



EXAMINERS' REPORTS

**LEVEL 1 / LEVEL 2 IN
ENGINEERING**

SUMMER 2019

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.

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UNIT 1

General Comments

This year's moderation of the Engineering award saw a much greater spread of briefs which allowed candidates excellent access to all assessment criteria. Centres are now far more confident in selecting their own briefs for the coursework elements and there is good evidence of continual development of projects from a large number of centres.

There still remains however, a small number of centres that rely far too much on attempting to gain access to the higher mark ranges on just one or two sheets of work submitted by the candidate. In each instance of this occurring during this year's moderation, centres were reduced accordingly.

There was also a slight increase in the use of pre-populated writing frames issued to candidates by centres. As covered in previous reports, this is considered as assisting the candidate outside of the level of control and consequently, centres were also reduced accordingly. In both of the above occurring incidents this year, moderators requested the entire cohort from centres to allow an accurate assessment to be awarded.

Assessments of Units 1 and 2

In most instances, centres applied the assessment criteria well across both units. Most areas were well addressed with some excellent manufacturing outcomes seen in the Unit 2. These were enforced by good connections to AC's 1,1 and 1.2. Unit 1 was also well undertaken by the majority of centres this year with again excellent use of CAD being utilised by candidates in both the designing and technical/engineering drawing outcomes. There were also a number of excellently produced drawings done using conventional media which also allowed candidates access to the higher levels within the AC's.

Administration issues.

The majority of centres complied with the requirements of the moderation process with samples arriving by the May 5th deadline. There were however, a number of centres who missed this deadline by a matter of weeks. In extreme cases, centres were unable to have their candidates awarded for this series of moderation.

It is vital that centres ensure that work is submitted on time in future to avoid delays in awarding. Information on submission and examination dates can be found on the WJEC website or directly at <http://www.wjec.co.uk/exam-officers/key-dates-and-timetables/index.html>

There was an increase this year on the number of centres which had requests by moderators for additional evidence or the submission of the whole cohort. This in the main was as a result of some centres awarding inaccurate final levels to candidates. It is important to remember that to achieve a given level, say Merit level, that all AC's in that unit must be to at least a Merit level overall. If any fall lower, then the awarded level will be the lowest marked AC overall. For example;

Unit 1									
	<i>AC1.1</i>	<i>AC1.2</i>	<i>AC1.3</i>	<i>AC2.1</i>	<i>AC2.2</i>	<i>AC3.1</i>	<i>AC3.2</i>	<i>AC3.3</i>	OVERALL
Candidate 1	MERIT	MERIT	MERIT	MERIT	MERIT	MERIT	MERIT	MERIT	MERIT
Candidate 2	MERIT	MERIT	Level 2 PASS	MERIT	LEVEL 2 PASS	MERIT	MERIT	MERIT	LEVEL 2 PASS
Candidate 3	MERIT	MERIT	DISTINCTION	MERIT	MERIT	MERIT	MERIT	MERIT	MERIT

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.

Comments on individual questions/sections

Assessment Criteria 2.1

This remains a key assessment area for candidates due to the need to generate a detailed technical drawing of their final design. Some candidates limited themselves by not producing and isometric drawing of their final design; this is a requirement if candidates are to be able to access the Merit & Distinction levels for this AC.

There were again some excellent examples of good practice seen in this AC with the application of CAD software being more widely applied by centres. Equally, there were also some high quality conventionally drawn orthographic and isometric drawings produced by candidates.

Assessment Criteria 2.2 & 3.1

Whilst there was again some excellent examples of design sketches being developed by both CAD and traditional methods, this is an area that some centres would benefit from developing further with their candidates. Clear concepts being produced in this AC are essential to allow candidates to be able to develop a sound outcome to move through into AC2.1. This will also aid in development stages of AC3.1, which is currently one of the weaker AC's in the unit. For candidates to be successful in 3.1, they must include the development of a single idea. Too many centres rely on assessing this AC based on the original ideas alone, which should have been assessed in 2.2. If there is no evidence of any development, then at best, a L1P will be awarded. For higher outcomes, candidates should also make further references to engineered products, these should also relate to information covered in AC's 1.1, 1.2 and 1.3.

Assessment Criteria 3.2

This AC is done well by the majority of centres and there is excellent evidence seen of numerous evaluative methods reviewing the specification, ideas or features of the designs produced in AC's 2.2 and 3.1. A good proportion of centres evaluate more than one aspect of the design giving more opportunities to evidence this AC and help make the best selection of their final concept.

Assessment Criteria 3.3

The evidence for this AC was far better this year with centres ensuring that candidates produced more realistic specifications, which were more appropriate to the briefs, issued. There were far less generic specifications seen which often had little to do with the product being designed. By having a more focused specification, candidates clearly found it easier to focus on reviewing their product and therefore gained better outcomes in AC3.2

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UNIT 2

Comments on individual questions/sections

Commentary on Unit 2

Before discussing the individual AC's in this unit, some clarification on the way candidates should present their outcomes for this unit. The presentation of this information is up to individual candidates and should not be done on centre-generated worksheets. The Unit 2 this year saw an increase in pre-produced worksheets, which in some instances, were heavily populated with titles and instructions for the candidate. In these instances, moderators requested the whole cohort from the centre as it becomes difficult to distinguish between a level 2 pass and a distinction if all the sheets contain exactly the same information. Centres should avoid this in future as a number of candidates in the merit and distinction bands were reduced this series.

Candidates are responsible for generating their own layout hence, the whole sample should be different, a whole centre where the GANTT charts are identical in process order, times and details would be highly unlikely unless the information is also given to the pupils, again this should be avoided next year.

Assessment Criteria 1.1 & 1.2

This AC was undertaken reasonably well by most centres however as there is still a tendency by a number of centres to be slightly generous with the awarding of the Merit grade. As mentioned, the information for manufacturing the product should be interpreted by the pupil and not simply copied off the details provided by the centre. If the centre provides a sheet with all the information for feed and speed rates, this is actually providing the candidate with the answers. They are not finding out anything for themselves, simply copying information from one location to another. Similarly, too many centres are also providing a parts list which is again simply copied by the candidates. It is strongly advised that this is not good practice, as candidates will find it difficult to access the higher mark ranges for the unit.

Assessment Criteria 2.1

Identifying resources tends to be focusing mainly on finished sizes of component parts, candidates should be identifying stock sizes and pre machined sizes such as on a job requisition sheet. Finished sizes would be more appropriate for AC2.2 although the finished sizes could be placed alongside stock requisition sizes. The AC looks at the candidates ability to prepare to manufacture their product and how they resource the given outcome.

Assessment Criteria 2.1

Sequencing the manufacturing process is produced well by many centres but there is still a tendency by many centres to be over reliant on GANTT charts to obtain the first four AC's. A submission with only GANTT charts as evidence is unlikely to be able to access the higher

levels. Candidates should also be descriptive of the process involved in sequencing and not just name the part ie; upright or leg. For higher-level outcomes, candidates should discuss contingencies for events that may have an impact on their manufacturing such as a broken machine or sickness.

A number of centres also include risk assessment linked to sequencing, which covers key aspects of the manufacturing stages. This often includes severity of risk and/or details on limiting the risk level itself.

Detailing equipment and finishes along with tolerances is another area which can be addressed in this section of the mark criteria, providing additional opportunities to clearly evaluate making at the end of the unit

Assessment Criteria 3.1 & 3.2

These areas are done consistently well in most centres with some excellent outcomes being seen during moderation. Centres' developing their own briefs have been able to tailor manufacturing based on experience and facilities, allowing most candidate access to the full range of assessment criteria.

Again, some excellent outcomes were seen where candidates produced a working diary of production, using photos and commentary to explain process, safety considerations and accuracy, in many instances, working in this way allowed candidates to obtain outcomes for AC4.2 as the work progressed.

A small number of centres provided poor photographs of outcomes, which did not allow the moderator to see sufficient detail in the outcome. This can result in requests being made for further photographic evidence. It is also important to clarify that the candidates again must be responsible for presenting this information and centre-generated templates should be avoided. Encourage candidates to show finishing detail and close ups of smaller manufactured parts where possible. Even things that went wrong, when explained and contingencies are given, carry towards the AC 4.2 assessment

Assessment Criteria 4.1

Well done in the majority of centres with only a small number of briefs that were lacking in technical outcome. It is important that centres address eight or more of the key engineering processes listed in the specification under learning outcome 4 (LO4) This assessment criteria can also include health and safety details if not applied elsewhere.

Assessment Criteria 4.2

This area was weaker this year with centres providing in a number of cases, more simplistic evaluations of the manufacturing outcome. This tended to be the case where candidates had not produced a work diary or over relied on the GANTT charts to cover most of the assessment criteria.

Again, if nowhere else in the folio of evidence, this section should be supported by relevant photographic evidence of the outcomes, should discuss accuracy and tolerance, preferably with some pictures to support these statements ie, a digital vernier showing the final machined size of a component part. This year there were too many bland statements, lacking in detail with little or no reference to actual accuracy, which limited candidates ability to move out of the level 2 pass range.

Summary of key points

Finally, I wish to again thank centres for producing such good quality work overall. Although this report focuses on a number of the shortcomings from the 2019 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 continue to be revised and improved. I hope the moderation process remains a constructive mechanism to ensure that candidate's work meets the expected standards and that centres are supported in order to improve candidate performance in future.

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UNIT 3

General Comments

Most candidates attempted all of the questions on the paper, but in a number of cases, there was evidence of candidates not having read questions carefully before answering. It is most important that candidates take the time to read through the question paper before attempting to answer questions, as this can help to ensure that basic errors are avoided. Detailed knowledge of basic machining operations/processes and engineering hand tools remains limited in many cases. This hinders their ability to answer questions on engineering processes.

Comments on individual questions/sections

- Q1. (a) (i) Most candidates scored well in this question by listing two advantages to the user of being able to fold the bicycle.
- (ii) Responses to this question were varied. Some candidates scored the full two marks, stating two reasons for the diameter of the wheels to be visibly smaller than the average bicycle. Reasons included: to be more compact and make the bike lighter.
- (b) This question was well-answered. The majority of candidates were able to explain the purpose of the sprocket and the wheel mud guard in great detail.
- (c) This question was not well answered in most cases, with the majority of candidates unable to list two properties of mild steel, such as toughness, easy to fabricate or tensile strength.
- (d) Most candidates were able to identify a ferrous metal, but struggled to identify Aluminium as a non-ferrous metal.
- (e) This question was not well answered at all across most centres. Candidates were not able to identify welding or brazing as suitable processes to manufacture the bicycle frame. There was a small minority who identified the correct process. An even smaller number were able to clearly explain the process through the use of sketches and annotations. This highlights the need to demonstrate the engineering processes, as listed in the specification, in centres.
- (f) This question was not answered very well. Candidates incorrectly suggested that the brake system was an example of a 'quick release mechanism'. Whereas it is in fact, a locking mechanism that can be opened or closed very quickly.

- (g) (i) Responses to this question were good. A number of candidates were able to explain why maintaining the bicycle is important to the user.
 - (ii) Most candidates were able to identify a part on a bicycle that should be maintained regularly. The majority of candidates were able to give a valid reason for maintaining the specified part.
- Q2. (a) It was pleasing to see that this question was answered very well by most candidates. The most popular responses including – reflective backing can be put on the signs, legibility of information at speed, quality of finish.
- (b) This question wasn't answered as well as 2 (a). Candidates failed to give two disadvantages of using cast iron to manufacture the old road signs.
- (c) Responses to this question were generally good. Candidates were able to describe two advantages of using a series of clips and domed nuts to attach signposts to vertical posts.
- (d) This question was generally not answered well at all. The vast majority of candidates failed to name two SMART materials, along with a benefit of the material to the user. They named 'modern materials', not SMART materials. There a definite difference between the two different types of material.
- Q3. (a) Very few candidates were able to name the internal callipers in this question. Without knowing what they were, it was very difficult to write a description of their use. Most candidates incorrectly named the second tool as a 'scribe'. The correct name for the tool is a 'scriber'. However, most candidates were able to write a description of its use and were not penalised twice for the spelling error.
- (b) This question was generally not answered very well. Very few candidates were able to name odd-leg callipers, Jenny callipers or a height gauge a tool to mark a parallel line to an edge on an aluminium sheet. Few candidates were able to correctly name an engineer's square. A 'square' was marked as incorrect.
- (c) The majority of candidates successfully listed at least two basic machining operations required to mill a slot in aluminium stock. Some candidates however, listed machining operations for a pillar drill. This highlights the importance of reading the question properly.
- (d) This question was answered very well generally. The majority of candidates were able to calculate the area of the rectangle and the four holes correctly. Most candidates were able to calculate the volume of the remaining HIPs plastic after the laser cutting operation.
- (e) The majority of candidates successfully completed a sketch of the side view, drawing the through hole and the hidden detail. The projected lines were drawn by most candidates. This was generally answered well. This shows that candidates are recalling the work they completed during Unit 1.

Summary of key points

Candidates must:

take time to read through the question paper before attempting to answer questions;

be more aware that basic knowledge of machining operations/processes could be the focus of questions;

be aware that knowledge taught in units 1 and 2 could also be the focus of questions in the examination.



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