Examiners' Report/
Lead Examiner Feedback

June 2015

NQF BTEC Level 1/Level 2 Firsts in Engineering

Unit 38: Materials Used In Engineered Products (20573G)

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Grade Boundaries

External assessment

The suite of next generation NQF BTECs include an element of external assessment. This external assessment may be through a timetabled paper-based examination, an onscreen, on demand test or a set-task conducted under controlled conditions.

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 ensures that a learner who receives a Distinction grade next year, will have similar ability to a learner who has received an Distinction grade this year. Awarding grade boundaries is conducted to make sure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in externally assessed question papers

Each exam 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 year on year because then it wouldn't take into account that a paper may be slightly easier or more difficult than the year before.

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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

Introduction

As this was the first series during which the examination has been available, and the overall entry of learners was low, there are no comparisons which can be made to previous series. The format of the paper is however similar to other traditional examinations in the BTEC Level 2 Engineering programme, namely Unit 9: Interpreting and Using Engineering Information, therefore some comparisons to the approach taken by learners for that paper can be made.

This paper forms part of the core of the BTEC Level 1/Level 2 First Award in Engineering Materials and Manufacturing.

Question 1

This question concerns materials and material properties and was in the format of multiple choice questions and short answer questions, most of which was direct recall of content from the unit specification. Considering the individual questions, learner achievement was variable across the responses seen.

Question 1a

Targeted Specification Area: B1

This question was generally well answered, with a large proportion of learners correctly identifying that medium carbon steel is an example of a ferrous metal. As a common engineering material, learners would be expected to be aware of how medium carbon steel is classified.

Question 1b

Targeted Specification Area: A1

Unlike Q1a, this question was less well answered, with only a small proportion of learners correctly identifying that transparency is a physical material property. Topic A1 in the specification states clearly how material properties are classified for the purposes of this unit.

Question 1c

Targeted Specification Area: B4

In this question, learners were asked to identify two examples of smart materials. The majority of learners were able to identify at least one of the two materials given in the question, although a common mistake was to identify thermoplastic polymers as one example of a smart material.

Question 1d

Targeted Specification Area: A1

Learners responded to this question with varying degrees of success, with few providing responses which were worthy of the award of the mark. Some

lower level responses which made a link between the strength of the material and the flexibility and not breaking were awarded marks, although the majority of learners did not reflect the responses exemplified in the mark scheme.

Question 1e

Targeted Specification Area: A1

As with Q1b above, this question focussed on the material properties which are stated in the unit content in Topic A1. A large proportion of learners could however identify that corrosion resistance is an example of a chemical material property.

Question 2

This question concerns metals, including the classification of metals and typical uses of metals. As with Q1, a range of question types were used; again learner achievement was variable.

Question 2a

Targeted Specification Area: B1

In this question learners were asked to state one example of a non-ferrous metal. Common responses included tin and copper which are listed in the unit specification; where learners gave examples of other non-ferrous metals such as gold, marks were also awarded. It was apparent that a large proportion of learners were not able to identify a suitable material.

Question 2b

Targeted Specification Area: D1

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. Whilst few learners were able to correctly identify the sector in question, centres should be aware that it is important that learners have a familiarity with the named sectors and the products which they manufacture.

Question 2c

Targeted Specification Area: A2

Learners achieved some success with this question, with a significant proportion being able to identify that grain structure is a material characteristic associated with metals.

Question 2d

Targeted Specification Area: B5

It was apparent that many learners lacked of knowledge of the heat treatments which could be applied to engineering materials in order to improve their properties or qualities. Very few learners were able to identify an appropriate process, despite an extensive list being available in the specification and a wide range of alternative processes being given in the mark scheme.

Question 2e

Targeted Specification Area: A1

As with Q1b and Q1e above, there was a general lack of understanding and knowledge of material properties. As noted above, material properties are given in Topic A1, along with their classifications. As such, it was disappointing that only a small proportion of learners were able to identify compressive strength as a mechanical material property.

Question 3

Question 3 was the first question in the paper to introduce a scenario; learners are expected to be able to apply knowledge of materials both in familiar and unfamiliar contexts. As such, a scenario allows learners to demonstrate deeper understanding of materials and their uses in an unfamiliar engineering context.

Question 3a

Targeted Specification Area: C1

This is another example of a multiple choice question where learners had to select the correct answer from four options. In this case, a large proportion of learners were correctly able to identify that mineral ore is associated with the extraction stage of a product life cycle.

Question 3b

Targeted Specification Area: C2

Learners were less familiar with the forms of supply which are associated with polymers and composites, with many learners unable to identify film as being a form of supply which is only associated with those types of material.

Question 3c

Targeted Specification Area: C2

This question allowed learners to demonstrate their knowledge of the uses of materials by asking them to identify the type of material which can be supplied as a wire. A large proportion of learners were correctly able to identify this as metal; those learners who named a specific metal were awarded credit despite the question asking for a ‘type’ of material rather than an example.

Question 3d

Targeted Specification Area: C1

Learners responded poorly to this question, despite a wide range of possible answers as suggested in the mark scheme. As with other questions in the paper, learners could gain credit for a response which is correct but not listed in the mark scheme.

Question 4

This question focussed on materials and their properties with a range of multiple choice and short answer questions.

Question 4a

Targeted Specification Area: B4

Although electrochromic materials are explicitly named in the unit specification, learners did not achieve well with this question.

Question 4b

Targeted Specification Area: B4

Continuing the focus on smart materials, this question asked learners to identify which type of stimulus photochromic materials respond to. It was positive to see a greater proportion of learners getting the question correct when compared to Q4a.

Question 4c

Targeted Specification Area: A1

This question tested learners' knowledge of materials and their properties, asking learners to identify which property of a composite could be improved by having continuously aligned fibres. Responses were generally incorrect, failing to identify improved tensile strength, this demonstrates a lack of understanding amongst the majority of learners.

Question 5

Question 5 was another example of a scenario based question, in this case satellite dishes which are one of the products listed in Topic D1.

Question 5a

Targeted Specification Area: B5

The performance of learners with regard to this question was variable, with common responses including galvanising. Rather surprising was the lack of more general types of surface finish such as plating, painting or powder coating.

Question 5b

Targeted Specification Area: B5

Knowledge of the reasons for annealing was poor amongst learners, which implies that although learners may be aware of the process there is a lack of understanding with regards to why the annealing process would be used for ferrous metals.

Question 5c

Targeted Specification Area: B1

Learners performed better on this question in comparison to Q5b, with many identifying at least one reason for using aluminium for the satellite dish. Common responses included aluminium having a longer lifespan or being easier to form into shape. Further marks could have been awarded if these answers had been expanded, for example stating the dish will have a longer lifespan because aluminium does not rust.

Question 5d

Targeted Specification Area: B4

This was a further question which required learners to apply their knowledge of the properties of a material to an unfamiliar situation. Learner responses were poor despite the technology in question being commonplace. Lower level responses could have included ‘batteries would last longer’ or ‘screens can be much bigger’ which would have attracted 1 mark each. To gain the second mark learners would need to provide a linked response; in the first case this could consider the small current which is drawn by QTCs and in the second there could be reference to the screens drawing less power than alternatives. For examples, please refer to the mark scheme.

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.

Question 6a

Targeted Specification Area: D1

This was an example of a question where learners were required to link components to the materials which would be used to manufacture the component. Generally learners performed well on this question, with many being able to identify acrylic as being used for the indicator lens and aluminium for the piston.

Question 6b

Targeted Specification Area: C1

Learners performed less well on this question compared to Q6a. Learners tended to be able to identify a reason why care must be taken when disposing of thermosetting plastics, with some being able to gain two marks by providing a linked response such as ‘thermosetting polymers are toxic so it needs care (1). With care it won’t have any affect on people or the environment (1)’ which relates directly to the third point on the mark scheme.

Question 7

Question 7a

Targeted Specification Area: B3

It was apparent that learners lacked knowledge of specific types of elastomer which are used within engineering. This question was poorly answered, despite common materials such as rubber being acceptable responses.

Question 7b

Targeted Specification Area: B2

Learners performed better on this question in comparison to similar ones where they were required to apply their knowledge and understanding of materials to an unfamiliar context. In this case, the context was of carbon fibre being used for racing motorcycles and learners were able identify that complex formings could be manufactured or that the strength of the material can be improved.

Question 7c

Targeted Specification Area: B3

As with Q7b, the context of the question was more familiar to learners than some of the others on the paper, however the performance on this question was poor, with only a small proportion of learners being able to achieve marks for identification of relevant points. Typically these were not linked responses, therefore were not awarded higher marks; for an 'explain' question valid points must be identified and then expanded upon or justified in order to gain the second mark. For example, 'it will not alter that taste of the food stored (1) because it is inert (1)' would gain 2 marks as there is a justification.

Question 8

Targeted Specification Area: D1

This question is marked using the level descriptors at the end of the mark scheme. Learners tended to achieve in the lower mark bands for this question as they had some familiarity with the materials which had been specified, generally stainless steel and aluminium. The points made tended to be generic and were not linked directly to the design of rotor blades. Common responses tended to focus on the lightweight nature of the composite blade and how this could be more efficient. There was little reference to a combination of materials being used in order for the rotor blade to benefit from the more useful properties of each material. A model answer has been included in the mark scheme for centres' reference.

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