OCR
Oxford Cambridge and RSA

GCSE

Design and Technology: Electronic and Control systems

General Certificate of Secondary Education **J301**

OCR Report to Centres June 2014

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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.

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

CONTENTS

General Certificate of Secondary Education

Design and Technology: Electronic and Control Systems (J301)

OCR REPORT TO CENTRES

A511 Introduction to Designing and Making

General Comments:

The majority of Centres helped the moderation process to run smoothly by providing the correct paperwork close to the coursework deadline. All MS1 forms should be received by the moderator before the 15th May. Some Centres delayed the moderation process by failing to complete the documentation correctly or posting the forms after the deadline. Most Centres were familiar with the requirements of the controlled assessment unit.

It was pleasing to see that most candidates' work had been annotated to reflect where marks had been awarded. The vast majority of the coursework seen during the moderation was relevant to a GCSE standard. However, Centres are reminded that in this unit, a candidate needs to produce a prototype system, not a quality product.

Creativity
It was pleasing to see that most Centres used the set themes provided by OCR, to identify a suitable need and user group. There is no need to produce detailed work on a number of themes. The limited time available for controlled assessment means that candidates should focus on one theme.

Centres are given clear advice on product analysis as part of the individual Centre report. A generic recognition of similar products should be followed by a comparison of products, preferably with a disassembly of an existing product.

Too many candidates failed to recognise the links between a quality product and the technology involved. Product analysis often refers to general features rather than a detailed breakdown into 'how' and 'why' a product is successful.

It was pleasing to see that many candidates now use an 'Eco-web' to consider the sustainability of a product.

Conclusions to the research continue to be lacking in detail and are often completed as an 'afterthought'. The conclusions need to bring all of the research activity together and form the basis for producing a detailed and justified Design Specification.

Successful Candidates:

- *choose a theme*
- *create a 'mind map' to identify action points*
- *clearly identify the needs of the user and explain the situation in which the prototype could be used*
- *conduct detailed research – considering the changes in existing products, identifying trends, identifying specific materials and identifying the technologies used*
- *produce a comprehensive Design Brief and action plan for realising the brief*
- *conduct further research using critical analysis of a product to evaluate function, user needs, consider specific material properties, sustainability, and product life cycle*
- *make specific reference to an 'Eco-Web', considering the sustainability of a product in detail*
- *make a summative evaluation of the research activity leading to conclusions which will help form a Design Specification and final list of User Needs.*

Designing
The Design Specification continues to be a cause for concern. Good Specification points should be justified and measurable. There should be clear evidence that the candidate has thought about controlling the proposed system.

Many candidates produced lengthy paragraphs for each Specification point that took a great deal of the available time, for little reward. In some cases, candidates described the **product** they were making before actually designing it. Candidates need to show their technical knowledge when adding system details.

It is good to see most Centres using a Systems approach to starting the design process. This clearly shows a range of INPUT and OUTPUT devices. However, many candidates fail to recognise or identify a range of controlling devices. Some Centres, incorrectly used Systems blocks, as the design stage.

Most candidates produce a range of ideas with detailed notes on the components used in each idea. A range of methods are used, including pencil drawings and the use of CAD programmes. In this section there should be clear evidence of how the design idea fits in with the need of the user. There should be clear reference to the Design Specification.

Design development continues to be one of the weaker aspects of the Unit. Most candidates undertake modelling to test their best idea. This is often a repeat of one idea to see if the circuit or mechanism works. Candidates should use this process to combine ideas, make modifications and suggest alternatives. Once again there should be reference to the need of the user and the Design Specification. There should be comments about the changes made to the original idea.

It was good to see that most Candidates produced a final design following the modelling stage. Candidates should include reference to dimensions and list the components and materials to be used in the Making stage. There is no need to include lesson notes on materials or make reference to batch production methods.

Successful Candidates:
- *produce a detailed, justified, measurable, Design Specification, for a prototype system **not** a Product*
- *create a range of ideas with written explanations of how and why each idea could work*
- *make specific reference to the needs of the user and the Specification*
- *select ideas for development and test these ideas to develop a final design using modelling.*
- *modify original ideas to produce a final design for a prototype system.*
- *show full details of the final design including materials, components and a consideration of size.*

Making
A detailed plan needs to be produced before the start of the making process. It was good to see that most candidates produced a plan. Candidates need to consider how they will include the control of the prototype system.

Generally, it is good to see that candidates produce high quality prototypes, either as a circuit or mechanism. Candidates are judged on the quality of the manufacturing.

Successful Candidates:
- *produce a plan that includes include specific reference to materials, processes, tools, equipment, health and safety and quality control. The plan should make reference to individual stages of production. 'Populating a PCB' is too generic*

- *show evidence that they have selected and used tools and equipment to construct, assemble and finish a working prototype*
- *manufacture a working prototype system*
- *use tools and equipment in a safe manner, producing accurate stages of manufacture*
- *emphasise the use of a control system for the prototype.*

Solving Technical Problems
Despite previous guidance to Centres, this section continues to be over marked. Candidates are awarded full marks when there is little or no evidence in the portfolios.

A SNAG sheet should be presented, clearly indicating when and how the candidate solved problems during the manufacturing stage.

Successful Candidates:
- *link this section to the production plan, clearly indicating how they solved problems as the prototype is manufactured*
- *C*
- *clearly show a SNAG page, highlighting the problems that occurred during manufacture of the prototype and giving clear evidence of how the problems were solved.*

Record Key Stages
Some Centres awarded full marks when the evidence presented did not justify the award. Most centres successfully produce photographic evidence of the manufacturing stages. It is important to describe the processes and techniques used. The comments should relate to the individual project and not reflect a class based approach with generic comments that are not specific to the project. It is important that the photographs are of sufficient quality to reflect the quality of work completed. When producing a PCB, the photographs should show evidence of the quality of soldering and construction of the control system.

Successful Candidates:
- *fully record all stages of manufacture, using photographs and notes. This includes evidence of producing a PCB and/or using CAD/CAM*
- *show clear evidence of the Final Prototype in use with photographs which clearly show the quality of manufacture including soldering and assembly.*

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

Candidates do not need to evaluate the Design Specification in this unit.

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

Most portfolios were presented in logical order and most centres awarded the correct mark for Spelling, Punctuation and Grammar.

Successful Candidates:

- *produce a critical evaluation of the making process, for the prototype system*
- *fully test the prototype and suggest improvements*
- *present their work in a logical, structured format*
- *use the correct technical terms, using words accurately.*

A513 Making quality products

General Comments:

It is good to see that Centres are working within the 20 hour limit for the controlled assessment. There were fewer repository portfolios submitted this year, although candidates did present work as a 'Power Point' presentation, which was then saved on an individual, compact disk.

The information on the CD allows high quality photographs and video clips of the final product being tested. This is particularly beneficial in providing evidence that the circuit or mechanism works. The final product can also be seen in a suitable environment. It was noticeable that candidates who work in a Power Point format do so, without too many irrelevant pages.

Paper folders are still too large, especially at the start of designing.

The completed products seen during the moderation process continue to be manufactured to a high standard.

Many Centres are relying on library circuits, either school based or from software, leading to whole centres of very similar products. When this happens, it affects the creative aspect of the design process.

It is still a concern that some Centres encourage group projects, where the work presented is very similar and this makes it very difficult to give the appropriate mark for the work. Some candidates are allowed to undertake projects which are almost impossible to complete within the time limit.

Designing

Using a mind map is the best way to start investigating the theme. Candidates are reminded that this section should be concise and 'padding out' this section will gain no more than four marks.

There is no need to produce questionnaires or surveys for this unit.

The design brief should clearly identify the need and problem to be solved. There is confusion in the next stage with many centres carrying out a product analysis. Information and data needed is about the problem, user and/or client group.

When writing the specification, most candidates use a series of headings which often become a generic list, lacking in focus and not specific to the project being undertaken. Centres should encourage candidates to think more clearly about the function and meeting the needs of the user. Some candidates limit the designing section by being too prescriptive in the Design Specification – predetermining the materials and components to be used

It is good to see that centres are using a system approach at the start of ideas, but centres must ensure that candidates then produce a range of full circuit ideas.

Selection of designs/ideas is still poorly completed, where most reasons seem to be based on the ease of making the circuit or system, rather than consideration of the user. Modelling, either on breadboard or virtually, via software tends to be just a repeat of the selected idea. Candidates should be using the opportunity to develop and improve the initial idea.

The casing of a structure needs to be developed in the same way as the control system. It was good to see quality pencil sketches with detailed annotation. Selection had little relation to the needs of the user.

There has been some good use of CAD, with Google sketch-up and 'Techsoft' 2D Design being used. It is good to see the direct connection to manufacture where centres use laser cutters for mould making or directly cutting the materials for the case or mechanism using a CNC router/miller.

Where centres use bought cases it is important that candidates show in detail how the box is being used. Fixing of the PCB, battery and cable routing must feature in the design work. It is important that the case and circuit fit together to form a completed product. Many photographs of completed products clearly show that the PCB and components do not fit the case. There is a lack of evidence with regards to the use of component size, the final product is incomplete and will not be awarded full marks.

The final design should be shown, as the PCB mask or the mechanism layout together with dimensioned details of the container or structure. Most candidates produced the correct information to start manufacture.

Successful candidates:

- *quickly identify from the theme, the work area they are interested in, providing information that highlights the problem*
- *set the situation using a design brief leading to an action plan*
- *Use clearly focussed information gathered about the user/client group. This may include ergonomic data, illustrating the problem and making reference to any important component/part*
- *Produce a summary which brings out the bullet points which must be considered.*
- *clearly state the function and performance of the product in the design brief*
- *produces a list of Specification Points which are measurable and related to the user/client, enabling them to be used in the evaluation*
- *appraise and develop **creative** ideas clearly linked to the specification and need*
- *select reasons based on user need. When modelling, the selected system is built and then improvements made to make it match the need of the user*
- *finalise the control system and the structure with clear details for making the product.*

Making

Most centres produced plans including detail of materials, equipment, health and safety, quality control and time. Candidates should consider the whole product and composition of the system, the structure/container and the assembly. In some cases there was no plan evident yet the product was given full marks.

Candidates have been able to demonstrate good quality making both in the control system and case/structure. In a few centres, the PCB was a pre-manufactured item where the candidate did not contribute to much of the design, therefore limiting the mark awarded.

Dry produced PCB with CNC milling does cause soldering problems because of the narrow insulation gaps. To achieve the top marks in the making section, candidates need to consider how the parts are assembled. On a PCB, resistors should be flat on the board and parallel; off-board wires should have a cable clamp to ensure they are not pulled out; wire links should be flat on the board, not looped over components; off-board components should have good insulation from other metal parts.

Electronic products must have cables and battery fix to prevent the bird's nest effect.

Solving Technical Problems

It is expected modifications and changes will be made during the making stages and these should be recorded in writing with reasons for the change. This section can include more than just things that go wrong.

Centres must not assume because the product is successful they can award the highest marks. **Evidence must be presented** to justify any mark given. Often candidates hide problem solving comments in the evaluation section.

Record Key Stages

This section has been a real success this year and most candidates are proud to display images of how they made the product. Centres are really organised now to record and store the pictures.

Candidate labels should be more evident to ensure the images are unique. It is good to use library images for the start of the project when manufacturing a PCB, but care should be taken to show the real work of candidates when assembling the control system. Where centres link the recording with the production planning chart, care must be taken to ensure that planning which took place before making and recording of making during/afterwards is distinct in the evidence provided.

Successful candidates:

- *include a production planning chart which really breaks down the stages of manufacturing the control system and the case or structure, then shows the assembly stages through to final testing. The chart records materials, equipment, quality control points and expected time*
- *use a range of construction methods, using their own skill for a high quality product*
- *make and record changes and modifications to ensure the product matches the needs of the user/client. The candidate records all the changes of both manufacture and any re-working that is necessary*
- *demonstrate solving technical problems with a written log*
- *record the key stages of manufacture with a set of detailed pictures with comments of the Stages, showing the test set up, with the product working. If using PowerPoint- short video clips, record stages and/or testing.*

Critical Evaluation

Most candidates use the specification when looking at the final product. This comparison works well when the specification is written as measurable points for the performance of the product. Writing general points of sustainability and generic descriptions of performance makes evaluation more difficult and less effective.

Using members of the user group for testing the product can give some good feedback when the group makes constructive comments. Effective bench testing should be recorded to show the performance, and this is where short video clips are useful. When matching the product's outcome to the user need, real points of modification and improvement do arise. It is important to have the candidates own work rather than general class opinion.

Successful candidates:

- *write critical points when comparing the specification to the final product*
- *test their final product and show clearly how the product works for the user group and brings out points where the prototype needs modifications and changes. Sketches and notes show how the second prototype will be different and improved*
- *organise their folders and use a range of technical language correctly.*

A515-01 Sustainability and technical aspects of designing and making – Electronics Paper

General Comments:

This is the first year of the new style single paper sat as part of the current specification. It was pleasing to see that there were only a small number of 'no response' answers which were linked to specific questions and very few candidates who failed to complete the paper.

It is important to stress that questions must be read fully before an attempt is made to respond. This is particularly important with the '*' questions which test the quality of written communication. If the question is misinterpreted a lot of marks can be lost. There were fewer instances of 'bullet point' lists or repeated points within these questions than in previous years under the old specification which is a positive sign.

It is also important that candidates take care to ensure their answers are legible to the Examiner, and that they do not put themselves at a disadvantage if credit is not able to be given because the response could not be read.

It was apparent that basic techniques are no longer being covered to the extent that they once were. These techniques are still needed for controlled assessment so they should not be neglected. While it is convenient to use simulation software for a number of the circuits that must be covered it is also important that techniques such as breadboarding are included in the learning experience.

The use of a range of testing devices such a multimeters, logic probes and oscilloscopes for testing voltage, resistance and current on real circuits should be seen as an essential part of any electronics course.

Knowledge of commercial practice can best be gained from the disassembly of electronic products. Candidates who had carried out this type of work were clearly better equipped to answer the questions which covered design features, information now found on electronic products, and understanding of manufacturing techniques.

Comments on Individual Questions:

SECTION A

Q.1 The majority of candidates correctly identified that natural gas central heating contributes to Global warming, where candidates answered incorrectly the common wrong answer given was "Carbon dioxide reduction".

Q.2 Answers to this question were mixed with some candidates understanding that for maximum efficiency wind turbines should face directly into the wind. Where candidates answered this incorrectly the common misconception was that wind turbines should face sideways to the wind.

Q.3 Again answers to this question were mixed, a number of candidates were clearly familiar with the role of the Forest Stewardship Council but the majority were not and answered this incorrectly.

Q.4 This question was well answered by candidates who clearly understood the term Eco-footprint when referring to a product with the majority gaining the mark.

Q.5 Again this question was well answered with candidates demonstrating an understanding of the term secondary recycling and the majority of candidates gaining the mark.

Q.6 Answers to this question were mixed, many candidates correctly identified the term "refuse" to gain the mark, however there were a significant number who suggested the wrong term commonly suggesting "reuse" or "rethink". Candidates need to have a good understanding of the meaning of these terms.

Q.7 Few candidates gained a mark on this question indicating a lack of understanding of smart materials. Most commonly candidates named a "new" material rather than a smart material. Candidates need to have an understanding of a range of different smart materials. Where candidates gained a mark common responses included Shape Memory Alloy's (SMA).

Q.8 Where candidates answered this correctly the most common answer related to electronic waste containing toxic or hazardous chemicals and in particular lead.

Q.9 This question was not well answered, and candidates showed a lack of understanding of the term "anthropometric". The majority of candidates suggested incorrectly carrying out a survey or questionnaire. The small number of candidates who gained a mark on this question suggested measuring people.

Q.10 Candidates showed little understanding of the term "Life Cycle Analysis" and this question was incorrectly answered by the majority of candidates.

Q.11 This question was correctly answered by the majority of candidates.

Q.12 All but a few candidates answered this question correctly.

Q.13 This question was correctly answered by the majority of candidates.

Q.14 The majority of candidates incorrectly thought that NiMH cells contain mercury when answering this question and so failed to gain a mark.

Q.15 The majority of candidates correctly understood that CFC means Chloro Fluoro Carbon to obtain a mark on this question.

Q.16(a) This question was generally well answered with the majority of candidates gaining 2 or 3 marks. Common answers identified the control buttons, clock / display, timer(s) and the plastic cover as design features of the garden watering controller. Where candidates failed to gain marks they often suggested that the device allowed you to control the temperature of the water.

Q.16(b) The majority of candidates gained at least 1 mark on this question with many gaining full marks. The most frequent answers given by candidates referred to solar power and the use of rechargeable cells. Candidates who only obtained 1 mark tended to incorrectly suggest water power as an alternative power source or to suggest improvements to the casing design e.g. rounded corners or recycled plastic.

Q.16(c) This was well answered with the majority of candidates gaining a mark

Q.16(d) Most candidates gained 1 mark on this question for correctly identifying that the use of clear plastic packaging would allow the customer to see what the product looks like before purchasing it. Common incorrect answers referred to the use of clear plastic costing less than coloured plastic or suggesting clear plastic had been chosen

as it could be recycled. There was some confusion by a number of candidates who misunderstood the question and thought it was referring to the casing on the product (plastic lid) and not the packaging.

Q.16(e) This question was well answered with the vast majority of candidates securing at least 1 mark and the majority 2 or 3 marks. The most common answer referred to plastic not biodegrading whilst in landfill. Other common answers referred to using up non-renewable resources in the production of plastic and the increase in greenhouse gases. Where candidates failed to gain marks this tended to be due to a lack of points being covered in relation to the mark scheme and not due to incorrect answers. It is important that candidates read the question which was asking for disadvantages (plural) to ensure they maximise their marks.

Q.16(f) Again this question was well answered. Common answers referred to the CE or Kite mark, the recycling logo with some candidates suggesting a plastic recycling code as part of this. Many candidates identified the type of batteries and most candidates referred to suitable disposal of the product. Where candidates failed to gain marks on this question they talked about generic information for example the product name or logo and did not suggest information relating to the function, care, operation or disposal of the product.

Q.16(g) A few candidates tried to answer this question by referring generally to energy saving initiatives in the homes such as solar panels rather than discussing specific ways that electronic products can help save water and energy. Common points made included use of sensors on taps and lighting so they only operated when a person was present. Many candidates identified the use of energy saving LED lamps and meters to allow a user to monitor and manage their energy and water consumption.

SECTION B

Q.17(a)(i) A number of responses failed to gain the mark because they referred to marking the centre of the hole using a ruler which was done already in the drawing which formed part of the question. Better responses described the use of a compass or template to mark the hole outlines.

Q.17(a)(ii) Knowledge of the fitting of key switches and potentiometers to casings was not evident from candidates' responses to this question. Many candidates' answers said that it was because the switches were that shape but did not gain credit as they had failed to explain why they were that shape which importantly was to prevent rotation of the whole switch in the hole when turning the key.

Q.17(a)(iii) Most candidates gained at least 1 mark on this question but many had failed to read the question stem which asked them how to cut the hole for the key switch in the aluminium front plate using hand tools. Consequently many candidates missed out on marks by including descriptions related to marking out the hole or drilling the hole using a pillar drill. More successful candidates included detailed drawings and descriptions for stages involved in drilling and filing the hole.

Q.17(a)(iv) A reference to the accurate shape or the clean edges created by the punch tool gained marks for candidates on this question. References to generic terms such as quicker or faster need to be qualified to gain a mark.

Q.17(b)(i) The reason for the use of stranded wire on the switch was not well understood by candidates. Better candidates identified its flexibility and the benefit of multi strands should one break.

Q.17(b)(ii) This question was well understood and answered by candidates with many gaining full marks. Where candidates made an error on this question this restricted the mark they could gain.

Q.17(c) This question was not well answered by candidates and showed a lack of understanding of unit values on resistors. Many candidates correctly calculated the tolerance but failed to convert the answer into the correct units to gain the marks.

Q.18(a)(i) This question was well answered with most candidates identifying the piezo ultrasonic tweeter as the most suitable speaker unit.

Q.18(a)(ii) Less candidates were able to identify the reason for their choice of speaker unit for 18(a)(i). Those gaining the mark identified that the device top range could not be heard by humans or that the device had the highest frequency range.

Q.18(b)(i) This question was not well answered with only a minority of candidates drawing a potentiometer or variable resistor symbol to gain a mark. More able candidates positioned this correctly on the circuit diagram.

Q.18(b)(ii) Candidates' answers showed a lack of understanding of counter circuits with common answers referring to "converting to analogue" or "making the output smaller".

Q.18(b)(iii) Use of suitable testing methods for the circuit was not widely known. A minority of candidates suggested an oscilloscope or a logic probe and gained a mark. Few of these were able to gain further marks by correctly connecting the device to the circuit signal and the OV rail.

Q.18(c)(i) There was a lack of understanding of a suitable sensor with the majority of candidates suggesting motion sensor, candidates need to name a specific sensor to gain a mark.

Q.18(c)(ii) This question differentiated well and identified those who were familiar with logic gates. Most candidates scored 1 mark for correctly identifying one of the logic gates. Only a few then made the link between an AND and a NAND gate to gain the second mark.

Q.18(c)(iii) Candidates who were familiar with printed circuit layouts successfully attempted this and gained some marks. Most candidates successfully connected Pin 8 to 0V. A common mistake by candidate with this question was to cross the output signal track or go round the outside of it when connecting Pins 13 and 15 to 0V. Some candidates inverted the layout and consequently connected things incorrectly.

Q.19(a)(i) Many candidates did not attempt this question possibly indicating a lack of familiarity with breadboards both in real life and on simulation software. It is important that candidates have experience of both and are familiar with constructing prototype circuits using them. Where candidates obtained a mark this tended to be for correctly connecting the Common (pin 1 or 6) to the 0V rail.

Q.19(a)(ii) It is important that candidates read the question carefully as responses suggested a misunderstanding of the question in many cases with candidates comparing breadboarding to circuit simulation rather than virtual breadboarding compared to real breadboarding. A majority of candidates were able to gain a mark and commonly this was for either understanding that no components would be damaged using the virtual breadboard or that the software gave access to a larger variety of components without the need to purchase them therefore saving money.

Q.19(b) To gain any marks on this question candidates needed to calculate the voltage drop first. Those higher ability candidates who were familiar with this went on to gain full marks in most cases although some failed to convert the current from mA to Amps. This question was not well answered.

Q.19(c) The points most frequently mentioned related to tracking of the swimmers in the water and the accuracy of this tracking method which eliminated the possibility of human error if stop watches were used to time swimmers. Candidates also identified the storage and transfer of this data using computers and the easy unique identification of each swimmer making it easy to work out times and final places. Candidates mainly focussed on the use of RFID devices in the context of swimming and rarely suggested other uses for these devices.

A515-03 Sustainability and technical aspects of designing and making – Mechanisms Paper

The amalgamation of two papers into one did not have any significant effect on candidate numbers or overall performance although there was a slight trend for weaker candidates to use sustainability arguments in the mechanisms section of the paper. The paper was accessible across the ability range which gave the full range of candidates the opportunity to gain credit for their level of ability and understanding.

Section A - questions 1 – 15

1. The majority of candidates realised that burning natural gas did contribute to global warming (c)
2. A significant number of candidates thought that wind turbines should face sideways to the wind direction (a) with higher ability candidates generally gaining credit.
3. The majority of candidates gained credit (b).
4. All but a few understood the eco-footprint of a product (b).
5. Secondary recycling (a) was well answered.
6. As expected, lots of words beginning with R were offered although the majority managed Refuse.
7. A good range of smart materials were named by stronger candidates along with a variety of other materials.
8. Around half the candidates were able to describe a good range of toxic hazards.
9. About half the candidates were able to suggest a suitable method of gathering anthropometric data.
10. Very few candidates were able to recall Life Cycle Analysis although many did at least attempt the question with a variety of imaginative possibilities.
11. This was well answered by the majority of candidates.
12. This was well answered by the majority of candidates.
13. This was well answered by the majority of candidates.
14. Very few candidates realised that NiMH cells do not contain mercury.
15. The majority were able to confirm the abbreviation CFC as correct.

Question 16

(a) Was well answered with the vast majority of candidates gaining some, if not all the credit for naming various design features. Some candidates gave possible rather than actual design features, perhaps implying too brief a read of the actual question.

(b) Solar power and rechargeable batteries were the most popular answers with the majority of candidates gaining some credit although a number did not relate their answer to the power system as required.

(c) The majority of candidates were able to suggest an appropriate disposal method.

(d) Most candidates gained some credit with answers relating to the customer being able to see the product but very few were able to suggest a second valid reason, resorting to repetition or suggesting that plastic was easier to recycle.

(e) The environmental disadvantages of using plastic packaging were suitably answered by the candidates with majority scoring some credit.

(f) Well answered with recycling symbols or recycling code for plastics as well as operating instructions being some of the popular answers.

(g) A wide range of answers with some candidates sticking to the garden watering controller and some producing much broader answers relating to how electronics could help save energy and how by monitoring sunlight/moisture levels (using electronics) water could also be saved. Some candidates had three well defined explanations, whilst others were far more general. Weaker candidates tended to write about ‘cutting off’ electricity and water, suggesting solar panels without explanation or suggesting wind and wave power. The question concerned electronic products, not electrical products. The use of solar power to

produce mains electricity through the use of electronics would have been credited, but was not seen. Once again, a number wrote out the stem, to no avail.

Section B - Question 17

(a) The automaton was well answered with the majority of candidates able to give at least one suitable method for creating different types of motion, with an eccentric, pear and snail cam being the most popular answers.

(b) (i) This question was not well answered with a large number of candidates relating their answer to repairing the box as opposed to assembling.
(ii) PVA either generally well known with PVC a popular incorrect answer or simply left blank.
(iii) When answered correctly epoxy resin and araldite were the most popular answers.

(c) Both the eccentric and snail cam were well known with appropriate descriptions of the movement produced. However circle cam was a most common wrong answer.

(d) Advantages of CAD/CAM were well understood and explained with most candidates scoring some credit.

Question 18

(a) (i) The identification of the crank/crankshaft proved to be quite difficult with under half of candidates scoring the mark.

(b) (ii) Reciprocating motion was generally well known.

(c) (iii) Nut was well known by most candidates but only a few candidates were able to add either tie-rod or threaded bar.

(d) (i) Grease cups were not well known with most candidates suggesting it was something to do with keeping the parts secure.

(e) (ii) Also not well answered with the vast majority of answers relating to keeping the parts from coming loose due to vibration.

(f) (iii) The explanation of an alloy was generally well known with the appropriate number of candidates getting the second mark for the link to iron.

(g) Issues relating to choosing materials and components were appropriately answered with a range of answers to cover all grades. A large number of answers were very general, often heavily laced with sustainability points whilst the better answers discussed at least three key points.

Question 19

(a) The effort, fulcrum and load were generally identified with the majority able to gain some, if not all, the credit in this question. Positioning of the load was where candidates who lost marks tended to be unsuccessful.

(b) The calculation was poorly answered with only a relatively small number of candidates scoring marks in this question.

(c) This question was not well answered with characteristics of high carbon steel not generally known.

(d) Most candidates who attempted this question were able to score some marks with reference to keeping the spring in place/under tension or holding down the pin so that the device would function, but a valid reason why was only occasionally stated.

(e) A suitable lubricant was suggested by the majority of candidates with oil/WD40 being the most common.

(f) (i) Most candidates gained some credit but only a few were able to draw the correct configuration for a top hat bush.
(ii) Suitable materials for a bush were either known or not with brass, bronze and nylon being the most common answers and aluminium or steel being the most popular incorrect answers.

(g) A suitable method of preventing corrosion in steel was generally well answered.

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