevant and well argued discussions that frequently achieved Level 3.

4(a) Those who attempted this question either got two marks because they knew how to apply the formulae or got no marks because they simply filled the space with the numbers hopefully arranged.

(b) Generally well known.

(c) Reasonably well answered although a number reversed the properties of oil and grease.

(d) Very similar response to (a).

(e) Generally well answered although a significant number thought it was to take up the slack in the belt.

(f) Well answered, particularly by those who gained a mark in (e). This suggested an understanding of the principles.

(g) The majority suggested changing the profile of the pulley to suit the belt. Some had clearly remembered question one and talked about the use of jockey wheels with a number adding a clear drawing to show their intentions.

5(a)i A wide variety of temporary fixings. A number of successful candidates added reasons why the fixing they had chosen would be suitable. (a)ii This was not well answered. Chromium was a popular incorrect answer through to inappropriate constructional materials for the end product – stainless steel.

(b) Generally, candidates drawing ability was adequate enough for them to be able to show what they were trying to describe. However, their knowledge of suitable mechanisms and their function/limitations was limited in many cases, resulting in the lack of ability to work out a suitable set of components that would achieve the desired effect. Those who had used mechanisms (hands-on in some form, perhaps though modelling) generally scored well with sensible and functional solutions.

(c*) Where candidates concentrated on factors relating to the design of the Playpump a number of excellent responses were seen including interesting discussions about balancing the desire to play with the needs for water and how to use the surplus in the event of over-enthusiastic play. Aspects of maintenance and reliability were touched on by top candidates, along with the potential for moving the system in the event of the water table falling too far. Unfortunately a number of candidates failed to read the question properly. There were many answers that were descriptions of a system which included every mechanical feature or component that had appeared in the previous questions. Others included issues connected with the African climate and how to find water.

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