

Examiners' Report/
Principal Examiner Feedback

Summer 2014

Pearson Edexcel GCSE in
Application of Technology in
Engineering and Manufacturing

Unit 5EM03 Paper 3A
Printing and Publishing, Paper and
Board

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Printing and Publishing, Paper and Board

General Comments

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

Some students 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 students and consequently a proportion gave inappropriate responses. Some students misunderstood the technical terminology in the questions and/or based their answers on an incorrect context and therefore generated low quality responses.

Some students would benefit from being taught examination skills and techniques, as often 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, students should be encouraged to attempt all questions on the paper.

Section A

Question 1

The majority of students correctly identified the products belonging to the printing and publishing sector in part Q1(a) and the paper and board sector in part Q1(b); however, a significant minority chose the response 'Medium density fibreboard' for part (b), which was incorrect (the correct responses being 'School diary planner' and 'Box file').

Question 2

For Q2(a), the majority of students correctly named the 'Keep Britain Tidy' symbol (for 1 mark), but very few identified the 'Green Dot' as the second symbol, which was surprising, as this has been an established symbol since the early 1990s. Several students incorrectly stated 'Recycling' as a response for both parts of the question. For Q2(b), students generally gained 1 mark for both parts (2 marks from 4 overall), with responses such as 'Farmers were paid a fair amount' (for the 'Fairtrade' symbol) and 'How long it can be used when you have opened it' (for the 'Period-after-opening symbol'), but only the higher ability students extended their answers for the second mark in both parts (please refer to the mark scheme).

Question 3

A generally well answered question, with most students scoring high marks; however, a significant proportion of students identified the Term 'Composites' as belonging to either the 'Control technology' Key area or the 'Information and communications technology' Key area, which was incorrect.

Question 4

Appropriate responses to Q4(a) included products used in the pre-release materials for examination papers from previous years, such as 'Cereal packaging', 'Paperback books' and 'Point of sale displays', and the vast majority of students gained 2 marks for this question. When students 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, or a material was given rather than a product. Part Q4(b)(i) elicited a mixed response, with 'Conveyor belts' the most popular correct answer; popular responses that were not creditable included manufacturing stages, such as 'Materials Control' and 'Production Planning' or types of technology without a control link, such as 'CAD'. Students that did not score on part Q4(b)(ii) normally gave no response in Q4(b)(i), or stated a manufacturing stage or technology with no control link in Q4(b)(i) and then gave an inappropriate explanation of the said stage/technology in Q4(b)(ii); however, when a correct answer was given for Q4(b)(i), the responses for Q4(b)(ii) often gained full marks, for example [when 'Conveyor belts' was given as a correct answer in Q4(b)(i)] 'Conveyor belts mean better control of processes as the packaging goes to where it needs to be next when it has been printed' (for 2 marks) and 'They also mean less waste as when the packaging is on the conveyor belt it is less likely to get damaged so less waste' (for another 2 marks). Part Q4(c)(i) was well answered in the main, with a variety of appropriate printing processes stated by the majority of students, 'Flexography' being the most popular. Again, when a correct response was given in Q4(c)(i) invariably the student gained both marks for Q4(c)(ii), with an answer such as [when 'Flexography' given as the response in Q4(c)(i)] 'It is a CMYK process where the raised images print onto the paper very quickly by using rollers'.

Question 5

Part Q5(a) was generally answered well. Most students provided responses associated with actions that can now be completed online rather than manually, such as 'The manufacturer is able to complete web-based activities such as promoting products or finding materials without the need for expensive journeys to see clients or suppliers' (for 2 marks). The majority of students also scored quite well for part Q5(b); however, a lot of repetition was seen in the answers to this question. Good responses stated three different benefits of the change for the manufacturer, with a description of why they are benefits, for example 'There is now less chance of human error as CAM is very good at repetition and following instructions' (for 2 marks) or 'It will now cost less to make lots of items once the CAM machinery has been set-up' (for 2 marks); in contrast, poor responses were highly generic, for example, 'It's quicker' or 'It's easier' (not creditable), which were often repeated later in part Q5(b). A small proportion of students read the question as CAD and answered accordingly, which was incorrect.

Question 6

Most students gained 2 marks for part Q6(a)(i); the large range of correct answers provided by students included 'Mobile phone', 'Texting', 'Video

conferencing' and 'Skype' (VoIP). A good range of answers were also seen for part Q6(a)(ii), with the majority of students gaining 2/3 marks for responses that focused on clarifying requirements, expediting information and arranging resources, such as 'The manufacturer could order the materials from their suppliers using email instead of sending a paper order which would reduce the delivery period' (2 marks) and 'They could email the customer to ask for a reply with instructions, so they can then forward it quickly to the staff that are going to make the order' (2 marks). Where students gained lower marks for Q6(a)(ii) they often gave responses that did not relate to the context in the question. There was a mixed response to part Q6(b)(i), with numerous smart materials stated (such as 'Hydrochromic inks', 'Photochromic paper' etc) for 1 mark; however, many students just stated 'cardboard' or 'paper'. For Q6(b)(ii), most students provided good responses for two marks that were associated with the appearance or protection of the material, such as 'They make the material look more aesthetically pleasing and also they will stop it from getting damaged by scratches or rips'. Incorrect responses for Q6(b)(ii) often focused on the advantages of the material rather than the benefits of the finish.

Question 7

This examination paper is ramped in difficulty and the latter questions in each section are aimed at the more able students; as a result, this question required an ability to provide specific responses, by drawing upon specialist knowledge. Part Q7(a) elicited a mixed response, as expected; good answers, for three marks, included 'They have made information on product sales more accurate as the manufacturer can get instant feedback. This means that they can see how many products will be needed (customer demand) and find out how much profit they will make from each type of product, so they can advertise those that are most profitable' or 'They contain detailed customer information, so the manufacturer can change the amount of products they make based on the trends being seen in sales and suitable advertising methods can be devised'. Less able students often mentioned using the internet for advertising or promoting products, as they concentrated on the 'sales' aspect of the question, when what was actually required was a benefit of information and data handling systems (for product sales). Surprisingly, part Q7(b) drew out a strong response from most students, with many gaining 2 or 3 marks; popular answers focused around a benefit of: 1) easy access to data; 2) accurate, up to date information; 3) being able to monitor costs; and 4) ordering materials in a timely fashion (or a combination of the aforementioned), for example 'They mean supplies and materials can be ordered just in time to meet the production schedule as it is easier to forecast what will be needed and when so you don't need to hold as many stocks' (for 3 marks) and 'They can help to control waste due to monitoring of the process as there is fast access to data using queries, which means quality issues are easy to spot' (for 3 marks). Incorrect answers were often generic and lacking a production link, such as 'They are easy to look at when you are designing something'.

Section B

Based upon the 'mass produced food tray packaging' pre-release material

Question 8

A well answered question for all three parts. Students were able to effectively explain, using notes and sketches, the function of the 'Tray', the 'Clear polymer film' and the 'Sleeve'. The vast majority of students had clearly undertaken extensive 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 students omitted one or the other, or just labelled a sketch without describing the function of the part (see below). For Q8(a), the majority of students gained 3 marks, with an appropriate 3D sketch and written answers such as 'It holds and contains the food' and 'It also prevents the food from rolling around and getting damaged'. Where students gained lower marks for Q8(a) it was mainly because a suitable sketch wasn't provided or a function was given that was incorrect, such as 'It has food information on it'. For Q8(b), the majority of students gained 3 marks, with a legible 3D sketch and written answers such as 'It stops bacteria getting onto the food' and 'It also allows the shoppers to see the food'. Where students gained lower marks it was mainly because a suitable sketch wasn't provided or the sketch was simply labelled and functions weren't stated. For Q8(c), the majority of students again gained 3 marks, with a suitable 3D sketch and answers such as 'It provides the nutritional information' and 'It is also where the brand is promoted'. Where students gained lower marks it was mainly because: i) the sketch wasn't provided; or ii) the properties of the material that the part is made from were stated rather than the function of the part itself.

Question 9

For part Q9(a)(i), the vast majority of students were able to correctly add the missing main stages in the list ('Marketing' and 'Assembly and finishing') for 2 marks. Non-creditable responses often stated 'Planning' or 'Quality control', or sometimes the correct responses were entered in the wrong order. For Q9(a)(ii), almost all students correctly named the stage as 'Design'. Part Q9(b) was generally well answered, with many students gaining at least 2 marks. Responses normally centred on purchasing, storage or testing of materials and stock taking. Where students gained lower marks it was invariably due to repetition in the answers, for example 'Checking for damage' and 'Checking for blemishes'. It was pleasing to note that answers for part Q9(c) were often contextualised, focusing specifically on what would happen at the production planning stage for food tray packaging. Responses associated with getting materials, equipment and people to the right place at the right time were prevalent, with some very good answers seen on occasions, mainly associated with planning critical paths/quality control points and scheduling. Poor responses often stated

activities with a design bias, such as planning for the layout of the 'Sleeve' or creating the final 'Tray shape' using CAD.

Question 10

Q10(a) was answered well; popular correct responses included 'Cardboard', 'Duplex board' and 'Solid white board'. Part Q10(b)(i) elicited a very mixed response, which was surprising; answers that gained the full 3 marks were not seen as frequently as expected, with many students stating inappropriate forming processes, such as 'Blow moulding' or 'Compression moulding', or other manufacturing stages/manufacturing terms, such as 'Packaging and dispatch', 'Systems and control', 'Health and safety,' or sometimes even 'Materials'. 'Heat sealing', 'Flexography', 'Laminating', 'Die cutting', 'Varnishing' and 'Gluing' were the most popular correct responses, with 'Shearing' seen very rarely. For Q10(b)(ii), some students that had studied the pre-release material were able to offer complete responses in relation to why vacuum forming is a suitable process for making the 'Tray', but the majority of students only gained between 1 and 2 marks. Popular and correct responses for 3 marks included 'Vacuum forming is a fast process with cheap moulds but you still know you will get the same tray shape every time' or 'As vacuum forming is a very cheap process when you are making large amounts, and there is little waste because you can change the size of the food trays easily'. A small proportion of students simply described the vacuum forming process, which was incorrect, and very few students gave responses associated with the process being simple to automate, which was surprising. Part Q10(c) was answered well by students, with most gaining 2 to 3 marks. The majority of responses centred on the recyclability, biodegradability and durability of modern materials and again it was pleasing to note that answers were often contextualised, focusing specifically on materials that are used in food tray packaging, such as cardboard and polystyrene. Students that gained lower marks often provided responses associated with lowering pollution or lessening the greenhouse effect without any link as to how the use of modern materials has contributed to these improvements.

Question 11

Q11(a) and Q11(b) were generally answered well by the majority of students. For Q11(a)(i), a wide range of answers were identified in the mark scheme, and hence a variety of responses were seen from 'Drawing using CAD' (for 1 mark) to 'Researching where to get materials' (for 1 mark). For Q11(a)(ii), answers such as 'Using bar codes to monitor the amount of food tray packaging going to the sausage maker' were popular (gaining 2 marks), as were responses associated with generating/printing labelling and/or raising invoices. For Q11(b), many correct responses were associated with monitoring sales, matching stock to demand (leading to less waste) and route planning for vehicles. Part Q11(c) elicited a mixed response, with most students gaining only 1 to 2 marks. The majority of good responses centred on modifying ideas and the speed at which such ideas can then be generated, such as 'ICT means new designs for food tray packaging can be sent to the sausage maker more quickly as the design, development and production processes have become faster. CAD design

ideas can be changed quickly and can be easily converted into onscreen models, which can then be downloaded to CAM for rapid prototyping or production' (4 marks). Poor responses were too generic and lacked the detail required for a higher demand question, for example 'ICT makes for a better quality design'. Few students gained 3 or 4 marks for part Q11(c) as a result of not expanding their answer into a fully developed explanation.

Question 12

Q12(a) resulted in a range of responses of variable quality; popular and correct answers included 'The workers will need to know how to use (or maintain) the automation, so they will have to do more training' (2 marks) or 'The workers will have to work at strange times because they will need to keep the machinery going 24/7' (2 marks). For the second effect, several students repeated their first response; furthermore, many responses were too generic to be creditable, especially when they had no specific link to the workforce. For Q12(b), the majority of students were awarded 1 to 2 marks as a lot of repetition was again evident. Correct and popular responses often focused on the working environment being safer, such as 'The machines now do most of the dangerous work so less accidents happen and people don't get hurt as much' (for 2 marks); unfortunately, a very similar safety related response was often repeated for the second benefit, restricting the marks awarded. Furthermore, responses associated with the workforce (rather than the working environment) were seen frequently (eg 'Changed work patterns') and answers such as this were not creditable. More able students gave responses that were directly related to the working environment, such as 'Automation can be enclosed which means there is less noise and it's cleaner for the workers', with a second different response of a similar quality also evident, for all 4 marks. For Q12(c), a good range of responses were seen, with many students gaining at least 1 mark by providing an answer associated with increased noise pollution, higher energy costs or the time required for maintenance.

Question 13

The majority of students gained between 1 and 3 marks for this question, with answers associated with collection/reuse and improving energy efficiency seen most frequently. Students that gained full marks for this question gave a contextualised and specific response that considered what a food tray packaging manufacturer could actually do with waste heat, such as 'The waste heat could be converted into useful energy which can be used to heat the food tray factory and some water so they don't use as much electric. The heat could also be used in the manufacturing process, for instance the waste heat could be blasted over the plastic to make it softer and more malleable so a tray can be vacuum formed without using as much electric when it needs to be heated' (4 marks). Numerous students provided responses that were associated with waste heat but unrealistic given the context, for example 'The waste heat will be used to generate steam which will turn a turbine and power all the manufacturing processes'. Weaker responses often stated 'Saving money' or 'Lowering costs' with no link to the use of waste heat, or were more applicable to the global environment

rather than the manufacturer, such as 'Using waste heat means you can lower CO²'.

Question 14

Although the standard of response was mixed overall, the majority of students attempted this final question, which was pleasing, and most gained some credit for their answer (generally between 1 and 4 marks). The latter questions in each section are written to challenge the most able students; nevertheless, some excellent responses were seen, with several students providing answers that were very specific to the question in hand, such as 'Just in time techniques are used to make sure the right amount of parts and materials arrive at the right place when they are needed, so typically the manufacturer can give a supplier a set period of notice as to what they will need. This is useful as it reduces the amount of old materials used in production and means a manufacturer won't need to store materials for the food tray, so they can put in another machine where the stores were to increase profits. It also means that if there is a problem anywhere it needs to be sorted out quickly, because otherwise production can grind to a halt and one of the main reasons for going just in time is so that you can make more food trays when there is a big demand, for instance during the summer as people are buying sausages and having barbeques'. Very few students commented on improved collaboration with key suppliers, and lower scoring responses normally suggested improvements in efficiency/productivity, or stated the benefits of controlling a manufacturing process without any link as to how specific 'just-in-time' techniques improve the aforementioned. 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 highest marks (please refer to the mark scheme for further details).

Grade Boundaries

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