Examiners' Report/
Lead Examiner Feedback

Summer 2017

NQF BTEC Level 1/Level 2 Firsts in Engineering

Unit 38: Materials Used In Engineered Products

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Introduction

As with the previous series, the overall entry of learners was low, but did show an increase in numbers. This means that realistic comparisons with the previous series are limited. The format of the paper remains 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.

Introducing external assessment

The new suite of 'next generation' NQF BTECs now include an element of external assessment. The external assessments for NQF BTEC Construction are timetabled paper-based examinations.

What is a grade boundary?
A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade (Distinction, Merit, Pass and Level 1 fallback).

Setting grade boundaries
When we set grade boundaries, we look at the performance of every learner who took the assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark should be for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments
Each test we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each test, because then it wouldn't take into account that a test might be slightly easier or more difficult than any other.

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Grade boundaries for this, and all other papers, are on the website via this link: qualifications.pearson.com/gradeboundaries

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

Question 1
This question concerns materials and materials properties, and in the main part questions were answered well.

Q1(a)

This question was a short answer response. This question was well answered by the majority of learners in the cohort, with appropriate alloys such as stainless steel, brass and bronze being presented by learners.

Q1(b)

This was the first multiple choice question on the paper. A large number of learners were correctly able to identify magneto-rheostatic fluid as a smart material. Where learners selected the incorrect option, thermosetting polymers tended to be the most common.

Q1(c)

In this question, learners were asked to name two examples of physical materials properties. The majority of learners were able to identify at least one, with transparency, opacity, density and mass being commonly given. Some learners included examples of other types of property in error. The majority of correct responses were however directly from the list given in the unit specification.

Q1(d)

As with Q1b, this question was generally well answered, with that majority of learners correctly identifying that kevlar is an example of a composite material. It is positive that more learners are becoming familiar with the various material groups that are listed in the specification.

Q1(e)

This part question followed the same format as in January 2017, with the focus again being on one of the material properties which are stated in the unit content in Topic A1. Approximately half of all learners were able to name brittle or brittleness as the answer. The specification indicates that learners should know the definitions of material properties, which was lacking in this cohort of learners.

Question 2

This question concerns a range of areas of the specification, including life cycle, sectors and forms of supply. As with Q1, a range of question types were used, with learners showing an overall increase in knowledge of the properties of materials.

Q2(a)

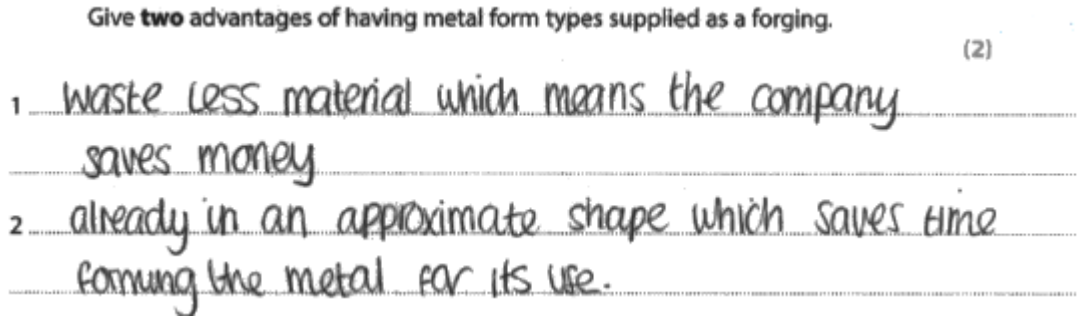
This question draws from two aspects of the specification, asking learners to identify the sector which is associated with the manufacture of one of the named products in Topic D1. The majority of learners were correctly able to identify that braking systems are produced by the automotive sector whilst wireless routers are produced by the communications sector. Centres are once again reminded that it is important that learners have a familiarity with the named sectors and the products which they manufacture as listed in Topic D1.

Q2(b)

This question was another multiple choice question where learners were asked to identify two characteristics of composite materials. Many learners achieved at least one mark for correctly identifying one property, although a common incorrect selection was monomer which was chosen along with one of the correct options, laminar and particulate.

Q2(c)

Learners achieved very limited success with this question, with only a small proportion being able to identify advantages of metallic materials being supplied in the form of forgings; the majority of learners who achieved marks tended to focus on the forging being supplied in a shape that requires less further machining or reduces manufacturing time.



Give **two** advantages of having metal form types supplied as a forging.

(2)

1 waste less material which means the company saves money

2 already in an approximate shape which saves time forming the metal for its use.

Q2(d)

In this question learners were asked to identify the stage in the life cycle of engineering materials where raw materials are transported to companies. A large proportion of learners were able to correctly identify this as processing, although alternatives such as 'refining' were also given due credit.

Question 3

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

Q3(a)

Learners tended to have an awareness of heat treatments, with most learners correctly identifying tempering as a heat treatment.

Q3(b)

As with Q1d above, this question focussed on the material properties which are stated in the unit content in Topic A1. Only a small proportion of learners were able to identify two examples of chemical and durability properties; common correct answers included corrosion resistance, wear resistance and resistance to environmental degradation. A small number of learners stated 'chemical resistance' which attracted no marks as this is a repeat of the question stem.

Question 4

This 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.

Q4(a)

This question was answered well by the majority of learners, who were able to identify correctly that games consoles are manufactured by the electrical/electronics sector. It was a concern that common incorrect answers such as 'gaming sector' and 'entertainment' were offered as answers by a significant minority of learners.

Q4(b)

This was the second 'line match' question on the paper, and learners performed very well. The majority identified HDPE as the material used for the casing of a games controller and the wire core of a power lead would be made from copper. Learners performed much better in this series in comparison to January 2017 where a similar question was asked, albeit for a different sector.

Q4(c)

Many learners correctly identified an advantage of recycling materials used in the manufacture of the games console, although only a relatively small proportion achieved two marks for explaining the advantage. Where one mark was given, the focus of the response tended to be on the reduced amount of waste going to landfill, however learners who achieved two marks often focussed on other aspects of the mark scheme, as shown in the example. Here the learner has linked the reduction in energy use with both savings in money and reduced carbon emissions. Both expansions would be appropriate, therefore two marks have been given.

(c) The games console controller has been designed to be recycled.

Explain **one** advantage of recycling the materials used to manufacture the controller.

(2)

When recycling the materials, one advantage is that less of the raw material has to be extracted. This means that less energy is used (benefit to the environment)*. Using less new materials also saves money for the company. **(Total for Question 4 = 5 marks)**

another ~~advantage~~ effect of recycling.

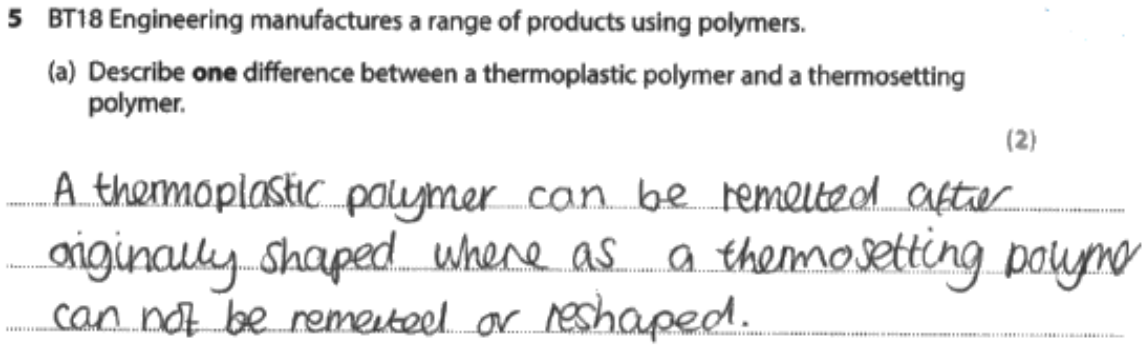
* This means that for example less harmful gases (CO_2) are being emitted into the atmosphere that causes global warming.

Question 5

This was another example of a scenario based question, in this case related to polymers.

Q5(a)

The performance of learners with regard to this question was very good, with the majority of learners being able to correctly describe the difference between a thermoplastic polymer and a thermosetting polymer.



5 BT18 Engineering manufactures a range of products using polymers.

(a) Describe **one** difference between a thermoplastic polymer and a thermosetting polymer.

(2)

A thermoplastic polymer can be remelted after originally shaped where as a thermosetting polymer can not be remelted or reshaped.

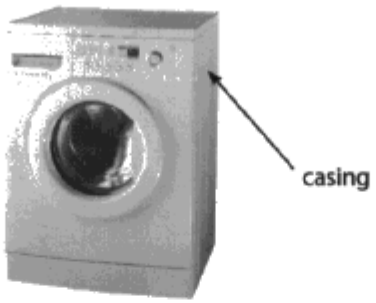
Where learners failed to achieve both marks, they either omitted to include one of the types of polymer or provided descriptions in reverse.

Q5(b)

Knowledge of the uses of surface treatments, and plastic coating in particular was variable, with a large proportion of learners identifying that a plastic coating would often be more durable that paint to achieve one mark. Expansions and justifications were often limited, although a small proportion of learners were able to achieve three or four marks for detailed and justified explanations.

In the example shown, the learner has achieved one mark for the first response, whilst the second attracts two marks for stating that it will make the material harder, and links this to increasing resistance to abrasion. It is important that learners include expansive points or justifications when answering 'explain' type questions as the failure to do this limits achievement to one mark out of the available two per response.

(b) BT18 Engineering applies a plastic coating rather than paint to the surface of washing machine casings.



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Explain **two** reasons why BT18 Engineering uses a plastic coating rather than paint in this situation.

(4)

1 Plastic will last longer. This is important as the user will expect durability and the plastic coating will provide this.

2 A plastic coating will make the material harder. This will be important as it will increase resistance to abrasion which will add to it being more durable.

(Total for Question 5 = 6 marks)

Question 6

The focus of question 6 was on the automotive sector, with a range of different question types being used to test knowledge and understanding.

Q6(a)

Learners were presented with an image of a form of supply of materials. A large proportion of learners correctly identified tube or pipe as the correct answer, although somewhat disappointingly some learners presented generic responses such as ‘batch production’ which were inappropriate.

Q6(b)

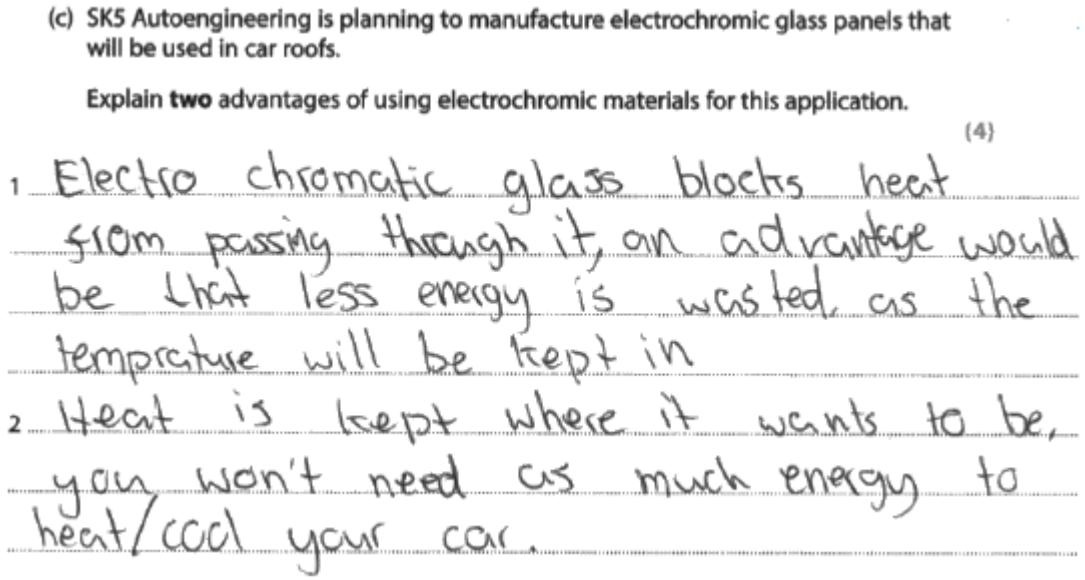
Only a small proportion of learners were able to identify reasons why a thermoplastic material is suitable for the manufacture of a car bumper. Those who achieved marks tended to make reference to being able to recycle the material, or that it is lighter than alternatives.

A large proportion of learners considered the end use of the bumper, which attracted no marks as this was not the focus of the question.

Q6(c)

Learners performed with limited success for this question, with the majority of learners achieving at least one mark. Learners showed an awareness of how electrochromic materials function and were able to make an appropriate link with the automotive application.

There were no answers that were particularly common, with the majority of points in the mark scheme being represented, for example the ability to control the temperature in the car, as shown below.



(c) SK5 Autoengineering is planning to manufacture electrochromic glass panels that will be used in car roofs.

Explain **two** advantages of using electrochromic materials for this application.

(4)

1 Electro chromatic glass blocks heat from passing through it, an advantage would be that less energy is wasted, as the temprature will be kept in

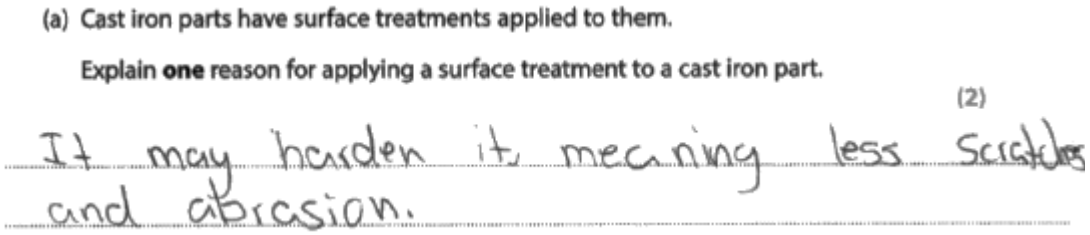
2 Heat is kept where it wants to be, you won't need as much energy to heat/cool your car.

This learner has identified the ability to control temperature but has effectively repeated this. This limits achievement to a maximum of two marks. Learners must be careful not to repeat either the stem of the question or their own answers if they are to achieve full marks.

Question 7
This question also related to the automotive sector, with the focus being focussed on car engines and the parts of engines.

Q7(a)

Learners tended to perform well on this question, with many achieving 1 or 2 marks. Where learners achieved two marks, this was through an expansion of the lead point. This is exemplified below.


(a) Cast iron parts have surface treatments applied to them.

Explain **one** reason for applying a surface treatment to a cast iron part.

(2)

It may harden it meaning less scratches and abrasion.

This answer links increasing the hardness of the part and the reduction in scratches and abrasion. Such links are required in order to achieve both marks, and learners are encouraged to use suitable connectives when presenting their answers.

Where learners achieved only one mark, the most frequent response related to reducing rusting or corrosion.

Q7(b)

This was an example of a question where learners were required to link the properties of a material, cast iron, to its suitability for an application, in this case piston rings for engines. Many learners were able to identify that cast iron had good wear resistance or that is was able to not deform under high temperatures. Very few learners achieved more than one mark however. It is important that learners have knowledge and understanding of why materials are selected for applications, primarily for the various products listed in the specification.

Q7(c)

Learners performed with some success on this question. Many were able to indicate that the fibre reinforcement added strength to the hoses; where two marks were achieved learners tended to expand on this with a consideration of the ability to withstand high pressures, as shown in the exampled below.

(c) SO15 Engineering uses fibre reinforced composite material when manufacturing hoses for engines.

Explain **one** advantage of fibre reinforcement when used in engine hoses.

(2)

It increases the strength of the material - it is able to withstand greater loads and pressures without plastic deformation.

Q7(c)

Learners tended to achieve in the middle mark band for this question as they were able to consider more than one requirement of the propeller blades and how the performance of the replacement blades would need to be comparable to those of the existing aluminium blades. Learners often achieved in the middle mark band, with some achieving marks at the top end of the mark range.

- Will the polymer tarnish underwater or become brittle? This is important because the blade may snap because of how brittle it is.
- Is the polymer strong and light? Because the polymer will have to withstand lots of pressure.

Those learners who performed well tended to consider a wide range of factors associated with propellers, with factors being considered in some detail, as shown in the extract from a response shown above.

Summary

Based on their performance on this paper, learners should:

- Prepare for exams using all available material, including Past Papers and Sample Assessment Materials.
- Carefully read the questions before answering,
- Ensure that they have covered all aspects of the specification.

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