

Examiners' Report/ Principal Examiner Feedback

Summer 2016

Pearson Edexcel GCSE in
Engineering/Manufacturing (5EM03)
Paper 3A: Printing and Publishing,
Paper and Board

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General Comments:

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

Lower ability learners often gave generic responses to questions, such as 'Quick', 'Fast' or 'Cheap' etc which gained limited marks. The more demanding questions, especially towards the end of Section A and Section B, were difficult for some learners and consequently there were several unsuitable responses to the said questions. Some learners misunderstood the technical terminology in the questions and/or based their answers on an incorrect context and therefore generated low quality responses.

Learners would benefit from being taught examination skills and techniques, as sometimes they did not read the questions properly, and 'describe', 'explain' or 'discuss' questions were answered using single word statements and/or bullet points, as opposed to the 'It's...because...which means...' method. In addition, learners should be encouraged to attempt all questions on the paper.

Section A

- Q1 The vast majority of learners correctly identified the products belonging to the printing and publishing sector in part (a) and the paper and board sector in part (b).
- Q2 For (a), the majority of learners correctly named the two items used during the manufacture of printing and publishing, paper and board products. For (b), learners generally gained high marks (3 or 4), with responses such as 'Used to cut multiple pieces of paper accurately and at 90 degrees' (for the Guillotine) and 'Accurate drawings of circles and used to measure the distance between two points' (for the Pair of compasses).
- Q3 A generally well answered question, with most learners scoring high marks; however, a significant proportion of learners identified the Term 'Voice over internet protocol' as belonging to the 'Control Technology' Key area, which was incorrect.
- Q4 Appropriate responses to (a) often included products used in the pre-release materials for examination papers from previous years, such as 'Paperback books', 'Point of sale displays', 'Food tray packaging' etc,

and the vast majority of learners gained 2 marks for this question. When learners did not gain the second mark for this question it was normally because the product was not from the printing and publishing, paper and board sector. Part (b)(i) mainly elicited a good quality response, with 'Lithography' the most popular correct answer. Learners that did not score on part (b)(ii) normally gave no response for (b)(i), or stated a general process (such as 'Folding', rather than a printing process) in (b)(i) and then gave an inappropriate description of the said process in (b)(ii) (please refer to the 'follow through rules' in the mark scheme); however, when a correct answer was given for (b)(i), the responses for (b)(ii) often gained the full 3 marks, for example [when 'Lithography' was given as a correct answer in (b)(i)] 'The plate is washed in a chemical that makes the image area attractive to the ink and the non-image area is dampened with water to repel the ink. The image is then put on a rubber blanket which prints onto the paper'. Part (c) was poorly answered in the main; again, a variety of general processes were often described, with no automation link evident. Learners that scored well on this question often referred to conveyor systems or the use of assembly equipment, for example 'Conveyor belts would be used to automatically move the materials for food tray packaging from one process to the next' (for 2 marks) or 'Automatic assembly processes would put together the book, for example by gluing the paper to the spine of the cover using heat' (for another 2 marks).

Q5 Part (a) was generally answered well. Most learners provided responses associated with modelling and adaptation, such as 'To create virtual models in 2D and 3D' and 'To modify designs that you already have saved' (for 2 marks overall). The majority of learners also scored well for part (b), with many responses focusing on the costs of set-up/training or possible security issues. Conversely, parts (c) and (d) were not answered well, and it was clear that most learners did not have a good understanding of the functions/benefits of Computer-Integrated Manufacturing (CIM). Where learners gained marks for (c), the response normally focused on controlling manufacture and/or effective communication at different stages of manufacture. For (d), a response that gained 2 marks was likely to focus on error reduction/time saving, such as 'All the stages are properly linked so when a CAD design change is made it changes how

it is made automatically, which improves efficiency’.

Q6 Part (a)(i) was answered well by most learners, with many gaining 2 or 3 marks for responses that normally focused on data storage/handling/security, for example ‘A database is used to store lots of customer and supplier information centrally so it can be handled easily without spending time searching through paper that might get lost’. 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), a number of learners did not read the question properly and again provided responses associated with reasons for using a database; learners that provided suitable responses associated with reasons for a manufacturer using an electronic spreadsheet generally gained high marks for this question (3 or 4), with answers such as ‘The manufacturer can use functions such as averages on a spreadsheet which saves time and means there won’t be working out mistakes’ (for 2 marks) and ‘It is convenient for the manufacturer as the spreadsheet can be emailed around to suppliers and customers to share information quickly without the need for posting’ (for another 2 marks).

Q7 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) elicited a mixed response, as expected, but some good answers (for 3 marks) were seen, 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 in a discrete fashion with no link to the global environment. Surprisingly, part (b) prompted a strong response, with many learners gaining 3 marks for an answer such as ‘Using communications technology means that marketing can be electronic and sent to possible customers without delay because nothing has to be printed or sent through the post, it can be emailed or pushed with an app’. Incorrect answers were often generic, lacking a link to

marketing and sometimes just provided another simple benefit of communications technology, such as 'It means not as many people need to use their cars'.

Section B **Based upon the 'mass produced suspension files' pre-release material**

Q8 A well answered question for all three parts. Learners were able to effectively explain, using notes and sketches, the function of the 'runners', the 'index tab' and the 'insert'. The vast majority of learners had clearly undertaken research based upon the pre-release material, and those that provided incorrect responses sometimes described a manufacturing process for the part in question, rather than the function. Centres should note that full marks can only be achieved with a written response and sketches for each of (a), (b) and (c); a significant number of learners omitted one or the other, or just labelled a sketch without describing the function of the part. For (a), the majority of learners gained 3 marks, with an appropriate 3D sketch and written answers such as 'Allows the file to hook onto the cabinet' and 'Keeps the insert in one place'. Where learners gained lower marks it was mainly because: a) the sketch wasn't provided; or b) the properties of the material that the part is made from were stated rather than the function of the part itself. For (b), the majority of learners also gained 3 marks, with an appropriate 3D sketch and written answers such as 'Makes it easier to find information' and 'Allows you to move the files more easily'. Where learners gained lower marks it was mainly because a legible sketch wasn't provided or the sketch was simply labelled and functions weren't stated. For (c), the majority of learners again gained 3 marks, with a suitable 3D sketch and answers such as 'Holds papers and folders inside' and 'Protects files and documents from damage'. Where learners gained lower marks for (c) it was mainly because a suitable sketch wasn't provided.

Q9 For part (a)(i), the vast majority of learners were able to correctly add the missing main stages in the flow chart ('Design' and 'Assembly and finishing' [or appropriate variations thereof]) for 2 marks. Non-credible responses often stated 'Quality control', or sometimes the correct answers were entered in the wrong order. For (a)(ii), almost all learners correctly named the stage as 'Marketing' (or appropriate variations thereof). Part (b) was generally well answered too, with

many learners gaining at least 2 marks. Correct responses normally centred on labour, machine and material requirements. Where learners gained lower marks it was invariably due to repetition in their answers, for example 'Working out the machines needed' and 'Deciding on the printer required'. 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 suspension files; responses associated with quality checks and sourcing, purchasing and ordering materials were prevalent (and correct). Poor responses often described activities with a production or assembly and finishing bias, such 'Cutting the insert card to the right size'.

Q10 Part (a) was answered very well; the most popular correct response was 'Cardboard'. Part (b)(i) elicited a mixed response, which was surprising; answers that gained the full 3 marks were not as frequent as expected, with many learners incorrectly stating printing processes that were barred by the question itself, such as 'Gravure'/'Letter press'/'Lithography', or other manufacturing stages/aspects of manufacturing, such as 'Quality control', 'Health and safety,' or sometimes even 'Materials'. 'Cutting', 'Scoring', 'Folding' and 'Gluing' were the most popular correct responses. For (b)(ii), some learners that had studied the pre-release material were able to offer complete responses in relation to why injection moulding is a suitable process to use when making the index tab, but the majority of learners only gained between 1 and 2 marks. Correct responses for 3 marks included answers such as 'Injection moulding is a good process for making small complex shapes that have to be made in the 1000s like the index tab, as you can mould a lot at once and they are ready to use straight away.' A small proportion of learners simply described a production process (not necessarily injection moulding), which was incorrect, and very few learners gave responses associated with the process being highly automated, which was surprising. Part (c) was answered appropriately in the main, for 1 or 2 marks; the majority of good responses centred on the recyclability/biodegradability of modern materials, and again it was pleasing to note that answers were often contextualised around the suspension file. Learners that gained no or lower marks normally provided generic responses that centred on possible reductions in global warming/CO².

Q11 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, with a lot of repetition in responses meaning that most learners gained between 2 and 4 marks overall; however, it was pleasing to see that many learners referred to examples of sector specific quality control procedures, such as 'Using crop marks to make sure that the sheets of card for the insert are cut to the right size' or 'Using registration marks to make sure printing plates are in line and CMYK print correctly' (for 2 marks each). Popular answers were also associated with functional checks (for example, 'Checking the suspension file opens/closes correctly') or size checks (for example, 'Measuring the first few made with a ruler'). Poorer responses were often related to checking the amount being made or were associated with quality control techniques used at a manufacturing stage other than production. Some less able learners were able to state the types of procedure but not how they should be carried out, or they may have given the benefits of the procedure, which was not required in this part of Question 11. Some repetition was again evident in part (c), but 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'.

Q12 Part (a)(i) resulted in a small range of mainly correct responses that invariably focused on the requirement for retraining, fewer job opportunities and less manual effort. 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). Part (b) was also answered well by most learners, with many gaining 2 to 4 marks for 'They improve the appearance/colour/durability/recyclability of the product leading to new/enhanced/repeat sales' type responses.

- Q13 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 suspension files has 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 automatically in dangerous environments, which reduces the risks to humans further. If control technology means they can be run automatically there are less humans on the production line for the files 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'. Surprisingly, very few learners mentioned a fundamental aspect of modern, safe manufacturing environments; the use of control technologies to monitor parameters and trigger alarms.
- Q14 Although the standard of response was somewhat mixed overall, the majority of learners attempted this final question as the robotics context was accessible, and most gained some credit for their answer (generally between 1 and 4 marks). The latter questions in each section are written to allow the most able learners to demonstrate the depth of their knowledge and understanding; consequently, some strong responses were seen, with several learners providing an answer that covered both the positive and negative impact of robotics on production efficiency, product quality and manufacturing costs, for example 'The increased use of robotics has allowed products to be of a higher quality because there will be less human error to affect consistency. The use of robotics has also increased the efficiency of production as they don't tire and lose concentration, which allows a higher amount of products to be produced, and this allows manufacturing to keep up with demand. The use of robotics means less staff to be paid which can reduce the manufacturing costs of paying workers, however there will be higher energy use which will counter this. Robotic production lines also have a high set up cost and

a high repair/maintenance cost if things go wrong'. It should also 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 higher marks (please refer to the mark scheme for further details).