

Examiners' Report/
Principal Examiner Feedback

Summer 2016

Pearson Edexcel GCSE in
Engineering/Manufacturing (5EM03)
Paper 3D: Engineering Fabrication

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General Comments

Overall, the two sections within this paper produced a good range of responses.

Lower ability learners are still giving responses to questions, such as 'accurate', 'quicker' and 'cheaper' which gained limited marks. Some learners continue to misread or misinterpret questions therefore did not gain marks. The more demanding questions, especially at the end of Section A and Section B, were difficult for some learners; however, there has been an improvement in the quality of most responses.

The majority of learners continue to attempt all questions and empty spaces were again kept to a minimum throughout the paper. It appears that centres have again taken on board information from previous series examiners reports as there was further improvement in learners abilities to respond to 'describe', 'explain' or 'discuss' without using bullet points. Centres continue to build on teaching appropriate examination skills and techniques.

Section A

Question 1

The majority of learners correctly identified the products belonging to the engineering fabrication sector in part (a) and part (b); however, a minority chose the response 'Welding gloves' for part (b), which was incorrect (the correct responses being 'Garden rake' and 'Bolt cutter').

Question 2

Learners had the opportunity to use their knowledge and understanding to correctly identify and describe some tools and equipment this year. A minority of learners were able to identify both in part (a) however; most learners only identified the first tool which was the 'hacksaw'. The second (Die stock) was often referred to as a 'tap wrench' which were clearly incorrect. Part (b) of this question also proved quite challenging. The first image clearly showed a 3 Jaw Chuck that could be used on a centre lathe and responses relating to securing work for this operation were rewarded; however, many learners responded with statements that related to a drill chuck such as 'used to hold drill bits'. This was an incorrect response for this type of chuck. Many learners were unable to suggest a use for the Hand reamer and gave a generic response such as 'used for reaming' with no indication of what reaming actually was. Where learners were successful, responses such as 'to produce accurate holes sizes' and 'to remove burrs from holes'.

Question 3

A straightforward and generally well answered question. However a number of learners thought that 'Quantum Tunnelling Composite' was linked to 'Control Technology' where the correct Key Area was 'Modern Materials'.

Question 4

Good responses to part (a) included products used in the pre-release materials for past papers or specimen assessment materials. This question again required two responses and it was pleasing to see that learners had not responded with the excluded product, the bicycle brake calipers, as the subject for the question. In part (b), there was a considerable improvement in performance.

Most learners were able to correctly identify a joining process used in the chosen product. Typical responses included 'welding' and 'nuts and bolts'. Likewise, this allowed learners to access the full range of marks for the description of the joining process. Typical responses for welding included 'the material is heated or melted and a filler rod is added to join the materials together' and nuts and bolts, 'temporary fasteners used together with a washer to join two pieces of material together'. Part (c) was also answered reasonably well. Learners who had been taught about examples of automation were clearly able to respond well and access full marks. Typical types of automation included 'conveyor belts' and 'robots' with appropriate extensions such as 'used to transport goods around the factory' and 'used to assemble different parts of the product' respectively.

Question 5

Part (a) was generally answered well. Most learners provided responses such as 'to create design ideas' and 'to model designs in 2D and 3D' (for 2 marks). The majority of learners also scored well for part (b), with many responses focusing on the initial cost of CAD software and the need to train staff to use it. Parts (c) and (d) proved to be a little more challenging and it was clear that most learners did not have an understanding of the functions/benefits of CIM. Where learners did score some marks there were responses relating to the control of manufacture and reduction in manufacturing errors for 5c and 'improved efficiency' or 'consistent products' for 5d. Some learners gave benefits for functions in 5c and then went on to discuss the benefits of using CAD rather than the benefits of linking CAD with CIM.

Question 6

Part (a)(i) was answered well by most learners, with many gaining 2 or 3 marks for responses that normally focused on data storage and handling information, for example 'A database could be used to store customer information so it can be handled easily without spending time searching through files'. The majority of learners again focused on security when providing a response for (a)(ii), with most gaining 2 marks for answers such as 'The database could crash or be hacked which could lead to loss of data and lots of time lost'. For (b), the majority of learners scored reasonably well as they were able to demonstrate an understanding of electronic spreadsheets. Typical responses centred around 'the ability to use formulas to create results reducing mathematical errors' and 'the ease of sharing information as data can be transferred electronically'. Some learners discussed environmental issues which were not acceptable in this context.

Question 7

Centres are reminded that this examination paper is ramped in difficulty and the latter questions in each section are aimed at the more able learners; as a result, this question required an ability to provide specific responses, by drawing upon specialist knowledge. Part (a) was generally well answered by most learners. There were popular 3 mark responses such as 'Pollution from burning fuels for travel is reduced because of video conferencing. It allows people to have a meeting without travelling which reduces emissions because less fuel is burned. This impacts the environment by reducing air pollution and climate change'. Less able learners often just described a simple benefit of communications technology with no link to the global environment. Part (b) also produced some good responses for the advantages of using communications technology when

marketing products. Many responses focused on the 'instant contact with customers' or 'paperless marketing' and 'reduced cost of advertising'. It was pleasing to see so many responses actually relating to the marketing aspect of the question rather than generic responses.

Section B – based upon the 'mass produced bicycle brake calipers' pre-release material

Question 8

The paper continued to create a greater opportunity for all learners to display their knowledge and understanding of the pre-release product through detailed sketching and notes relating to the functions of various parts of the bicycle hand pump. Most learners were able to effectively explain, using notes and sketches, the function of the 'brake pads', 'quick release lever' and 'brake shoe bolt'. Some learners are still producing notes only and this does not allow them access to full marks for each part of Q8.

Question 9

For part (a)(i), the majority of learners were able to correctly add the missing main stages in the flow chart ('Design' and 'Assembly and finishing' for 2 marks. Responses that could not be rewarded often stated 'Quality control', or sometimes the incorrect stages were entered. For (a)(ii), almost all learners correctly named the stage as 'Marketing'. Part (b) was generally well answered too, with many learners gaining at least 2 marks. Responses normally centred on scheduling production and health safety requirements along with establishing labour requirements. It was pleasing to note that answers for part (c) were often contextualised, focusing specifically on what would happen at the materials supply and control stage when manufacturing bicycle brake calipers; responses associated with purchasing component parts of the brake calipers, goods inward inspection of these parts and purchasing specific materials for manufacturing.

Question 10

Part (a)(i) proved quite challenging for most learners and reward was given to the learners that recognised a polymer such as 'ABS' or 'Polystyrene'. Many learners mis-read the question and gave a metal such as 'Aluminium' instead of a polymer. Part (b)(i) produced a better response than last series with popular correct answers such as 'injection moulding', 'casting' and 'drilling'. For part (b)(ii), those learners that had studied the pre-release material were able to offer detailed responses in relation to why forging is a suitable process used during the manufacture of the arms of the brake caliper. Popular answers centred on 'the production of consistent quality products and minimal waste production'. Part (c) was answered well by learners, with most gaining 2 to 3 marks. The majority of responses centred on 'improved properties meaning products will last longer' and 'improved product consistency leading to fewer rejected calipers'. Again it was pleasing to note that answers were often contextualised, focusing specifically on materials that are used for the bicycle brake calipers.

Question 11

Many learners gained 2 marks for part (a) with obvious but correct responses such as 'It produces more consistent products' and 'It is automated so reduces production time [and/or] labour costs'.

Part (b) proved to be a challenging question. The majority of learners would have gained 1-3 marks on this question, for answers that focused on three quality control procedures carried out at the packaging and dispatch stage. There were typical responses such as 'visual checks of packaging' and 'weight checks' or 'using bar code scanners'. Learners that scored higher marks for this question gave typical extensions including 'checking for packaging damage' for visual inspection, 'ensuring the correct amount of contents are in the box' for weight checks and 'checking delivery details are correct' for barcode scanners. Far too often, learners simply stated quality control checks related to production or assembly and finishing such as 'functional testing' or 'dimensional checks' which would not happen at the packaging and dispatch stage.

In part (c), most learners gained at least 2 marks, with responses such as 'It will make sure mistakes are found before the product is sent off to be sold which means the customer will be happy with it' and 'QC guarantees the function of the machines is checked so processes are controlled to make sure all parts are correctly produced'.

Question 12

Part (a)(i) was answered very well by the majority of the learners. Typical correct responses for this question included 'loss of jobs due to the introduction of robots' and 'a higher skilled workforce is needed to operate or maintain automated machinery'. Similarly, part (a)(ii) was also answered well; most learners gained 3 or 4 marks with responses that often focused on improved safety or cleanliness, such as 'Machines self-regulate, don't tire and become dangerous so the working environment is safer' (for 2 marks) and 'The processes are contained with waste being collected automatically, so the working environment is cleaner' (for another 2 marks). For part (b), the majority of learners scored 2 marks here with two low responses that centred around 'longer lasting products', 'improved finish/appearance' and/or 'more readily available'. Some learners produced extensions to award further marks with responses relating to increased sales and less customer complaints.

Question 13

Learner responses to this question generally gained 1 to 3 marks. Popular answers focused around responses such as 'Safety will be improved and control technology will reduce the risk of accidents', although such responses didn't explain the reasons why, which limited the marks gained. Some learners provided generic responses associated with control technology, such as 'You get less waste', without a link to the impact on safety, therefore gaining no marks; nevertheless, some excellent responses to this question were seen (for 4 marks), such as 'Machinery for manufacturing bicycle brake calipers have sensors which means they can shut down straight away if something goes wrong, and this reduces the risk of accidents. Also control technology can mean that machines can work in hazardous environments, which reduces the risks to humans even more. If control technology means they can be run automatically there are less humans on the production line for the calipers so humans are less

likely to get hurt through losing concentration and getting tired, as they will probably be in the control room rather than near the machine'.

Question 14

The standard of response was an improvement on the previous series. The majority of learners attempted this final question, which was pleasing, and most gained credit for their answer (generally between 2 and 6 marks). The latter questions in each section are written to challenge the most able learners; nevertheless, some excellent responses were seen, with several learners providing answers that were very specific to the question that related to product efficiency, product quality and manufacturing costs, such as 'products are made more accurately as the product consistency is high as there is less human error as there is better control of the process. Everything can be checked or monitored which means there is less waste. Also robots don't get tired unlike humans who need a break. There is also high set up costs for the robots but there are reduced energy costs and less products out of tolerance which all means the customer will be happier as they are getting a product that meets their specification'. It should be noted that the 'quality of written response' is taken into account for this question, and therefore accurate spelling, punctuation and grammar were required for the highest marks. Some learners still insist on producing responses in bullet form which limits access to the higher marks but the majority of responses indicated that learners are being shown appropriate techniques to answer this question.