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**NQF BTEC Level 1/Level 2 Firsts
in Engineering**

**Unit 38: Materials Used in
Engineered Products**

20573G

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Introduction

For this there was a reduction in the number of learners completing the assessment which is against the trend of previous series. The format of the paper was again similar to other traditional examinations in the BTEC Level 2 Engineering programme, namely Unit 9, therefore some comparisons to the approach taken by learners for that paper can also be made. This paper forms part of the core of the BTEC Level 1/Level 2 First Award in Engineering Materials and Manufacturing alongside Unit 4.

Grade Boundaries

Unclassified	Level 1 Pass	Level 2		
		Pass	Merit	Distinction
0	11	21	31	41

Individual Questions

Question 1 concerns materials and materials properties, and in the main the individual parts of the question were answered well.

Question 1a – this question was a multiple-choice question. This question was well answered by the majority of learners in the cohort, with the majority of learners being able to identify bronze as an example of an alloy.

Question 1b – this was a multiple response question on the paper. A large number of learners were correctly able to identify thermosetting and elastomer as examples of polymer materials. Where learners selected one incorrect option they did tend to identify one correct answer.

Question 1c – in this question, learners were asked to give two examples of characteristics of composite materials. The majority of learners were able to identify at least one, generally that they are composed of more than one material. Reference to characteristics such as laminar structure or containing particulates was however limited.

Question 1d – this was the first open response question on the paper and followed a similar format to questions on previous papers, with the focus being on one of the material properties which are stated in the unit content in Topic A1. A large proportion of learners could identify transparency or opacity as the required physical property.

Question 2a – this question tested learner's knowledge of the products manufactured by a specific sector. The majority of learners were able to identify that televisions are manufactured by the electrical engineering sector and telephones by the communications sector.

Question 2b - this question was another multiple-choice question where learners were asked to identify two examples of physical material properties. Learners tended to achieve at least one mark although tensile strength was identified by a number of learners. As noted in previous reports, it is important that learners can recall the various properties and how they are categorised in the unit specification.

Question 2c - this question asked learners to give two advantages of having metal form types supplied as a casting. Common correct answers included that they are already in the needed shape or that there is less need for secondary processing compared to other forms of supply.

Question 2d – in this question learners were asked to identify one stage in the life cycle of engineering materials. Many learners identified an appropriate stage, such as processing or extraction to achieve the mark that was available.

Question 3 followed a similar format to Question 2, with a number of areas of the specification being assessed through short answer and multiple-choice questions.

Question 3a – learners in general did not perform well on this multiple-choice question. Only a small proportion of all learners achieved the one mark that was available for identifying 'plating' as a surface treatment.

Question 3b - learners performed with mixed success on this question. Common correct answers included corrosion resistance although few learners were able to identify two different examples of chemical and durability properties.

Question 4 was the first question in the paper to introduce a scenario; learners are expected to be able to apply knowledge of materials in familiar contexts. As such, a scenario allows learners to demonstrate deeper understanding of materials and their uses in an engineering context.

Question 4a – this question was answered well by the majority of learners, who were able to identify correctly that boats are manufactured by the marine sector. There were some common incorrect answers, for example 'automotive' that were offered by a significant minority of learners.

Question 4b - this question was answered well by the majority of learners. These learners generally identified that propellers are manufactured from aluminium whilst sonar masts are commonly made from glass fibre.

Question 4c - many learners correctly stated that one advantage of applying a paint finish to a ferrous metal boat hull would be to prevent rusting or corrosion. Other answers that attracted credit referred to improving the aesthetics of the boat.

Question 5 was another example of a scenario based question, in this case related to an engineering organisation that manufactures a number of different products.

Question 5a – the performance of learners with regard to this question was somewhat surprising with only a relatively small proportion of learners stating reasons why pipe/tube would be suitable for a transmission tower. Where marks were awarded learners referenced the comparative lightness of the pipes compared to solid sections.

Question 5b – knowledge of the properties of composite materials was variable, with a large proportion of learners identifying that disadvantages of composites for an aircraft landing gear strut could be that it is brittle or unable to absorb impacts. Expansions and justifications were often limited, although a small proportion of learners were able to achieve two marks or more for detailed and justified explanations.

In the example shown, the learner has achieved three marks. The learner has correctly stated that composite materials may not be as good at absorbing impacts as they are not able to bend, and that they may be more brittle.

1 Composite materials may not be as strong as metals at withstanding impact as they will only retain the original shape and won't be able to bend or absorb a shock.

2 Composite materials may snap under alot of stress as they may be more brittle then metals.

The focus of question 6 was on products manufactured by the automotive sector, with a focus on a range of different materials.

Question 6a - learners tended to perform with limited success for this question. Learners did not seem to recognise that the form of supply shown was an extrusion, with a wide range of alternatives being suggested including sheet and tube.

Question 6b - most learners identified that an advantage of using polymers for the production of sports cars was the relative lightness of the material. This was sometimes linked with incorrect justifications such as the car would travel faster, although some did recognise that the car would be more fuel efficient or be able to accelerate faster.

Question 6c - only a small number of learners achieved more than two marks for this question. The focus of the question was on the use of electro-rheostatic fluids in car suspensions. A large number of learners made generic comments related to car suspensions, which did not attract credit. Where learners did achieve marks, these were often awarded for reference to the change in viscosity of the fluid and the ability to provide a smoother ride in the car.

The focus of question 7 was on materials used by the aerospace sector and the products manufactured by the sector. with a range of different question types being used to test knowledge and understanding.

Question 7a - learners were asked to explain one reason why stainless steel is a suitable material for jet engine parts. Common correct answers made reference to heat resistance and corrosion resistance. Only a small proportion of learners provided a justification that made a link to the lead point.

Question 7bi – only a small proportion of learners were able to explain one advantage of using aramid fibres for the wing spars of an aircraft. Where marks were awarded learners focussed on the weight saving properties of the material compared to alternatives, as shown in the example below.

Using aramid fibres would be advantageous as they are strong enough to support the wing but they are lighter than metal so they don't create ~~any~~^{too} much weight.

Question 7bii - although in general learners struggles when answering this question, there were a number of learners who identified at least one advantage of annealing duralumin wing spars. These answers tended to focus on reducing the brittleness of the spar or making them tougher. Learners did not however provide a linked justification which prevented them from achieving the higher marks.

Question 8 is an extended writing question where learners were asked to evaluate the reuse of components for games consoles.

Learners seem to be more comfortable with questions that relate to environmental issues and are linked to products they have some familiarity with.

In many cases learners achieved marks in the middle mark band for this question as they were able to consider more than one factor that would need to be considered when reusing components, for example the need to disassemble the existing consoles and then check that the components were fit for use.

3/5 Engineering's plan of reusing components to build new game consoles is controversial. However it does have benefits such as the cost of buying one of these consoles would be cheaper as second hand products have a lower value. Also it would be better for the environment as less game console components would be being thrown away and burned where we would never be able to use it again for the valuable metals.

The disadvantages include the product being less appealing to the end user as they are essentially buying a refurbished product that someone else has used. The product would be more likely to break down more and have a shorter life span

as the product has already been used alot by another person. This could be countered by the company having a planned maintenance plan however it is inconvenient for the customer.

Another major disadvantage is that it could cause the technological advances to slow down as less people would be buying the latest products such as the latest CPU as they could get an older one for cheaper. So there would be no incentive for the companies to spend money researching for these new products.

Those learners who performed well tended to consider a wide range of factors including the potential that reused components might fail sooner than new ones leading to products being less reliable. The example shown is from the middle mark band, with the learner developing some aspects of their evaluation more than others.

Learners in general provided some form of conclusion, albeit implied in a number of cases. It is encouraging that learners seem to have developed their skills in answering these longer questions and are therefore able to access the higher marks that are available. Learners often achieved in the middle mark band, with some achieving marks at the top end of the mark range.

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