EXAMINERS' REPORTS

LEVEL 1 / LEVEL 2
AWARD IN ENGINEERING

SUMMER 2016

Grade boundary information for this subject is available on the WJEC public website at: https://www.wjecservices.co.uk/MarkToUMS/default.aspx?l=en

Online Results Analysis

WJEC provides information to examination centres via the WJEC secure website. This is restricted to centre staff only. Access is granted to centre staff by the Examinations Officer at the centre.

Annual Statistical Report

The annual Statistical Report (issued in the second half of the Autumn Term) gives overall outcomes of all examinations administered by WJEC.

LEVEL 1 / LEVEL 2 AWARD IN ENGINEERING

SUMMER 2016

UNIT 1: ENGINEERING DESIGN - 9791
UNIT 2: PRODUCING ENGINEERING PRODUCTS - 9792

General Comments

Candidates and centres should be congratulated this year for the hard work and commitment seen by moderators in completing Unit 1 and Unit 2 of the specification. The 2016 series is the first full year through of the course where candidates have completed the course in year 11. Most centres have shown that they are comfortable with the setting and task taking for both of these units, with the majority of centres setting briefs which allow candidates to access the full range of assessment criteria. This is encouraging as for the majority of centres; this is still a new course, which for many, has a whole new assessment method and mode of delivery.

During this year's moderation of the samples for both Unit 1 and Unit 2, there were some excellent examples of work seen across all assessment criteria. This is a good indication that centres are now becoming more familiar with the way in which the tasks are set, completed and assessed. Whilst a number of centres used the exemplar brief for their first assessment of the course, a number of centres developed their own briefs whilst still maintaining the level of task setting and task taking required for the course. There was a range of innovative and creative briefs seen with some centre submissions. Could I remind centres that if you do change the briefs you must **not change the tasks**.

Assessment of Units 1 & 2

In general, the majority of centres applied the assessment criteria consistently and fairly across all candidates and both units of work. There were a number of instances where grades were generous and in a few cases where grades were harsh, limiting candidates where they deserved slightly more. It is at this point that it is worth reminding centres that for a candidate to achieve a given achievement grade (for example, a Merit grade), the candidate cannot fall below a Merit in any of the individual Assessment Criteria's (AC's). If this is to happen then the candidate would fall down to the level of the lowest AC awarded. There were considerable instances of this occurring during this years assessment and the decision was taken to allow a level of leniency where a candidate may have had one AC outcome lower that the others in any given unit. It should be noted however, that this will not be the case during the 2017 series where it will become vital for centres to carefully standardise their entries to ensure grades accurate.

Delivery Issues

Centres largely comply with the instructions for delivering and assessing controlled assessment work. However, this year it was evident that there were some issues relating to procedures and managing controlled assessments in centres.

(i) **Centres must ensure that they adhere to the controlled timeframe specified for each unit.** A small number of centres had work that was excessive in nature and moderators felt that the production of these folios were unlikely to have been completed in the prescribed time. It will be the policy for moderators to stop marking when they feel that the level of work has met that expected amount for the prescribed time.

(ii) **Brief Setting.** Centres are reminded that if it decides to change a brief for either Unit 1 or Unit 2, that it is only the content of the brief that may be altered. The Centre is not permitted to change any element of the Tasks associated with each unit.

(iii) **Selection of appropriate briefs.** Again, in a small number of centres, briefs were issued to candidates that were in breach of the levels of control for controlled assessment taking, these briefs tended to disadvantage candidates in not allowing them to be able to access the full range of AC's within the unit.

(iv) **Preparation for moderation.** A number of centres failed to submit their posted sample by the prescribed deadline. It is essential that centres liaise with the WJEC, department heads and examination officers to ensure that the sample of work arrives with the correct moderator by the given date. The set dates are available on the WJEC website at http://www.wjec.co.uk/exam-officers/key-dates-and-timetables/index.html or by simply following the link at the bottom of the www.wjec.co.uk home page titled WJEC Key Dates. Next years deadline for receipt of samples is the 5th of May 2017. Centres will need to ensure that the date for the completion of the work by candidates precedes this date by a sufficient margin, to allow for assessment and cross moderation/standardising of work by subject teachers.

(v) **Writing frames** given by centres to help candidates complete pages constitutes support and guidance outside of the set levels of control. This will therefore reduce the marks awarded when compared to a candidate who has worked without support, guidance or a writing frame. Centres should be reminded that candidates are expected to individually decide on the method of presentation for their outcomes.

Administrative issues

Please would centres ensure that the following requirements are met for assessing and authenticating work.

(i) Once marking is complete, the sample is generated automatically when all marks are entered via www.wjecservices.co.uk. Centres must then print a hard copy of the sample and include it with the project work to be sent to the moderator.

(ii) All covers of work should include both the centre number and candidate number, a small number of project folios this year had neither. It is also important to ensure that folios are securely put together as a number of samples arrived with moderators with loose sheets which can make it difficult to determine which candidate the work belongs too.

(iii) The justification of the assessment criteria awarded to candidates by a centre is critical. This is an opportunity to support the AC's awarded by giving some reasons. This helps the moderator agree with centre marks.

(v) It is important that centres clearly write the Assessment Criteria outcomes in the box alongside the descriptors. A small number of centres failed to do this resulting in unclear outcomes, these required full marking of work submitted and could easily disadvantage candidates. Submissions with unclear outcomes in the 2017 series will more than likely require the centre to submit coursework from ALL students to determine accuracy of assessment and awarding.

(v) For moderation purposes, it is vital that centres provide clear and detailed pictures of the final outcome of candidates for the making element in Unit 2. These pictures should clearly show the finished level of detail as well as complex sections of the make. Photographs should also be available of the making stages that the candidate undertakes to show the main processes involved in making the product. This is covered later in the report.

(vi) Centres who have candidates which are selected for Unit 1 and Unit 2 moderation must ensure that the work for each unit is packaged separately and sent to the correct moderator. A number of centres included single folders with both units of work. This requires the incorrect unit to be separated and sent on to the correct moderator. Centres should be aware that moderators deal with only one unit and not both. It is therefore the responsibility of individual centres to ensure that the correct samples are sent to the correct moderator address.

Commentary on Unit 1 - 9791

Assessment Criteria 1.1, 1.2 and 1.3 focuses on features and function of engineered products. Candidates should focus on identifying other products or component parts which address their given brief. A number of candidates addressed this section well by including pictorial references to either their sketch sheets or as separate with justifications for as to why this particular element would be suitable to address the problem etc.

Assessment Criteria 2.1 is a key assessment element for Unit 1. It requires candidates to provide a set of drawings detailing their final design outcome. Centres which allowed candidates to use CAD had a clear advantage here with the ability to generate the key views to scale and accurately dimension the final product. Whilst CAD is an excellent method for AC 2.1, candidates who choose to generate their drawings in a traditional manner were not penalised. There were some excellent examples of drawing work seen using both methods. It is important for centres to remember that for candidates to achieve a Merit or higher in this AC, considerable detail such as hidden detail, dimensions for linear, angular and radius sizes and an isometric drawing must be present in the outcomes.

Assessment Criteria 2.2 evaluates the candidates ability to communicate their design ideas in the form of drawings or sketches. In the main this was quite a weak section with many examples having just a single sketch on a page with little supporting annotations. It would be desirable to have a range of initial ideas, possibly on an A3 or 2 A4's if using paper, and these being supported by clear annotation. There is, as mentioned above, a clear opportunity to include elements linking to AC's 1.1, 1.2 & 1.3 in this area, as candidates link their findings/details regarding to features and function of engineered products. Visual aids are required to be clearly evident to obtain the Merit award in this AC.

Assessment Criteria 3.1 is considerably weak across the majority of samples seen during moderation. To achieve a Level 2 Pass, there must be 'exploration of ideas' and 'references to other engineered products'. This again leads back to work done in AC's 1,1, 1.2 & 1.3. Again, an A3 or 2 A4's would be an ideal estimate of the work needed but candidates MUST show development. Too many centres relied on the original drawings provided by candidates in this AC to achieve outcomes. a small number of samples which did provide good evidence here were done using CAD, where candidates could quickly change and develop their initial ideas. Again, candidates will not be penalised for using traditional drawing and sketching methods if they do not wish to apply CAD software.

Assessment Criteria 3.2 saw many candidates doing exceptionally well in this AC. Many examples showed candidates using ranking systems etc, to prioritise their evaluations against the brief or specification. It is important to clarify that the 'evaluate options' AC can be credited from a variety of different sections within the unit. For example; evaluating features and functions that could contribute to the final outcome, reviewing the initial design ideas against their specification or evaluating their final design against the brief and/or specification. To achieve the higher mark bands, results of the evaluations must be commented upon by the candidate and conclusions drawn which are relevant to the brief. Many centres had candidates where evaluations were undertaken in more than one area.

Assessment Criteria 3.3 is an area which needs further work by most centres. There seems to be a tendency to either let candidates generate large specification lists which often have little or no relevance to the brief, or in many cases, give candidates pre populated sheets for them to discuss key points such as aesthetics etc. It would be more beneficial to candidates if centres required a smaller number of specification points which were then more detailed and relevant to the brief. This would allow candidates to focus more on key points and highlight areas which are critical to the development of a successful end product. Again, looking at AC 3.2, many opportunities arise to evaluate the specification to gain credit for this unit.

Commentary on Unit 2 - 9792

Before commenting on the individual assessment outcomes for Unit 2, it is important to clarify that this unit focuses on the candidates ability to manufacture an outcome which is set by the centre. Each candidate must be given all necessary information in the form of technical/engineering drawings, data sheets and pictorial information. It is expected that all candidates produce the same outcome unless a number of options is available where centres may have more than one staff member delivering the Unit. Where more than one set of outcomes are available, it is vital that centres standardise the briefs and information to be provided to candidates, to ensure that each brief contains the same level of demand and rigour, to ensure that candidates producing one product are not disadvantaged by an over simplified product therefore limiting access to the higher grade outcomes.

Again, centres are reminded that briefs may be changed to accommodate staffing expertise and available facilities, but the task outcomes may not be changed and must follow that given in the specification. Briefs may be submitted to the WJEC to check suitability and to ensure that the product contains enough depth to allow candidates to be successful in Unit 2.

Assessment Criteria 1.1 & 1.2 were undertaken reasonably well by the majority of centres however a number of centres were slightly generous with the awarding of the Merit grade. It is important to remember that the information. For candidates to be successful in these units, they must generate a series of outcomes which detail as much technical detail associated with making the product as possible. There is an over reliance at present for candidates to simply submit a large Gantt chart which is expected to secure a large range of individual Assessment Criteria.

Again, the presentation of this information is up to individual candidates but it would be expected, at the higher levels, to incorporate data or information on items such as correct drill sizes for tapping, thread information such as pitch and size, feed rates and machining speed would also be an area to gain higher level grades. These should be broken down into individual component details where appropriate.

Elements of AC1.1 may also evident in AC2.2 where candidates must actually show an understanding of the supplied engineering drawings in order to logically sequence the stages of manufacture. It is also highly expected that each candidate in the sample would not have the exact same sequence for manufacturing the product.

Assessment Criteria 2.1 was quite well done in the main with a good level of detail seen in a number of samples. This section should be looking at both physical resources as in materials from stock as well as the application of PPA for various operations of manufacture. Good examples were seen of material request forms and cutting lists for stock materials. Some candidates were also showing request lists for PPA and linking these to sequencing in AC 2.2.

Assessment Criteria 2.2 was another aspect that was well covered but as mentioned, some candidates relied too much on one large Gantt chart to achieve lots of the first 4 AC's. Whilst Gantt charts are appropriate for this AC, it would be expected that candidates break down manufacturing into stages, primarily associated with the individual component parts. Tools and equipment would be expected to be evident here as well as any references to safety considerations. There were also good examples of risk assessments for key stages of manufacture and contingencies were offered for areas that might affect the making stages.

Assessment Criteria 3.1 & 3.2 is done very well in the main with a number of outcomes being seen which challenged and stretched candidates in the production of their final outcomes. It is important at this point to clarify to centres that there is a need to provide sufficient photographic evidence of the making stages undertaken by candidates. Excellent examples were seen this year where candidates included a working diary of processes with descriptions of what they were doing for key stages of manufacture. Health and safety is assessed by the actions the candidate has shown during manufacture.

Assessment Criteria 4.1 is also done very well by the majority of centres and only a very small number of centres had outcomes which were too simplistic to access mark scheme. It is important that centres include a minimum of 8 of the key engineering processes listed in the specification under Learning Outcome 4 (LO4) AC4.1. Health and safety should also be applied in this assessment element. Again good photography helps to verify this AC when moderated.

Assessment Criteria 4.2 also showed a number of very well produced evaluative outcomes which candidates reviewed against the information provided to them at the start of the unit by the centre. Again, good examples showed photographs of component parts being tested with micrometers and vernier callipers to show accuracy, and many candidates gave detail descriptions of their outcomes, including accuracy and finish.

Further Administration of Unit 2

To recap on Unit 2, a key point which centres would benefit from including is the amount of photographic evidence provided for key stages of manufacture. Focus should be on the work as it is undertaken and supporting annotation by candidates is also a key strength in supporting grades. Centres also need to ensure that photographs of the final outcomes are clear and sufficiently large enough for moderators to make a verification on the quality of the final outcome. Please could centres also ensure that candidate names, centre and candidate numbers are also in the pictures of the final outcome.

Finally, I wish to thank centres for producing such good quality work overall. Although this report focuses on a number of the shortcomings from the 2016 Engineering moderation, the process was very positive for both centres and moderators. At this particularly busy and stressful time of the year, the standard of work presented by many centres shows that this qualification has many strong features which are evident very early on in the lifetime of the specification. I hope the moderation process remains a constructive mechanism to ensure that candidates work meets the expected standards and that centres are supported in order to improve candidate performance in future.

LEVEL 1 / LEVEL 2 AWARD IN ENGINEERING

SUMMER 2016

UNIT 3: SOLVING ENGINEERING PROBLEMS - 9793/01

General Comments

Questions relating to the recognition of basic engineering materials were generally quite well answered, but detailed knowledge of specific materials was less common. Answers to questions about engineering processes were also rather disappointing. Detailed knowledge of volume calculation remains limited in many cases, as does a clear understanding of technical drawing standards and conventions; this is disappointing considering Unit 1 is all about drawing standards.

Question 1

(a) This question was generally well answered, with most candidates gaining full marks. It was, however, disappointing to see that some candidates failed to fully describe the functions of the handlebar and instead just stated the functions. Candidates failed to provide detailed explanations of the functions.

(b) (i) In many cases, responses to this question suggested that detailed knowledge of engineering material classification was rather limited. Most candidates were able to identify aluminium alloys as being non-ferrous, but a significant number failed to classify ABS as thermoplastic and suggest a suitable composite material for the handlebars.

(ii) Responses to this question were generally quite disappointing. Most answers given were very simplistic, and often stated the benefits of tubular steel without giving an explanation of the benefits to the manufacturer.

(c) This question was well answered, and virtually all candidates stated ‘welding’ or brazing as a method of permanently joining steel tubing.

(d) This question was well answered in most cases, with reasons such as corrosion resistance and aesthetic appearance appearing in many responses. A number of candidates did lose marks, however, by suggesting ‘feels nice’ which was not accepted.

(e) (i) Candidates were required to explain what is meant by the term ‘composite material’. Responses to this question were quite varied, the higher scoring candidates gave complete and reasoned explanations, not only referencing the combination of different materials, but also the improvements gained by combining material properties.

(e) (ii) Most candidates were able to explain the advantage and disadvantage using composite materials when manufacturing the scooter frame. Only a small number of candidates scored full marks, however, and simplistic responses such as ‘cheaper’ and ‘lighter’ were all too often seen.

(f) Responses to this question were a little disappointing, with a number of candidates scoring two marks or less. Whilst almost all candidates attempted this question, very few good responses were seen, with a number of candidates failing to identify the correct physical properties from the list provided. Many responses identified the 'inflatable tyre' as requiring malleable properties and the 'brake cable' requiring 'conductivity'. This prevented these candidates from correctly explaining the 'reasons' for choosing the component property.

Question 2

(a) This question was generally well answered by candidates, and some interesting responses were seen. Most examples centred around the use of battery technologies eliminating the need for a cable, reducing the risk of trips and polymer materials in the drill body construction reducing weight and the risk of electrical shock through reduced voltage and having an insulated body.

(b) (i) Surprisingly, many failed to correctly state the full meaning of Computer Aided Design.

(ii) The majority of candidates were able to correctly describe a benefit of using CAD when designing products. Responses mostly centred around speed accuracy and ability to edit.

(iii) Again, many candidate responses failed to correctly state the full meaning of Computer Aided Manufacture.

(iv) Most candidates scored marks on this question but, in a number of cases, responses consisted of rather simplistic references such as 'fast'.

(c) A straightforward and generally well answered question. However, it was disappointing that a number of candidates failed to discuss repair, recycling and disposal in sufficient detail to gain 4 marks.

Question 3

(a) An accessible question to some, in which a number of candidates gained the full 8 marks. However, there were quite a number of candidates who simply failed to even attempt the question or just copied the orthographic views provided.

(b) In many cases, responses to this question suggested that detailed knowledge of engineering drawing was rather limited. The question required candidates to explain the purpose of the 'hatched lines' in sectional view A-A. Very few candidates offered a correct response.

(c) (i) This question was quite poorly answered. Many candidates did not attempt this question. It proved to be challenging for a number of candidates who struggled to complete the 'pin' volume calculation. Only a small number of candidates showed good knowledge and understanding to correctly calculate the volume of the aluminium required.

(c) (ii) There were mixed responses to this question. Some candidates answered the question extremely well and correctly listed the key machining operations required, gaining 4 marks. However, it was concerning that many candidates failed to correctly identify a single operation.

WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk