

Examiners' Report/  
Lead Examiner Feedback

Onscreen Test  
Version 1

NQF BTEC Level 1/Level 2 Firsts in  
Engineering

Unit 1: The Engineered World (20526E)

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## Introduction

This report has been written by the Lead Examiner of Unit 1: The Engineered World. It is designed to help you understand how learners performed on this test. The report provides an analysis of learner responses for each question. You will also find example learner responses, with commentary.

The external assessment for this unit is an onscreen, on-demand test. A number of tests are live within the 'test bank' at any one time and learners are allocated tests randomly. It should be noted that this report refers to the first test retired from the live 'test bank'. Whilst not all learners will have sat this particular test, the Lead Examiner's comments provide valuable feedback, relevant across different tests for this unit.

We hope this will help you to prepare learners for the external assessment for this unit.

## Grade Boundaries

### Introducing external assessment

The new suite of 'next generation' NOF BTECs now include an element of external assessment. This external assessment may be 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. We have awarded grade boundaries for the first time for our new next generation BTECs, so this means that a learner who receives a 'Distinction' grade on a particular test will have similar ability to a learner who has received a 'Distinction' grade on another onscreen test. 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.

The grade boundaries for the first onscreen, on-demand test to be retired from the test bank are shown below.

Grade	Unclassified	Level 1 Pass	Level 2		
			Pass	Merit	Distinction
Boundary Mark	0	16	25	34	43

## General Comments on the onscreen test

This test is the first external assessment to be retired from the live 'test bank'. The onscreen assessment for this unit has been available on-demand since November 2013.

Most learners were able to respond effectively to the questions early on in this test; however, some of the later questions were designed to be more challenging and as such, mixed responses were produced. A detailed breakdown of performance against each question is detailed later in this report.

On the whole, learners appeared to be familiar with most of the command verbs in the questions, and were able to use the different mechanisms available to answer the questions, for example, drag and drop, line-matching, missing word drop downs and multiple choice questions.

There were some unexpected gaps in knowledge for some of the very basic engineering principles, with a lack of knowledge of specific processes such as MIG welding and unfamiliarity with explicit elements of the specification such as the steps undertaken in the powder metallurgy process. Some learner responses suggested a lack of awareness of characteristics and applications of many processes and materials as outlined in the unit specification. It is very important that the whole specification is delivered and learners should be exposed to the full range of engineering processes, engineering materials and sustainable technologies. This is reflected on Page 23 of the Delivery Guide, issued with the specification and available on the website at:

<http://www.edexcel.com/quals/firsts2012/engineering/Pages/default.aspx>.

From having practical experience of these aspects of the unit, learners will be better placed to apply their knowledge and understanding to the applied situations in the assessment and gain credit for their responses.

The answers to open response questions were on occasion rather minimal and it was clear that a number of learners did not make full use of the stimulus material provided in the question. The emphasis in this assessment is on candidates' application of their knowledge to a variety of practical engineering related situations. Stronger answers to extended response questions should demonstrate application along with theory. It is important for learners to have practice in doing this in their preparation for the assessment. Learners that were able to access higher marks for these questions were able to apply their knowledge and understanding to the stimulus and provide realistic and appropriate suggestions. As Unit 1 is a vocational engineering-related unit, the external assessment seeks to put the learners in applied situations and ask them to respond to these. It is essential that centres stress to learners the need to read the stimulus information carefully before they answer questions, and be prepared to use that information within their responses. Where learners were unable to apply the stimulus in their answer, it restricted the number of marks they were able to access. Generic responses gained limited credit. It is not necessary for learners to have an in-depth knowledge of the different engineering principles in order to answer the questions well, however, an awareness of the basic requirements of how engineering impacts on products and processes is expected.

The external assessment requires some recall of knowledge in the specification and it is important that learners revise to prepare for this assessment. Sample Assessment Materials (SAM) are available on the subject website to support learners' preparation. In addition, this test has now been retired from the 'test bank' and is available for download.

Learners appeared to manage their time effectively and appeared to be able to complete the assessment in the time available.

### Question 1

#### Targeted Specification Area: Learning Aim A.2

Most learners were able to answer this question correctly, recognising straightforward electrical/electronic engineering processes.

### Question 2

#### Targeted Specification Area: Learning Aim A.1

Most learners were able to answer this question correctly, recognising types of products manufactured by specific engineering sectors.

### Question 3

#### Targeted Specification Area: Learning Aim A.2

a) Most learners were able to provide two responses; however, these were often two examples of Personal Protective Equipment (PPE). Appropriate PPE can only be considered as one example of a safety precaution in this context.

b) This element was answered reasonably well.

In this response, to part a) of Question 3, PPE has been identified (using an example) as one safety precaution. The second response is another example of PPE and therefore cannot be credited as a second precaution.

(a) Give **two** safety precautions that you should follow when using a soldering iron. (2)

Type your answers in the boxes.

You should always be wearing an apron at all time whilst using the piece of equipment.

You must wear gloves at al time whilst using the pice of equipment.

(b) Give **one** disadvantage of using the soldering process when modelling circuits. (1)

Type your answer in the box.

If you mess us and solder a piece of metal in the wrong place you willneed to start all over again.

The response to part b) recognises soldering skill is required. Consequently, the learner has been awarded two marks.

#### Question 4

##### Targeted Specification Area: Learning Aim A.3

On the whole, this question was answered well with many learners correctly identifying characteristics of one off/jobbing production.

#### Question 5

##### Targeted Specification Area: Learning Aim B.1

This question proved to be challenging for some learners. Although a significant number of learners were able to identify tungsten as the correct material for a light bulb filament, few managed to identify titanium as the correct material for spectacle frames opting instead for shape memory polymer.

#### Question 6

##### Targeted Specification Area: Learning Aim A.2

This question was unexpectedly challenging for a number of learners. The reference to MIG welding, as a specific type of welding, follows the pattern outlined in the Sample Assessment Material (SAM) where sand casting is used as an example of one type of casting process. This distinction is important for learners to understand, as more than a generic response about welding was expected. It is anticipated that learners will have been exposed to a full range of machining, forming, fabrication and electrical/electronic processes expanding upon those outlined in the specification.

**Metal Inert Gas (MIG) welding is an engineering process that can be used to join metal.**

Explain one reason for using a MIG welding process to join metal.

Type your answer in the box.

because the joints will be strong and will hold the metal in place together strongly

In this example the learner has given a generic response that is a feature of many welding and/or joining techniques. There is no recognition of the specific features of MIG welding, as outlined in the mark scheme. Consequently, the learner has not been awarded any marks for this question.

## Question 7

### Targeted Specification Area: Learning Aim A.4

- a) This question was, for the most part, well answered as many learners were able to identify appropriate characteristics of robots and relate their use to the hazardous environment.
- b) This aspect of the question provided mixed responses with some learners able to recognise the low volume aspect of the question in their response. Some learners gave generic disadvantages which did not make this link.

Candidate answers

Question 7

Structure response:

It can withstand the harsh conditions, in this case the radiation given off from the nuclear waste , unlike humans which will not be able to work there due to the radiation.

Structure response:

It can keep going 24/7 , unlike a human which needs to eat drink and rest.

Structure response:

the cost of manufacturing and programming a robot is high , especially since it is a low volume production cell which might not be able to afford the heavy cost.

This response, in part a), recognises the use of a robot in a dangerous environment, to protect humans, as the first advantage. The second advantage is a more generic response, which is still appropriate as the reason is still a valid one. The response to part b) clearly links the cost aspect, which is generally justified for mass/continuous production, but would be prohibitive in this scenario. This learner achieved 3 marks for this question.

## Question 8

### Targeted Specification Area: Learning Aim A.4

This question was often answered with one appropriate property of the given material along with one property not linked to the application. Consequently, one mark was frequently awarded for this question.

Superalloys and cubic boron nitride are modern high performance materials.  
Superalloys are often machined with a cubic boron nitride cutting tool.

Give two properties of cubic boron nitride that make it a suitable material for machining superalloys. (2)

Type your answers in the boxes.

Strong

Durable

This response has one very generic response, "Strong" which is true of many materials and is too generic to be considered appropriate in this context, whereas "Durable" is a more desirable property due to the hardness of superalloys.

## Question 9

### Targeted Specification Area: Learning Aim A.2

- a) This question was not answered as well as expected with many learners apparently not conversant with the operating parameters/position of key components of a lathe.
- b) This question provided mixed responses again, somewhat surprisingly, as it would be anticipated that learners would be aware of the names of key components of a lathe.

## Question 10

### Targeted Specification Area: Learning Aim C.4

- a) Most learners were able to identify one advantage in response to this question; however, an explanation goes beyond simple identification. The required further expansion/justification to form an explanation was often missing.
- b) Most learners were able to identify one disadvantage in response to this question; however, the required further expansion/justification to form an explanation was often missing.

Hydro energy is a renewable source of energy used to generate electricity.  
Hydro energy is generated from a free resource.

Explain one other advantage and one disadvantage of using hydro energy as a renewable energy source.

Type your answers in the boxes.

#### Advantage

It doesn't emit carbon dioxide which causes global warming

#### Disadvantage

It's initial set up cost is very expensive

This response provides an identification point for both the advantage and disadvantage responses, with no further explanation/justification. The learner was awarded a total of two marks for this question.

## Question 11

### Targeted Specification Area: Learning Aim A.2

- a) This question generated mixed responses, with a range of parts being identified that suggested not all learners had knowledge of this type of casting process.
- b) The majority of learners were able to identify aluminium as having a low melting point, this being a property that is not necessarily uniquely linked to the die casting process.

## Question 12

### Targeted Specification Area: Learning Aim B.3

This question proved somewhat challenging with a significant number of learners unable to identify powder manufacture as the first stage of the powder metallurgy process. It is important that learners know the different stages and sequence of operations used in powder metallurgy, as detailed in the unit specification.

## Question 13

### Targeted Specification Area: Learning Aim B.4

This question was generally well answered, suggesting that most learners know the key characteristic of optical fibres.

## Question 14

### Targeted Specification Area: Learning Aim C.2

This question proved somewhat challenging for many learners. The question specifically targets advantages and disadvantages for the manufacturer. Many responses identified an advantage/disadvantage of recycling, allowing marks to be awarded, but failed to explain the impact of this, with no clear links to the manufacturer.

Products such as circuit boards are often collected for recycling.

Explain **one** advantage and **one** disadvantage for a manufacturer of making its products recyclable.

Type your answers in the boxes.

#### Advantage

It will save you money as it means the product will not have to go through the entire manufacturing process again, which could potentially be polluting and a heavy cost.

#### Disadvantage

The product that you have recycled might not be the same quality that was made in the first place, if that is the case then the customers will not be satisfied with there products

In this response, the cost effectiveness of recycling has been recognised and the reduction of waste in the manufacturing/supply chain extends this advantage. This exemplifies a full response, as the advantage has been justified. The disadvantage, related to quality, does not recognise that a manufacturer making its products recyclable would take this into account. Consequently, this is not an appropriate response. The learner has been awarded two marks for the advantage and as a result two marks overall.

## Question 15

### Targeted Specification Area: Learning Aim B.4

Learners were able to recognise characteristics of the smart materials targeted in this question. Most realised that piezoelectric transducers produce charge when squeezed; however, some confusion was evident about whether heat or pressure is applied in order for shape memory polymers to return to their original shape.

## Question 16

### Targeted Specification Area: Learning Aim B.3

A large number of learners identified either the characteristic that allows nanocoated windscreens to remain clean or the damage preventing properties of the treatment. These responses often failed to explain the reason why and this extension is required to obtain the second mark for this two mark question.

It has a much lower chance of the screen cracking again as the nanos are closer together and have stronger bonds

This response received two marks, for recognising that nanocoatings make the windscreen stronger and help to prevent cracking through a bonding action.

## Question 17

### Targeted Specification Area: Learning Aim B.4

Two explained advantages were required for this question. Where learners were awarded marks, they often only explained one advantage for two marks or simply identified an advantage for one mark. Responses often suggested advantages such as lighter, faster etc. without any justification.

To gain full marks for this question, learners needed to state two specific advantages and explain why these are advantages.

The whole aeroplane can be used to produce lift therefore the fuel consumption will be allot less as it will not be needed. Another advantage is that the overall strength of the aircraft will be allot more which will help in turbulant weather or at high speeds.

This learner was awarded two marks having recognised two advantages, namely increased lift and improved fuel consumption; however, these are not necessarily linked and further explanation related to the reduced drag, flying characteristics etc would be anticipated.

### Question 18

#### Targeted Specification Area: Learning Aim B.2

Most learners were able to make general statements related to metallic foams, although many discussed its lightweight properties, something that was mentioned in the stem of the question. One other advantage should have been explained. As in previous examples often the advantage was identified but not expanded upon.

it can also absorb energy if it takes impact and is able to protect the engine

In this response the learner has identified that metallic foam has good impact absorbing properties, allowing the engine to be protected which links to passenger safety for 2 marks.

### Question 19

#### Targeted Specification Area: Learning Aim C3

This question proved challenging for many learners suggesting that Kaizen principles are not well understood. Often blank responses were seen and where learners did provide an explanation there was little effort to balance the advantages and disadvantages in order to draw conclusions, a characteristic anticipated of learners accessing the higher marks. Often responses discussed the scenario presented in the question and tried to link this to scales of production or confused the waste aspect of lean manufacturing with industrial waste and recycling. Where marks were achieved these were often for comments related to continuous improvement, workforce involvement, and the whole business approach to improving quality. However, these comments were rarely justified, put in context or compared to disadvantages, restricting learners to only one or two marks.

Get the materials you need when you need them so they aren't just laying around in the storage area and so you have more room to work with. If there is any waste materials recycle them so they can be used again. Instead of getting the equipment and just making one switch panel get the materials to make more so the production is faster and more efficient. Instead of making the product then carrying it to the goods area, have one person make it then one person carry it so it is more efficient and also faster.

This learner achieved no marks as the response does not focus on any of the features of Kaizen philosophy and makes general comments about transporting the product.

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