AQA
Questions matter

GCSE
Engineering

8852/W Unit 1 Written Paper

Report on the Examination

8852
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General comments

The paper totals 120 marks, making up 60% of the overall qualification. All questions were compulsory, and responses were written into the examination paper. Some students made use of the additional pages at the back of the examination paper in order to expand upon their answer. Where these additional pages are used, it is important to clearly label and number their responses.

The examination allowed more able and better prepared students to score well with a range of topics and question types. Where students successfully responded to the command word in the question, they were able to access the higher mark bands.
Lower-level responses were often found to include generic statements and basic descriptions or observations supported by the material provided in the questions. It remains clear that students are often more familiar with workshop processes than industrial manufacturing processes and procedures but the effects of covid are still evident in the detail of many responses when compared with similar questions prior to the pandemic.

It was pleasing to note that the vast majority of students attempted most of the questions on the paper and the percentage of not attempted questions was lower than in previous series. In many cases students have responded to questions with precision and accuracy, demonstrating clear evidence of effective planning and preparation of students by teachers. Centres are to be congratulated on this.

However, for a few questions a number of students had responded to these questions without reading the questions carefully and giving repeated answers or just repeating the information from the question. To avoid this in the future, it is recommended students take the time to read over the questions before attempting to answer them, so that simple errors and generic responses to longer questions are avoided. There were a number of instances where the responses throughout the paper were not detailed, specific or technical enough to gain the higher level of marks.

The communication skills shown by students were varied. Although many students wrote clearly and expressed themselves well, there were an increasing number whose handwriting and powers of expression were poor, this made it increasingly difficult to award marks. This included a few students who typed their responses but did not number or label their answers making it very difficult to award many marks.

A high percentage of students were able to show good mathematical skills and therefore many scored well in the questions which asked them to demonstrate mathematical skills. Students are advised to show their working out when answering the mathematical questions, as this may allow them to access method marks for early calculations where the final answer may be inaccurate. They should also be encouraged to lay out their calculations in an ordered, labelled and logical manner.
However, at times, students' mathematical skills were more evident than engineering subject knowledge when achieving marks, although this has improved year on year.

MCQ's 1.1-1.6

These questions were all multiple choice or word bank questions, covering a broad range of the specification and testing different materials, processes and areas.

These were as expected, the most answered questions on the paper and also mainly the best performing questions. With 1.3 being the best performing MCQ, with over 75% of students selecting the correct answer.
However, with question 1.2 just under a third of students were able to identify ‘transistor’ as an interfacing device and achieve a mark.

1.6 – This question asked students to select words from a word bank to fill in the gaps. Many students attempted this question with success and a high percentage of students achieved three or four marks.

Question 2

2.1 – Sintering
This was one of the least attempted questions on the paper and the responses showed that many students had limited knowledge sintering. Where students had attempted the question, many were clearly describing a different process and only around a fifth of students achieved both marks in this question.

2.2- MDF (medium density fibreboard) and OSB (oriented strand board)
Surprisingly fewer than 5% of students were able to communicate two clear differences between MDF and OSB. Many students gave generic answers such as ‘stronger’ or ‘cheaper’ without any justification or flipped their response and therefore only identifying one difference. Also a number of students also just gave the detail in the questions as their only response.

2.3 - Hard soldering and soft soldering
This question gave a more even spread of marks and high achieving students were able to clearly articulate differences between the two types of soldering such as the use of different temperatures. But again, there were a high number of generic responses that failed to gain any marks.

2.4 - Thermosetting and thermoplastic
Once again, there were many generic responses seen to this question, but where students did answer the question well, they wrote about cross links and the ability to reshape thermoplastics many times. Some students clearly knew the differences but attributed them to the wrong category which limited their mark for this question.

Questions 3

3.1 - Monocoque
Many students were able to communicate a basic understanding of a monocoque structure and achieve a mark within the level one-mark band, but only 15% of students were able to justify their points to achieve a mark in the top level. An increasing number of students had answered in bullet points or by just writing it was stronger but without justifying how and why. Responses like this limit the student’s ability to achieve full marks. Students needed to show more than one benefit of using a monocoque as well as justifying their points to achieve top marks.

3.2 - Testing
This question was attempted well and more than half of students were able to identify either a non-destructive or a destructive test. Where students failed to secure both marks this was often where their response for a non- destructive test was actually a destructive test.
Similarly generic answers for a destructive test where responses were ‘hit it’ were not awarded any credit.

3.3 - Benefit of non-destructive testing
Responses for this question were differentiated through the whole mark allowance for the question. Students who achieved the top mark for this question responded with detail about reusing the material and being able to perform multiple tests throughout a manufacturing process and therefore reducing costs.

3.4 - Altering carbon in steel
Around half of students failed to achieve any marks in this question as again many responses were too generic to be awarded a mark. Responses need to be specific to the questions, such as adding carbon makes it harder but also more brittle.

3.5 Use of high carbon steel
Students were awarded a mark in this question when they gave a specific use, such as ‘drill bit’ rather than a vague answer such as ‘car.’

3.6 Maintenance check
Many students stated checks such as ‘checking the drill bit was in properly’ rather than a maintenance check, for example, check the wiring or the emergency stop. Fewer than half of students were able to correctly identify a maintenance check.

3.7 Importance of maintenance checks
More than 90% of students were able to identify the importance of maintenance checks and achieve at least one mark, and more than half of all students then went on to identify a second reason or explain their response in detail for the second mark.

Question 4

4.1 - Pulley benefits
Responses for this question were differentiated through the whole mark allowance for the question with around a fifth of students achieving all four marks. The most popular answers included details of mechanical advantage and the reduced effort needed.

4.2 - Calculate effort of the pulley system
This question resulted in over three quarters of students correctly working out the load as 80N.
Where students gave an incorrect answer, this was often due to an incorrect transposition of the formulae. However, students were still able to achieve marks for the rest of the mathematical skills demonstrated with the error carrier forward marking if they had clearly shown their workings.

4.3 - Sand casting stages
Students were able to respond to this question with any two different stages of sand casting. Three quarters of students were able to identify at least one stage, with the most common response being about pouring molten metal into form the pulley wheels.

Question 5

5.1 – Systems block diagram
Many students were able to correctly communicate process, output and lever on the block diagram to be awarded three marks. The most common error on this question was mainly with lever. The most common errors instead of lever were decision, output or alternatively left blank.

5.2 – Flowchart
This question asked students to finish the flowchart. Responses for this question were differentiated through the whole mark allowance for the question, with around 25% of students able to complete the flowchart successfully and achieve full marks. The common errors in this question were when students did not add feedback loops and/or added an end box. If students had added additional boxes or loops but the flowchart still functioned, they were awarded marks.

5.3 - Pneumatic vs. hydraulic lever
Many students were able to give information about a pneumatics lever using a gas and a hydraulic lever using liquids to function but had limited comparisons. Top achieving students were able to show a good understanding of both and often compared the advantages and disadvantages of both systems. Where students scored lower marks, this again was often due to vague generic answers of ‘faster’ or ‘stronger’ or writing correct details but not identifying which system they were referring to. Also, a number of students gave their response in bullet points which wasn’t detailed enough to be awarded more than half marks for this question.

Question 6

6.1 – Drilling a hole in aluminium
This question allowed students to demonstrate their knowledge of practical skills. Students who performed well included both written and diagrammatic details in their responses. High achieving responses included detail about how and why securing the aluminium was necessary and the H&S precautions needed to safely drill the hole. Where students achieved lower marks, it was often when they hadn’t considered all the steps necessary to drill the hole or gave their response with limited bullet points.

6.2 – Name the tool
More than two thirds of students were able to identify the tool as a hacksaw.

6.3 - Evaluate the tool
This question did not require students to know the name of the tool shown in Q 6.2 but to explain why this tool was a suitable tool for cutting the aluminium corners out. Many students mentioned the type of blade allowed for precision and the depth of the throat allowed for cutting the 50mm depth. Where students achieved only one or two marks rather than the full three marks this was because the responses focussed on why other tools were not suitable and not why a hacksaw was suitable.

6.4 – Folding the aluminium sheet
Although over 10% of students did not attempt this question, just over 15% of students included enough detail to be awarded one of the top marks. Despite being a five mark question many students answered with just one or two sentences and with limited detail such as ‘put in a vice and hit with a hammer.’ Responses needed to include detail of how to ensure accuracy, quality checks and the tools necessary. Where students did include detail, many added lots of detail on how to mark out the fold lines and then very little detail about the actual folding and checking stages, this limited the marks they achieved in this question.

6.5 – Calculate area
Similarly, this mathematical question was a strongly performing question and over two thirds of students achieved full marks for this question. Where students failed to achieve full marks, this was often due to the fact they hadn’t accounted for four corners.

6.6 – Calculate percentage waste
Just over sixty percent of students calculated the percentage waste correctly. The most common error on this question, which limited many students to two marks instead of three, was not giving the answer to two decimal places as asked in the question.

Question 7

7.1 – Fossil fuel
An exceedingly popular answer to this question was coal followed by natural gas, with around ninety percent of students achieving one mark for this question.

7.2 – Biomass and wind energy
It was pleasing to see many students attempted this extended response question and a high percentage had knowledge of both wind and biomass. However, to achieve highly in this question students needed to compare the two different energy production methods, students often showed great knowledge but limited comparisons in their response. Responses were frequently written as separate paragraphs about each energy method. As this was an extended response question requiring comparison, students who presented their response as separate paragraphs or in bullet points, limited the mark they could achieve for this question.

Question 8

8.1 – Microcontroller / discrete device
This question asked students to analyse why a microcontroller had been used instead of a discrete device.
Around sixty percent of all students did not achieve a mark for this question. Student responses displayed a limited lack of knowledge about this area. Where students had performed well, they had written about the microcontroller being programable and being able to perform lots of functions as well as being able to be used in a different system.

8.2 – Circuit diagram
This question was reasonably well attempted and gave students the opportunity to demonstrate their circuit knowledge. Responses for this question were differentiated through the whole mark allowance for the question. The most common error on this question was the completion of the circuit to connect the light emitting diodes (LED) and/or the protective resistor R2. Often students drew the connection from the bar at the front of the LED symbol and not using the connecting wire and/or they connected more than one output from the counter to the LEDs.

8.3 – Resistor function
Many students identified the function of the resistor in controlling current to protect the LED.

8.4 – Calculate the size of the resistor
More than three quarters of students achieved full marks for this calculation. Where students achieved fewer marks, they often did not clearly show their workings and so were unable to be awarded error carried forward marks as their method was unclear.

Question 9

9.1 – Calculating the minimum cross-sectional area (CSA)
Similarly, this mathematical question saw over 70%of students achieve all three marks for their answer and again where students achieved less than full marks, they often didn't clearly show their workings.

9.2 – Buckling
This question asked students to explain buckling. A quarter of students included enough detail to be awarded full marks and included detail such as distortion. However, many students simply gave one- or two-word answers such as 'it collapses' or 'breaks,' which were not specific enough to be awarded a mark.

9.3 – Calculate the volume of low carbon steel in one leg.
Students who achieved highly on this question had clear responses, showing the different stages and their answer in the correct units. A high number of students who attempted this question failed to clearly show their method and their progression through the calculation stages. A high percentage also showed no indication of converting the diameter to a radius or converting the length from m to mm, this limited the mark they were able to be awarded.

9.4 – Calculating mass

Unfortunately, this question featured an error. The formula for the density of steel was given as 7750 kg/m^2. This should have been 7750 $kg/m^{3.}$

The vast majority of candidates either ignored or didn't notice the error and answered the question with the correct formula/units. In the small number of cases where students noticed the error and factored this into their calculations the answer of 6606875Kg was also awarded full marks accordingly. We are sorry that this error was present in the paper.

This was a popular question allowing students to show their mathematical skills and calculate mass using a given equation. Over 75% of all students achieved full marks for this question despite the error with the units for density on the original paper. While marking the paper there was the benefit of the

doubt given to responses where any unit had included Kg or g in any way along with any indication that students had attempted to convert units.
Where students achieved one or two marks it was often due to an unclear working method or an incorrect transposition in their calculations.

9.5 - Galvanizing
The most popular responses to this question were ‘to prevent rusting and/or corrosion.’

9.6 – Describing the galvanising process
Just over half of students were unable to achieve a mark for this question. Often this was because students’ responses included information about the reasons steel is galvanised rather than describing the process. High achieving students wrote about the different stages of the galvanising process and used technical detail such as ‘molten zinc’ and ‘pickled.’

9.7 – Static and dynamic loads
This question allowed students to demonstrate their knowledge of loads with many being able to clearly communicate the difference between a dynamic and a static load and give a clear example of each.
The most popular examples were a’ bridge’ for a static load and a ‘car moving over a bridge,’ for a dynamic load. Where students were less successful, they had often confused the static and dynamic loads or had not written an example for each load type.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.