GCSE
ENGINEERING

8852/W Paper 1
Report on the Examination

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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, or where students are using a word processor, it is important to clearly label their responses.

The examination allowed well 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.

It was pleasing to note that the vast majority of students attempted most of the questions on the paper. In many cases students have responded to questions with precision and accuracy, demonstrating clear evidence of effective planning and preparation of students by teachers. Schools 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, eg Q 2.3.
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 was a number whose handwriting and powers of expression were poor, this made it increasingly difficult to award many marks.

Many students were able to show good mathematical skills and therefore many students scored well in the questions which asked them to demonstrate mathematical skills. Students are advised to show their working out when answering the maths 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 and logical manner.
Nevertheless, at times, students' mathematical skills were more evident than engineering subject knowledge when achieving marks, although there has been an improvement since the start of this specification.

Question 1

1.1 – 1.7 MCQs

These questions were all multiple choice, 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 the best performing questions. With 1.3 being the best performing question, with over 90% of students selecting the correct answer – board.

1.8 – This question asked student to select words from a word bank to fill in the gaps. Many students attempted this question with success with the vast majority of students achieving full marks.

Question 2

2.1 For this question students had the opportunity to demonstrate their knowledge on press forming. While there were a few good answers gaining the full 6 marks, many students' answers were confused and often they had combined press forming knowledge with knowledge from different processes such as vacuum forming and injection moulding.

2.2 This question asked students to calculate how many complete steel plates could be cut from a given sheet. Just over a quarter of all students gained full marks in this question. However, many students used the approach of calculating the area of the sheet and the area of the plate and dividing. This didn't allow for the fact that only half plates could fit both horizontally or vertically and limited the amount of full plates that could be cut from the sheet.
If students wrote the correct answer with no written calculations they were still awarded full marks.

2.3 The formula for pressure was stated in this question and students were expected to use the equation to calculate the air pressure for the cylinder. The answer line indicated that the answer was to be given in N/m^2. Many students missed this and therefore weren't awarded the mark for unit conversion. Although many Maths based questions tend to be some of the best answered questions on the paper, this one was a little more challenging due to the conversion of the units needed for their final answer and therefore many students failed to gain the last mark.

2.4 Around two thirds of students who attempted this question were able to accurately calculate the length of a. Again, students were awarded full marks if they wrote the correct answer with no calculations shown. A common error of those students who didn't achieve full marks was just dividing their answer for $b^2 + c^2$ and not taking the square root to find the required answer.

2.5 This was the first of the longer extended answer questions. Students were expected to evaluate dip coating and painting of a castor wheel plate. This question was a good differentiator with the full range of marks being used. Where students were most successful they gave clear facts and information about both types of finishes and often linked the 2 methods giving similarities and key differences between the two methods. Students who were less successful often wrote bullet points about each individual finish with little evaluation of the process. In addition, many students also copied out the question at the start of their answer and also wrote a summary paragraph which contained no new information that was worthy of any additional mark.

2.6 A good majority of students were able to name a suitable material for the plate and showed good knowledge of suitable finishing techniques. Where students didn't perform as well in this question they had often written spray paint, or just paint, which the question had already asked for an alternative for.

Question 3

3.1 This was a very high performing question with the vast majority of students able to state, wind turbines or solar panels as a suitable form of renewable energy.

3.2 This extended response question asked students to compare nuclear energy against fossil fuel. Many students were able to give information about fossil fuels and their advantages and disadvantages, but the number of students who had detailed nuclear knowledge was much lower. It was clear from responses that many students were unfamiliar with nuclear energy.
Many students gave an answer that highlighted the similarities of both methods of energy production; harmful to the environment, produced a lot of energy, but often didn't indicate the differences or give details, such as the greenhouse gases from fossil fuels and the radioactive waste from nuclear, that harm the environment in different ways.

Question 4

4.1 Students were asked to name specific tools at different stages of the manufacture of a corner bracket in a school workshop. It was pleasing to see many students had good knowledge of tools and machines that were suitable for each stage of the manufacturing. Where students fared less well is where they gave generic tools names, such as saw, or named equipment not suitable for low carbon steel, such as sandpaper/glass paper.

4.2 In this question many students were able to write information about brazing but less so about welding. Where students achieved the full two marks that had highlighted the difference in the two methods, using filler rod in brazing compared to a higher temperature 'melting' the two metals together in welding. A few responses showed students seemed to have confused soft soldering and brazing when giving their answer.

4.3 Only around a third of students were able to state a suitable method of manufacturing the aluminium components. Many students stated methods that were more suitable for polymer production or methods that would be unable to manufacture the detail needed.

Question 5

5.1 This question showed from the responses that many students had limited knowledge of an engineering company and therefore the answers often lacked focus and specific detail.
Where students achieved high marks for this question they had a clear understanding of the different impacts and were able to clearly communicate the influence these would have; increase in a range of jobs, additional money in the local economy balanced against environmental issues such as increased traffic and noise. Higher level responses were characterised by personalised and insightful evaluative content. Many students made use of the additional paper provided at the back of the answer booklet for extending responses.
Where students were awarded fewer marks if any, this was often due to giving generic reasons for an impact, such as, 'it would improve society for many reasons', and then not giving any detail about the reasons.

5.2 This question required students to read data from a graph and calculate the value of the missing bar chart. A large majority of students were able to complete this question successfully.

5.3 Having calculated the value of the missing bar in the previous question, this question allowed students to show their skill of drawing a value onto a bar chart. Again, many students completed this successfully. Where students hadn't managed to calculate the correct value in question 5.2, they were still rewarded for their skills of completing the bar chart using their value calculated in the previous question.

5.4 As question 5.2 had rewarded students for the skill of reading off the graph, question 5.4 rewarded students for calculating the percentage of construction. One mark was awarded for showing the equation they would use and the second mark for the correct answer. However, students were still awarded full marks if they gave the correct answer without any written method shown. Where students found this more challenging or produced an incorrect answer was often when they used a longer method to calculate the 27%, first by working out 1%, then 10% and then working out the 27%. These additional stages often led to calculation errors.

Question 6

6.1 This question was one of the least attempted questions and with only a few students able to identify a transistor in the circuit. Many students seemed to confuse a resistor and a transistor.

6.2 There were many correct responses to this question and a large number of students were able to name an audible device instead of a buzzer. Where students didn't gain a mark they often gave a component that wasn't an audible component, such as an LED.

6.3 The flow chart question gave students a list of processes and stages and asked them to complete the flow chart. Around 20% of students achieved full marks for this question and around 50% achieved at least half marks. Where students didn't achieve many marks, they often drew feedback loops to the wrong place, had an end box or split up the stages of output 1, 2 and 3 and drawing them in different boxes, but then forgetting one of the stages.

6.4 This question asked students to give the advantages of writing an electronic program as a flowchart. While there were many very good answers such as, 'it was clear and easy to read as it was a visual representation', there were still many generic answers that were awarded no marks, for example 'it's easier'.

6.5 Students answering this question showed their knowledge well and the most successful students drew a clear sine wave to illustrate their answer for AC and a straight line for DC. They also clearly explained the difference in the direction of current between the two power supplies.

6.6 Only around half of students were able to clearly state two advantages of using batteries. Where students didn't achieve marks on this question they again gave generic answers such as 'cheaper, safer or quicker'. Without justification or reason, these answers were not awarded any marks.

6.7 This questions asked students to name a logic gate, with only just over half of students able to do so. It was clear from the responses that many students were unaware what a logic gate was.

6.8 Although around half of students were able to name a logic gate, only just over a third of all students were able to explain its function. With the most popular answer being an AND gate and its function of only producing an output signal when both input signals are high.

Question 7

7.1 This question differentiated students, some students being able to identify linear and rotary as the words needed to complete the sentences, with a similar proportion being able to identify one of the two missing words. Several responses using words and phrases like ‘sideways’ or ‘round and round’ were provided but not credited.

7.2 Where students achieved full marks in this question they clearly explained the movement of the follower and how it moves with the profile of the shape of the cam. Many students mentioned the cam but not how the shape influenced the movement of the follower.

7.3 This question allowed students to show their knowledge of why machines need to be regularly maintained. Over two thirds of students were able to show their knowledge and achieve full marks for this question, with the vast majority of students achieving at least one mark for this question. Where students achieved the two marks they gave two distinct and different answers that were justified, one example being, ‘to avoid corrosion and prevent deterioration of the machine.’

7.4 Responses for this question were differentiated through the whole mark allowance for the question. Many students gave a correct response but often gave simple statements that were awarded just one mark. For example, ‘prevents overheating’, but didn’t explain why this was necessary – to prevent the parts from jamming or seizing. Again, there were also many generic answers which were not awarded any marks.

7.5 More than half of students were unable to calculate the slope with many just reading numbers off the graph and not understanding how to manipulate them to calculate the gradient. In addition, a lot of students were able to correctly read values from the graph but used them upside down in their equation, therefore incorrectly working out a gradient.

7.6 The vast majority of students were able to identify the component as a ball bearing.

7.7 After identifying the component shown in Q 7.6 many students then went on to write a generic statement about what it does, eg ‘spins’, without mentioning controlling the movement for reducing friction, this information was needed to achieve the one mark.

Question 8

8.1 This question asked students to calculate the strain in a wire. There were marks awarded for the formula, substituting the numerical information and a final mark for the correct answer. This question was a good differentiator as there was a good spread through all the marks possible. Where students didn’t perform as well, they had often substituted the numbers incorrectly and therefore their final answer was incorrect. Students could have expressed their answer in stand form or as a fraction.

8.2 This straightforward calculation allowed around two thirds of students to achieve full marks, many of the students who didn't lost a mark for not writing their final answer to 1 d.p. as indicated in the question.

8.3 Around half of students were able to identify tensile strength as the correct answer for the strength in the cable in the pulley. Where students didn't achieve a mark they often wrote, elastic or potential energy with a few expressing tension as the answer.

8.4 In this question a reasonable number of students were able to explain how to test the cable in sufficient detail to achieve the full two marks. However, many students' answer included details about hanging a weight but little consideration was given to fixing one end of the cable or increasing the weight until the cable failed.

8.5 A reasonable number of students were able to give one reason for the main function of a pulley, such as the mechanical advantage, but far fewer were able to give two clear distinct reasons for using a pulley. Often generic answers were given, such as 'move things'. Students need to justify their answer or give more detail to be awarded a mark. eg 'pulleys are used to make moving heavier objects much easier'.

Question 9

9.1 Many students' understanding of rapid prototyping and 3D printing meant they often confused it for a mass production method. In addition, students also explained the process and stages of 3D printing but with little reference to the advantages and disadvantages. Where students achieved high marks, they had a range of knowledge, linked in other rapid prototyping methods and explaining why this was key to manufacturing.

9.2 Many students answered this question confusing Quality Assurance and Quality Control. Many also named destructive tests but with no information about how many products were to be tested destructively. Students achieved the highest marks for a clear test with specific details, such as 'using gauges to test tolerances of dimensions'.

9.3 A very high achieving question with nearly three quarters of students achieving full marks on this question despite it being the final question on the paper. Often students just wrote the maximum and minimum value, but were still awarded full marks for the question as it was clear they had calculated the tolerance to work out 147 and 153.

Mark Ranges and Award of Grades

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