

Design & Technology (Electronic and Control systems)

General Certificate of Secondary Education **GCSE J301**

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

Report on the Units

June 2010

J301/J041/R/10

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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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Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

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Design and Technology (Electronic and Control Systems) (J301)**

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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 first year for the new Innovator Suite.

An important point for teachers to remember about the Terminal Rule in relation to this suite of specifications and re-sits:

The terminal rule is a QCDA requirement. Candidates must be entered for at least two units out of the four (full course) at the time that they certificate ie the end of the course.

Please be aware that the QCDA 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.

Teachers are reminded that it is also a requirement of QCDA 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 responded well to the new style of examination approach, especially when the nature of the work between subject areas within the suite is so varied. Centres are to be commended for this.

WRITTEN EXAMINATION - UNITS 2 AND 4

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

A512 Electronic and Control Systems
A522 Food Technology
A532 Graphics
A542 Industrial Technology
A562 Resistant Materials
A572 Textile Technology

The overall performance and range of results for Unit 2 varied considerably. Many of the candidates demonstrated a general awareness of the main points and issues linked to sustainable design, but often failed to answer in sufficient depth to gain high marks.

In **Unit 2 - Section A** of the papers most candidates across the suite attempted to answer some of the questions, some candidates however did give 'no response' (NR) answers.

With reference to Section A of the paper it was noticeable that;

- At times, candidates had not read the instructions correctly and centres would benefit from explaining the correct examination procedures and requirements to the candidates.
- Candidates need to be able to identify signs and symbols in particular giving information about materials, products and safety issues in relation to environmental and design issues.
- Candidates must take greater care when circling their answers in Section A. They should not circle more than one answer and completely clear incorrect circles to eradicate confusion in marking.

Unit 2 - Section B of the papers showed more varied responses and teachers need to ensure that they read the subject specific reports for further detailed feedback on specific issues and individual question performance. Many candidates did manage to use subject specific 'terms' in their answers, but at times these lacked sufficient depth and tended to be generally weak. Occasionally candidate answers were merely taken from the question itself and care needs to be taken here. For example, where two reasons or an explanation was required the same point was made twice with slight word variation.

Candidates need to be made aware of the importance of the wording for each question and have struggled to answer specific questions in regards to 'explain' or 'describe'. Many candidates did not score marks on these questions, because they gave a list of unrelated points instead of developing one of these.

The questions marked with an asterisk * provided candidates with an opportunity to give a detailed written answer combining good subject knowledge with an ability to produce a structured response. The range of responses varied considerably in the specific subject areas and it is advisable that guidance is sought from the subject report within this document.

Hand writing, at times, was difficult to decipher and candidates need to be prepared to make an effort with their hand writing, particularly on the banded mark question * and questions requiring a detailed explanation or discussion of points.

Centres are reminded that candidates are marked on spelling, punctuation and grammar on the banded mark scheme question. It is also important to note here 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 new GCSE Innovator suite entries were seen from the following subject specialisms:

A514 Electronic and Control Systems

A524 Food Technology

A534 Graphics

A544 Industrial Technology

A564 Resistant Materials

On the whole candidates responded well to this Unit across the suite of subjects, with very few questions showing 'no response' (NR), which was encouraging. Candidates should be reminded that it is always better to attempt an answer, rather than leave a blank space with a guaranteed zero.

It is still apparent this series that candidates need to be practiced in examination technique; reading the questions carefully, responding to the instructions given in the questions and having an awareness of the full range of question formats.

All candidates seemed to have sufficient time to complete the paper and were able to access most parts of all the questions, which is encouraging.

Centres are to be reminded that questions marked with an **asterisk*** provide candidates with the opportunity to give detailed written answers combining good subject knowledge with an ability to produce structured, coherent responses. This type of question format still requires practice, although candidate performance was much improved this series.

CONTROLLED ASSESSMENT – Units 1 and 3

This series has seen portfolios for all subject areas 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.

In general, centres have been successful in applying the marking criteria for both Units 1 and 3. However, it was 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. For each of the marking criteria, one of the descriptors provided in the marking 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 noticeable this series that a significant proportion of portfolios, particularly for Unit 1, resembled the legacy format. Care must be taken here to ensure that the marking criteria and format for the Innovator Suite is not confused with the legacy approach.

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.

Centres are also reminded to ensure that the OCR cover sheet is evident on 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.

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 flair and creativity, and therefore achieve the higher marks. Centres should avoid the over-reliance on writing frames for candidates work. It is essential that candidates have the opportunity to show flair and creativity in the way they approach the various aspects of these units.

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.

Reports on the Components taken in June 2010

It was noticeable this series that some candidate's failed to provide any visual evidence of practical work within their portfolio. Centres are reminded to ensure that candidates provide clear photographic images in both portfolios for Units 1 and 3, particularly within the making and evaluation sections.

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 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 this unit – 20 hours.

Unit 1 – specific areas of importance

Centres are to be reminded that Themes for Unit 1 are based around environmental awareness and sustainable resources/processes. Therefore, 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

Due to the low number of entries for this Unit specific guidance is limited. However, 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 outcome.

A511 Introduction to Designing and Making

General comment

All centres had responded to the new style of approach with smaller portfolios.

Candidates gave a range of responses the most common areas represented were electronics and then mechanisms. Portfolios were smaller and represented the shorter time allowed for this unit.

Some centres limited the choice of themes for candidates, allowing them to focus resources to support lines of investigation.

Creativity

Most centres had connected the set themes in Appendix C with a mind map of areas of concern and problems leading to possible projects. A mood board showed the areas of interest including people images. At this point most centres then looked at a number of similar products; making comments on users' needs, function and design, technological differences.

A design brief gives precise details of the need and the problem to be solved. Many centres then used an action plan of the information needed and future investigation.

Candidates made a good attempt at a product analysis, but it is an area centres need to develop. Sustainability should be included in this analysis to look at the 'eco' credentials of the product, including life cycle and carbon footprint. First hand experience of a product was most important, some centres carried out a disassembly activity with detailed photographs.

Research and data needs to gather useful information for the design activity.

Many centres included a bullet point sheet pulling together important points.

Designing

Most candidates produced a specification for the systems only, some centres using headings to help responses.

It is still good to use the systems approach with Input, Process, Output to help candidates think of solutions. Quite a few centres used library circuits to extend the capabilities of candidates, these were analysed for system and function. Candidates need to show a good understanding of the function to allow them to make the choice of final design. In mechanisms ideas, modelling was carried out to check each idea.

A selection should be made referring to need and specification points. The final idea was developed in most portfolios. A final design can only be produced by modification and improvements developed by modelling and trialling ideas. For electronics there was equal use of breadboards and virtual modelling using electronics modelling.

Before making, full details should be given for construction of the prototype with; a pcb mask, component lists, a set of drawings for mechanism parts and connections.

Making

In this section centres were most comfortable about what they were expected to carry out. 'Planning for making' follows the style already established with grid sheets and headings.

Candidates give all the information for processes they will carry out.

Even though candidates are only making a prototype they can still demonstrate a level of quality and refinement putting parts together. During the construction activity, candidates should note

the snags and problems encountered and how they were overcome. This type of live problem solving has always been an activity when making, but now it should be carefully noted. Most centres had organised the candidates to record the stages of making with photographs. At a high level this record had photographs and comments clearly demonstrating the stages, with sufficient detail to show the quality of the prototype and range of techniques used. At the end of this section a working prototype should be an assembly unique to the candidate. The final prototype should be carefully photographed with sufficient detail to see how the system is made. In many centres these pictures were not of a good quality which caused difficulty when trying to judge the level of work.

Evaluation

The critical evaluation of the designing and making process is a new approach which does need further work in centres. When there had been a clear and structured product analysis, centres were able to use this style in the evaluation. Similarly when the planning for making was to a high standard a grid sheet was used to record, first the stages, then the comments that had been made on successful and alternative methods. After testing the prototype and looking back at the intended function, the candidate should give modifications and improvements to the prototype.

Summary points

The portfolios were organised and completed in a variety of ways by centres, it was good to see the number of pages had been limited. To help candidates respond to each section many centres used prepared sheets. The use of ICT helped candidates and some Centres used PowerPoint where a short video clip was often added to demonstrate modelling and functions of the prototype. The use of PIC chips allowed candidates to develop unique functions and were supported by detailed flow charts with stages explained. In mechanisms projects the use of laser cut parts allowed for quick construction times as finishing is not required. Refinements can be demonstrated in fitting and ensuring working parts can function.

A512 Sustainable Design

General Comments

Many candidates scored relatively well on this unit achieving 33-44 marks and above. Where detailed and technical knowledge was lacking, many candidates applied knowledge learned from general media sources or general knowledge gleaned from their everyday lives, suggesting that candidates have some interest in sustainability issues.

Comprehension skills held some candidates back and the incorrect use and understanding of basic terms embodied in this unit, such as "sustainable," was disappointing. This again emphasises the need to read the question fully, to answer what the examiner is asking and *not* what the candidate would *like* to write about.

Comments on Individual Questions

- 1 Well answered.
- 2 Well answered.
- 3 Well answered.
- 4 Often answered with "Solar heated water" although a majority correctly chose zinc chloride paste.
- 5 Generally correct.
- 6 This abbreviation was unfamiliar to most of the candidates although a number got close with some mention of ".....Hazardous Substance(s)". There was some imaginative use of the initials often involving royal and health & safety.
- 7 Surprisingly not that well answered, with the most common incorrect response related to the 'solder sticking out' as being 'dangerous'.
- 8 Most candidates were able to gain credit here with a number mentioning the specific recycling points/battery banks that are increasingly appearing in leisure centres, places of work, supermarkets and other retail outlets.
- 9 Many candidates failed to name one environmentally friendly packing material with many simply stating "cardboard" or "paper" without reference to sustainable sources.
- 10 Most candidates were able to gain credit here although a number referred to named commercial organisations, high street retailers and on-line auction sites.

- 11 Most candidates were able to gain credit here.
- 12 Not as well attempted as the other multiple choice questions with confusion about the exact nature and purpose of a screensaver being the likely cause.
- 13 Generally well answered with the majority of candidates gaining credit.
- 14 Generally well answered with the majority of candidates gaining credit.
- 15 Not so well known especially by weaker candidates.
- 16 (a) (i) This question was well answered by many candidates, some thought of wider environmental issues.
- 16 (a) (ii) This question was well answered but with some repetition from a(i). A few failed to gain a mark for giving "turn switches off" instead of "do not leave on standby".
- 16 (b) (i) Generally well answered by those who read the question carefully; many candidates scored 3 or more marks on this question but a number repeated examples given in the previous section. Common mistakes were to offer responses which were not home improvements but lifestyle choices. There was also some confusion between energy conservation and water conservation.
- 16 (b) (ii) Most candidates were able to gain some credit here, but did not achieve the full marks, due to weak and vague justifications. Careful choice of an easy to justify improvement would have benefitted many.
- 16 (c) This question was not well answered by many candidates as it would appear they missed the necessary and required focus on using *sustainable* materials. Many simply stated a commonly used building material or suggested an inappropriate recycling method / material. Sustainable was misinterpreted by many as durable, who then proceeded to incorrectly produce statements regarding the material properties of some common building materials. A few candidates produced excellent answers reflecting good background knowledge based on current good practice, eg the straw bale house at the Centre for Alternative Technology. Not detailing the *use* of a named material was a common reason for some candidates not getting full credit.
- 17 (a) (i) Generally well answered apart from the one word non-justified responses. Many gave 'portability' as a benefit.
- 17 (a) (ii) Most candidates were able to gain credit here and had clearly undertaken some simple research into the area as part of their course. Some candidates interpreted "wind up" as wind powered, but most gained the mark in this question.

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- 17 (a) (iii)** Many failed to achieve full credit by not displaying knowledge about the connected technology, often offering some convoluted, confused or impossible solutions to both generating the power and then storing it.
- 17 (b)** This question was generally well answered with most candidates scoring 3 marks. Unqualified reference to “water” was the most common cause of lost marks whereas hydroelectric or wave energy would have earned credit.
- 17 (c)** Eco-design did not appear to be well understood with few correct answers. A number of comments were given relating to the 6Rs.
- 17 (d)** This question was well answered by the more able candidates showing understanding of the issues involved and detailing cultural issues. Many candidates incorrectly focused on the energy requirements of having a television or the cost or end-of-life issues rather than the cultural implications.
- 18 (a) (i)&(ii)** Many candidates did not provide responses relating to the security and safety aspects of the controllers and therefore these two part-questions were not particularly well-answered. Despite the figures being clear and named, a number of candidates believed the units to be energy consumption meters of some kind.
- 18 (b)** This question provided appropriate differentiation to allow candidates at all levels to score marks. A good response with quite a number of candidates demonstrating a reasonable level of technical knowledge describing the electricity generation process, naming gases produced and how they are contributing to global warming and acid rain and the impacts of both. For those candidates without either the technical knowledge or the skills to articulate this, they were still able to score marks at level 1, demonstrating more general knowledge often of a specific part of the answer, eg CO₂ production or the greenhouse effect. A number included small diagrams to further illustrate their point although this is not required. It appeared that most candidates had sufficient time to complete the question paper as some lengthy responses were given for Q18(b) regardless of the candidates ability.
- 18 (c)** Some good answers but many incorrectly considered the finished product and overlooked manufacturing / transport / materials / packaging issues relating to products. More able candidates used the full range of acceptable responses in the mark scheme.

A514A 01 Electronics Paper

June 2010 was the first time that unit A514 has been examined. Questions testing the standard of written communication have not been found in previous examinations; there will now be one question of this type in each section of the paper. The response to these questions was in general promising, it is important that candidates read the questions carefully before proceeding; in some cases lengthy responses were found that did not actually provide an answer. The other major difference is the use of two sections to the paper;

- Section A comprising three questions on the more generic aspects of electronics in control systems.
- Section B which has two questions testing design thinking with respect to electronics

There were very few questions that had no response, which was encouraging.

Section A

- 1 (a) This opening part to the question was generally answered well, however, it is important that candidates justify their response when necessary eg switch size should relate to the finger or thumb that is operating it.
 - (b) (i) The diode symbol was known to the majority of candidates, gaining them one mark. The orientation of the symbol provided good differentiation between candidates.
 - (ii) A number of candidates realised that the diode had something to do with the reduced resistor value but the precise reason was not always well explained. Those who mentioned the voltage drop across the diode or mentioned one way flow through the diode gained a mark. The second mark was for stating that the same brightness is required from all three LEDs.
 - (iii) In the majority of cases the colour of the tolerance band was completed correctly. The second mark was for the colours representing the value; a high proportion of candidates gave 'black' for the multiplier band instead of 'brown'.
 - (c) A well answered question with candidates showing clear understanding of the purpose of a screen layer
 - (d) The first stage in the calculation was to apply the voltage drop, this was worth one mark. Following on from this the calculation for current had to be completed. Errors were in many cases found in the substitution. The final part required the 40mAh to be divided by the single LED current. Candidates should be advised that in this type of question they should look at their answer and see if it is a realistic value.
 - (e) Environmental factors were generally well known to candidates giving access to the mark. It is important with this type of question that a response relates to the details or facts that are visible rather than a generic response such as 'recyclable'.

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- 2 (a) (i) Placing the power connection to the PIC chip proved straightforward for the majority of candidates.
- (ii) This part which required the placement of a resistor and switch eluded all but the best candidates. One mark was awarded for the correct placement of each component.
- (iii) There was little evidence of candidates knowing the function of a Darlington driver array. This arrangement is used to drive a range of outputs and should be one that candidates are familiar with.
- (b) (i) A well answered part to the question. Most candidates gained a mark for knowing the segments of the display that would be lit. A good idea used by some was to shade in the required segments before completing the answer.
- (ii) Those who gained a mark for the previous part generally added up the pin values correctly.
- (c) A number of benefits for the ribbon cable could have been used; the most frequently found referred to increased flexibility when designing a casing for the circuit.
- (d) Stages in the soldering process were well known and most candidates gained at least one mark on this part.
- 3 (a) (i) In most cases the correct capacitor and resistor were identified. Those who failed to gain the mark were not specific enough in identifying the components.
- (ii) Accuracy of the delay provided by a programmable IC was correctly given as one of the reasons but a number of candidates failed to find a valid second reason. This could have been longer delays available or the facility for re-programming the IC.
- (b) (i) The transistor connections were completed correctly in the majority of cases but a few candidates clearly did not know how to complete the diagram and added connections between the positive and 0V rails.
- (ii) The Hfe scale on the multimeter for reading transistor gain was known only to the more able candidates.
- (c) This part was the first of two questions on the paper using a banded mark scheme and assessing the quality of written communication. There were some very clear responses from more able candidates but a few had not read the question accurately leading to responses on aspects of CAD other than circuit design and simulation. The question required both benefits and drawbacks to be given; candidates should be advised to show a balance of these in their response.

Section B

- 4 (a) (i) Candidates who had an understanding of how logic gates are connected generally gained at least one mark on this question. When completing circuit diagrams candidates should use either vertical or horizontal lines to make connections; they should also be advised to check that any connections they make do not form a short circuit.

- (ii) Few correct responses were found for the truth table completion. Candidates should note that entering anything other than a '0' or a '1' will be incorrect.
 - (b)
 - (i) One mark was awarded for the correct connection of each component. As with the circuit diagram vertical and horizontal connections should be made where possible. More able candidates had no trouble in gaining both marks.
 - (ii) This part was very well answered; the majority of candidates were aware that when the circuit is made the labels will appear the correct way around.
 - (c) The second of the questions assessing quality of written communication; some excellent responses were seen with many scoring over half of the available marks. A number of possible contributions to sustainability appeared in the mark scheme with designing for recycling being the most frequently used. Few had considered the impact of using local manufacture to reduce the distance that finished goods are transported.
- 5
- (a)
 - (i) The mark was allowed for any reference to the variable resistor being used to change the sensitivity or switching point of the comparator. Stating that the resistance can be altered was not enough to gain a mark.
 - (ii) This question was well answered by more able candidates who realised that in addition to showing that the circuit was working the LED could be used to set up the switching point.
 - (iii) Incorrect substitution into the given formula proved the downfall of many candidates. The question was targeted at able candidates and required clear understanding of comparator operation. The calculated voltage from the LDR / variable resistor should have been compared to the 4.5V provided at the non-inverting input to show that the LED is switched off.
 - (b)
 - (i) The majority of candidates failed to accurately carry out the calculation for current flow in the lamp circuit; in a few cases it was not attempted.
 - (ii) Those who had completed the previous part correctly gained the mark for choosing a suitable fuse. A few candidates who had not attempted the previous question did in fact choose the correct value of fuse.
 - (iii) The relay order code was correctly chosen by less than half of the candidates.
 - (c) This question required a suitable method of securely fitting the PCB to be shown. A number of candidates chose to use the two threaded holes in the casing which were actually to secure the lid; a maximum of one mark was allowed for this approach. Those who used a workable method such as PCB mounting pillars or spacers and screws gained a mark. The remaining two marks were for detail of how the method could be used. The final mark was for inclusion of hole sizes, suitable screw or mounting pillar sizes. The majority of candidates gained one mark but very few added the detail or clear description necessary for the other two marks.

A514C 03 Mechanisms Paper

General Comments

With such a small entry the comments on each question do not reflect the full range of abilities, particularly at the higher end of the mark range.

All candidates seemed to have sufficient time to complete the paper and even weak candidates felt able to attempt most parts of all the questions.

Comments on Individual Questions

- 1 (a) (i) Very few candidates scored full marks on this question, providing good differentiation.
- 1 (a) (ii) More able candidates were able to offer the correct answer.
- 1 (a) (iii) Around half the candidates scored full marks. Very weak candidates just used random words from their mechanisms vocabulary.
- 1 (b) (i)&(ii) Only a few candidates were able to correctly name the worm although a greater number were able to describe why it was suitable for the application with a number achieving full marks.
- 1 (c) Weak candidates gave confused answers that often used incorrect terminology or simply repeated their answer changing just one word. Those with direct experience of the machine seemed to gain full marks.
- 2 (a) (i) The majority of candidates correctly indicated the effort and load with most of those also indicating that the load should be near the fulcrum.
- 2 (a) (ii) Most candidates correctly identified the class of lever.
- 2 (b) (i) Stronger candidates were able to fully answer this question, often adding good justification of their answer eg 'cuts thicker stuff with same effort'.
- 2 (b) (ii) Poorly answered with few candidates gaining full marks.
- 2 (c) (i) A variety of inspired guesses showed limited understanding of torque.
- 2 (c) (ii) A few candidates scored full marks with workable systems shown together with appropriate annotation. Weaker candidates were clearly guessing or simply re-drew part of the mower.
- 3 (a) (i) The majority of candidates were able to substitute numbers correctly and gain credit.
- 3 (a) (ii) Weaker candidates tended to confuse the numbers and divide most combinations in pursuit of the answer, showing a lack of understanding or practical experience of the mechanical principles involved.

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- 3 (a) (iii) Rather a poor response to this question given the permissible number of reasons for the choice.
- 3 (b) This question was generally well answered by all but the weakest candidates. A number of overly complex solutions were offered but the question was accessible to all.
- 3 (c) A full range of responses to this question providing good differentiation. Higher ability candidates were able to discuss aspects of product lifespan, cost of servicing or repair compared to replacement of the product and advantages and disadvantages of different bearing types and their need for lubrication and the effect of that on product serviceability.
- 4 (a) (i) Well answered by most candidates.
- 4 (a) (ii) The purpose and properties of a flywheel were not well understood by the entry.
- 4 (b) (i) The majority of candidates scored well on this question. The most common failing was to not phase the crank correctly.
- 4 (b) (ii) A surprising number of candidates were unable to suggest an acceptable reason.
- 4 (c) A full range of responses to this question providing good differentiation. Most candidates were able to understand pump operation and comment, in varying degrees, on sustainability (materials choice, no fuel or electricity required to operate), ease of dis/assembly (for moving the pump when/where required), material choice in manufacture, ease of servicing (if rope breaks, easy to repair without tools, wing-nuts do not need tools).
- 5 (a) (i) Most candidates were able to fully describe the operation of the mechanism.
- 5 (a) (ii) Few candidates gave a valid benefit.
- 5 (a) (iii) Few candidates gave a valid reason for using wood.
- 5 (b) Most candidates were able to give a valid reason for the cam shape.
- 5 (c) (i) The majority of candidates were able to suggest at least one valid reason, higher ability candidates scored well.
- 5 (c) (ii) The majority of candidates were able to suggest at least one valid measurement, weaker candidates tended to choose irrelevant details, higher ability candidates scored well.
- 5 (d) Very few candidates scored well on this question, the majority mostly copying the diagram on the facing page. Only the higher ability candidates included the necessary detail to score marks.

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OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

14 – 19 Qualifications (General)

Telephone: 01223 553998

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