Examiners' Report/ Lead Examiner Feedback

Onscreen Test
Version 5

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 Engineering 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 second 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' NQF 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 externally assessments

Each test we set asks different questions and may asses 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 second 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	15	24	33	42

General Comments on the onscreen test

This test is the second 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 basic engineering principles, with a lack of knowledge of specific processes such as TIG welding and unfamiliarity with explicit elements of the specification such as bionics, as used in the biomedical sector, or Life Cycle Assessment (LCA). Some learner responses suggested that learners lack 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 35 of the Delivery Guide, issued with the specification and available on the website at:

http://qualifications.pearson.com/en/qualifications/btec-firsts/engineering-2012-nqf.coursematerials.html#filterQuery=Pearson-UK:Category%2FTeaching-and-learning-materials

From having practical experience of these aspects of the unit, learners will be better placed to apply their knowledge and understanding to the situations in the assessment and gain credit for their responses.
The responses to questions requiring an extended explanation 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 stem. The emphasis in this assessment is on learners' application of their knowledge to a variety of practical engineering related situations. Stronger responses to extended explanation 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. Retired assessments and Sample Assessment Materials (SAM) are available on the subject website to support learners' preparation. In addition, this onscreen test is now the

second assessment to have 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.1/A.2

This question was aimed at assessing knowledge of engineering processes and sectors. Most learners were able to answer at least part of this question correctly, recognising a crankshaft as a forged component and/or the chemical sector as being responsible for producing fuel for diesel engines. Some learners missed the focus of the question and linked production of fuel to the automotive sector, reinforcing the need for careful reading of each question.

Question 2

Targeted Specification Area: Learning Aim A.1

This question was aimed at matching products to the engineering sectors that manufactured them. 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

This question tested knowledge of industrial robots.
a) Most learners were able to provide two responses however the image clearly shows a robot with grippers attached, many learners responded, incorrectly, with applications such as spot welding or paint spraying. Alternatively responses listed generic applications, as exemplified in the response below.

0 mark example:

Type your answers in the boxes.

making cars

making planes

In this response neither of the generic industries listed can be considered an engineering operation, as specified in the question.

Where learners carefully read the question, and noted the image and the use of grippers, full marks were often achieved as exemplified in the response below:

The first response is indicated in the mark scheme whilst the second is a recognition of the pick and place function of this type of robot.

2 mark example:

Type your answers in the boxes.

assembly

Placing components in preparation for welding, drilling etc.

b) This element required learners to identify a disadvantage of the use of robots for a specific application, this proved somewhat challenging for many. Often very generic answers such as this were given:

0 mark example:

Type your answer in the box.

It is too expensive

No marks were awarded for simplistic responses linked to cost, time, health and safety etc. similarly those learners who gave an advantage of a robot (rather than the required disadvantage) were not rewarded. More specific responses related to the batch size did achieve the mark however, with a typical 1 mark response shown here:

1 mark example:

Type your answer in the box.

It is hard to program a robot, so the time taken to reprogram the robot between small batches can delay production considerably

Question 4

Targeted Specification Area: Learning Aim A.1

This question assessed knowledge of engineering sectors. On the whole, this question was answered well with many learners correctly linking the appropriate sectors with the given products.

Question 5

Targeted Specification Area: Learning Aim B.1

Question 5 assessed knowledge of piezoelectric tranducers. This question proved more challenging than anticipated. Although a significant number of learners were able to identify one of the applications of a piezoelectric transducer, the second application proved beyond most.

Question 6

Targeted Specification Area: Learning Aim B.1

This question assessed knowledge of a modern high-performance material, titanium. This question proved to be somewhat challenging for many learners. The form of this question, with two marks being available, requires learners to identify an advantage and extend this by explaining this advantage.

The response below would be credited with one mark, as the advantage has not been explained.

1 mark example:

Type your answer in the box.

good strength to weight ratio

The extension required to access the second mark was evidently the most challenging part of this question. An example of what might be expected is given here, in this response the corrosion resistance is recognised with reference to the implant being able to last a long time.

2 mark example:

Type your answer in the box.

Titanium does not corrode, this means the tooth will not break down over time and can function properly for very long periods of time.

Question 7

Targeted Specification Area: Learning Aim A.2

This question assessed knowledge of turning, a machining process.

a) This question was, for the most part, well answered if learners have some knowledge of the turning process and how lathes operate. That being said it was also evident that many did not have this knowledge and provided generic responses similar to that shown here.

0 mark example:

Type your answers in the boxes.

can be a quick job to do

can be alot easy

This contrasts with a response of a learner who has understanding of the process, recognising the quality of surface finish for one mark and the facility to produce perfectly round components for the second mark.

2 mark example:

Type your answers in the boxes.

It produces very smooth finishes to the material faces.

it can produce precise spheres etc. as it can be controlled very accurately and the turining motion means an almost perfect cirlce is produced

b) As noted above this aspect of the question provided mixed responses with some learners evidently understanding the turning process.

1 mark example:

Type your answer in the box.

To reduce the amount of friction generated and therefore prevent the part from overheating.

However less able learners tended to give responses not linked to the use of cutting fluid.

0 mark example:

Type your answer in the box.

to make it easier for the the lathe to turn the machined product

Question 8

Targeted Specification Area: Learning Aim A.2

This question assessed knowledge of health and safety issues relating to welding operations. This question was often answered with one feature of the welding mask or one hazard to be considered when welding; however, the link between the two leading to a coherent explanation was not always made.

This response is typical in that it recognises the eyes are protected from damage for one mark but does not explain why/how the mask prevents this damage.

1 mark example:

Type your answer in the box.

a welders mask is used to prevent the user from getting long term damage to the retina in their eyes

This response identifies that bright flames and sparks can damage the eyes, for one mark, and also recognises that the mask has a tinted lens (UV filter) to protect against this, thus earning the second mark.

2 mark example:

Type your answer in the box.

When welding, bright flames and sparks are emitted from the tools used. To protect against this, the welding mask has a tinted lense to prevent light damage and physical damage to the eyes.

Question 9

Targeted Specification Area: Learning Aim A.2

This question assessed knowledge of the powder metallurgy process. Some learners failed to select two of the given options, with only one response noted. Care should be taken, to ensure that the prompts given are carefully read and adhered to, in order to maximise opportunity across the test.
More able learners were able to pick out the two key characteristics of powder metallurgy, suggesting knowledge of the process and particularly the advantages of the use of powder metallurgy.

Question 10

Targeted Specification Area: Learning Aim B.1

This question assessed knowledge of superalloys. This response is typical of many with generic reasons such as "expensive" or "strong", and no marks are awarded for this type of response as it is true of many materials. Similarly references to speed, and the material being more than one metal, are generic and not specific enough reasons for use of the superalloy.

0 mark example:

Type your answer in the box.

because the metal is strong so it can't break
and it spins round fast enough to get the jet moving and moving smoothely
Also the super alloy is made by more than one strong metal
lastly, it has a sharp point to genorate speed.

Although this question proved challenging, particularly with two explained reasons being required, more able learners were able to provide more appropriate responses such as that shown below.

4 mark example:

Explain **two** reasons why superalloys are used to make jet engine turbine blades.

Type your answer in the box.

Superalloys retain high strength at intense temperatures. This is crucial in jet engine turbine blades because they become very hot; superalloys will not deform and cause the plane to malfunction. Another reason for why superalloys are used is because they do not corrode; jet engine turbine blades are subjected to lots of weathering. So by using superalloys, they will not break down overtime and cause the plane to malfunction.

4 marks were awarded here, the first two marks for recognising that the blades will not deform because the superalloy has good high temperature strength properties. The second explained reason recognises that superalloys have good corrosion resistance so will not weather/break down over time.

Question 11

Targeted Specification Area: Learning Aim B.1

This question assessed knowledge of modern composite materials. This question proved relatively straightforward, with most learners able to identify properties and applications of modern composite materials.

Question 12

Targeted Specification Area: Learning Aim C.3

This question assessed knowledge of lean manufacturing techniques. This question proved straightforward for those learners able to link the use of a Go/No Go gauge with quality/inspection/checking processes and consequently a poke yoke example.

Question 13

Targeted Specification Area: Learning Aim A.3

This question assessed knowledge of scales of production. This question was generally well answered suggesting most learners can identify an example of continuous production.

Question 14

Targeted Specification Area: Learning Aim C.2

Question 14 assessed knowledge of engineering processes. This question proved challenging for many learners. The question specifically targets energy efficiency when linked to engineering processes. The response shown here is a good example of where the learner (initially) has missed this point, instead focusing on recycling and sustainability in terms of material use rather than energy efficiency in production.
The final part of the response does attract marks however, two marks being awarded for recognising that batch manufacture avoids inefficient start up/shut down processes.

2 mark example:

Type your answer in the box.

ZYX enginerring can recycle unused metal products and recycle them into the metals needed to make the industrial shaft, this was it uses less energy and is also faster and cheaper than oring new metals from the ground, this is also more environmentally friendly. Also by making a larger batch at once to sell or store away will save energy because the next time a order comes in they will already have some made.

Question 15

Targeted Specification Area: Learning Aim C.4

This question assessed knowledge of solar energy, a renewable energy source. This proved to be a relatively straightforward question with learners able to recognise solar energy methods and identify them for the images provided.

Question 16

Targeted Specification Area: Learning Aim A.4

This question assessed knowledge of Computer Numerically Controlled (CNC) machinery. Many learners struggled with this question with generic responses such as that shown below not attracting marks. Many learners stated that CNC is accurate or is fast, cheap etc. however without linking this to the process or alternatives.

0 mark example:

Type your answer in the box.

you will be able to see how long it is and if its too short you will be able to see

Where learners were able to make this link the two marks available for this question were awarded as in the response below. In this instance the learner has indicated that the CNC device is not just quick but quicker than a human, also recognising the lack of mistakes (human error), hence two marks were awarded here.

2 mark example:

Type your answer in the box.

One advantage of using this CNC measuring device is it is much more accurate than humans adn does not make mistakes. This means parts can be made with higher quality and reduce faulty products.

Question 17

Targeted Specification Area: Learning Aim A.2

This question assessed knowledge of welding. 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 disadvantages related to cost, emissions etc. without any justification as in the example below.

0 mark example:

Type your answer in the box.

if the gas is harmful and leaks out it can then cause damage and if it does leak out then it slows dow the welding process

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

Question 18

Targeted Specification Area: Learning Aim B.4

This question assessed knowledge of bionics. Most learners confused the use of bionic eyes with the use of cameras often assuming a robot application. Although this learner has also confused the context with that of a spying application, there is recognition that the signals can be transmitted and recorded/saved demonstrating an understanding of the process, hence two marks were awarded here.

2 marks awarded:

Type your answer in the box.

They could be used to record the visions of someone by intercepting the electrical stimulations sent by the retina and converting them into digital data which can then be transferred to a hard drive and saved for later use, this may benefit an intelligence agency.

Question 19

Targeted Specification Area: Learning Aim C1

This question assessed knowledge of Life Cycle Assessment (LCA). This question proved challenging for many learners suggesting that Life Cycle Assessment (LCA) is not well understood by learners. Many responses missed the focus of the question and discussed the use of PV panels, without reference to the LCA. This is a further example of learners are perhaps not carefully reading the question and putting it into the appropriate vocational context.

It is pleasing to see that many learners are attempting to construct a detailed response, as this question ends the paper and carries a maximum of eight marks. Consequently it is assessed via mark bands (found at the end of the mark scheme), reflecting the level of response.

This learner achieved no marks as the response does not focus on any of the features of the LCA process and makes general comments about PV panels and the environment.

0 marks example:

Type your answer in the box.

the outcomes of the of the cycle assessment could be that if the PV is sustainable and eco friendly for the environment.

This learner has provided a simplistic response indicating a basic understanding of only one element of the LCA process, with a superficial point being made, which is not well linked to the question.

Mark band 1 example:

Type your answer in the box.

the possible out comes will be, the product will be made more efficently as LCA has many stages to it so it will be done to a high quality, the product will produce less material waste aswell as it would be better for the enviroment as it will beable to get recycled and made into something else. it is also a continuos process which will mean the product will always be getting made.

Whereas this response considers the source of materials (raw material extraction); how the products are designed (production of parts); JIT and methods of producing the parts (assembly) and the opportunity to reuse or recycle the parts that the panels are made from (disposal/recycling). There is a concluding statement however this is somewhat imbalanced, only really considering the positive effects. This answer was rewarded with 6 marks recognising that more balance would be needed in the justification to access the highest (level 3) marks as exemplified in the mark scheme.

Mark band 2 example:

Structure response:

One possible outcome of the LCA is that the sources of materials is changed. It is possible that Sunnydays' sources are not as efficient as possible, so by changing to a more efficient source the sustainablility is increased.

Another possible outome is that the design of the product is changed. The current design of the product could be tweaked to make the product more efficient in the way that it works or the way that it is made. Different materials or different amounts of them could have a big impact on the PV panels' efficiency.

An alternative outcome is that the type of production and assembly is changed. Poka-yoke or kaizen could be introduced to allow the production to be more efficient, and just-in-time could be used to reduce the need to store parts when assembling them.

An additional outcome is that the panels are changed so that a greater output is produced when in use. This would further increase efficiency as more energy can be produced for the same amount of light energy available.

A final outcome is that Sunnydays could make the product out of a greater percentage of reusable materials. This will increase efficiency as when the product is recycled some of its materials can be used to make another product, reducing the need for more raw material extraction.

In conclusion, no matter what angle that the product is assessed from changes can always be made to improve the effeiciency in its lifetime. Most of these changes will occur during the extraction of raw materials and production, however in assembly, use and disposal changes can also be made to contribute to a greater efficiency.

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