



# Examiner's Report/ Lead Examiner Feedback

November 2014

NQF BTEC Level 1/Level 2 Firsts in  
Applied Science

Unit 1: Principles in Science (20460E)

## **Edexcel and BTEC Qualifications**

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at [www.edexcel.com](http://www.edexcel.com) or [www.btec.co.uk](http://www.btec.co.uk) for our BTEC qualifications.

Alternatively, you can get in touch with us using the details on our contact us page at [www.edexcel.com/contactus](http://www.edexcel.com/contactus).

If you have any subject specific questions about this specification that require the help of a subject specialist, you can speak directly to the subject team at Pearson.

Their contact details can be found on this link: [www.edexcel.com/teachingservices](http://www.edexcel.com/teachingservices).

You can also use our online Ask the Expert service at [www.edexcel.com/ask](http://www.edexcel.com/ask). You will need an Edexcel username and password to access this service.

### **Pearson: helping people progress, everywhere**

Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your learners at: [www.pearson.com/uk](http://www.pearson.com/uk)

November 2014

Publications Code BF040244

All the material in this publication is copyright

© Pearson Education Ltd 2015

## **Introduction**

This report has been written by the lead examiner for the BTEC Principles of Science unit. It is designed to help you understand how learners performed overall in the exam. For each question, there is a brief analysis of learner responses. You will also find example learner responses from Level 2 Pass and Distinction learners. We hope this will help you to prepare your learners for future examination series.

## Overall comments

This was the fifth time that this paper has been set.

Learners that did well this series, did so because they had learnt key terms and used good scientific language. They were able to understand what was being asked for in the question and therefore could apply their knowledge of the science well. Learners that did well could use and evaluate equations to give correct answers. They were also able to apply the scientific concepts that they had been taught to new situations.

Exam technique is still an issue for learners. Centres need to prepare learners for the exam by; practicing exam technique, especially in relation to reading the question carefully; teaching key questioning terms so that the learners understand what is required and can then apply their knowledge correctly. Learners should be taught that they should be checking that the question set has been addressed in the answer given and that they must use appropriate scientific knowledge and vocabulary. There is also the need for Centres to continue to focus on learners learning the key scientific knowledge in the specification. One way this could be achieved would be to practice structuring extended writing questions as this is a skill that the learners are still not proficient in and with many are still not attempting these questions.

It was found, for this session in particular, that learners seemed to do well in one section, for example Biology or Chemistry but then were let down by their knowledge and application of knowledge of Physics, there seemed to be no particular pattern to this and was not just the Biology section that was at the end of the paper that was weak. Centres need to ensure that the whole unit content is covered in the teaching and learning stage, from learning aim A to learning aim F.

## Grade boundaries

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	Merit	Distinction
Boundary Mark	0	13	22	31	41

## Feedback on Specific Questions

### Q1bi

Learners found question 1bi quite difficult. Some learners repeated the stem of the question and stated test paper.

(b) (i) Give the name of the paper that can be used to test for the pH of a substance. (1)

test paper.

In some cases, learners did not read the question and did not state the name of a paper, but stated pH probe or just pH which was insufficient for the mark.

(b) (i) Give the name of the paper that can be used to test for the pH of a substance. (1)

pH probe

Litmus paper was an acceptable answer, although those that scored a mark here generally did so for correctly stating universal indicator.

(b) (i) Give the name of the paper that can be used to test for the pH of a substance. (1)

litmus paper

(b) (i) Give the name of the paper that can be used to test for the pH of a substance. (1)

universal indicator

### Q1bii

In question 1bii, many learners were able to name the type of chemical that would turn the paper red. In some cases learners were specific with their answer and gave a named acid, generally hydrochloric, which was acceptable and gained credit.

(ii) A chemist tested a solution with the paper used to test for pH.

The paper went red.

Name the type of chemical that will turn this paper red. (1)

Acid

(ii) A chemist tested a solution with the paper used to test for pH.

The paper went red.

Name the type of chemical that will turn this paper red. (1)

8. hydrochloric acid

Where learners did not score, it was because they thought that an alkali would turn the paper red or that they named another substance that was not acidic.

(ii) A chemist tested a solution with the paper used to test for pH.

The paper went red.

Name the type of chemical that will turn this paper red.

(1)

Sodium hydroxide

(Total for Question 1 = 4 marks)

## Q2a

In Question 2a, some learners were able to correctly state what type of element Aluminium is.

gas is also produced in this reaction.

													27 Al 13				

(a) Using the periodic table, state what type of element aluminium is.

(1)

metal

A common incorrect answer was non-metal or 13

													27 Al 13				

(a) Using the periodic table, state what type of element aluminium is.

(1)

13

## Q2b

Learners found question 2, part b, more difficult, many were very vague with their answers and just answered that the hazard symbol warns that aluminium sulfate is dangerous. Some tried to give a precaution to take, for example wear goggles or gloves. Some re-stated the stem of the question and just stated that it meant that aluminium sulfate is hazardous. Learners should be taught not to repeat the stem of the question as their answer. New hazard symbols are being used for this qualification.

(b) A container for aluminium sulfate will have this hazard symbol on it.



State the hazard that this symbol warns of when using aluminium sulphate.

(1)

dangerous

Better learners were able to recognise the hazard symbol as a warning that the salt could be an irritant or harmful. Throughout the paper phonetic spellings were accepted.



State the hazard that this symbol warns of when using aluminium sulphate.

(1)

Irritant

## Q2c

Question 2c, whilst well answered by the majority of learners, too many learners thought that the correct symbol for a molecule of hydrogen gas is  $H^2$ . Learners must be taught the correct approach to writing formulae.

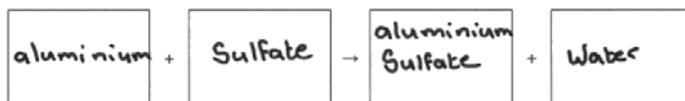
## Q2e

Question 2e states that aluminium sulfate can be made by reacting aluminium with sulfuric acid. It also states that hydrogen is produced in the reaction. Despite all the required information being in the stem of the question, learners found it very difficult

to write the word equation for the reaction and very few scored the two marks available to them in this question.

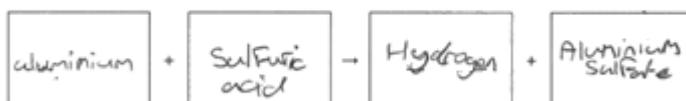
A common error was to state water as one of the products of the reaction, another common error was to write the aluminium sulphate across the two reactant boxes.

(e) Write a word equation for the reaction used to make aluminium sulfate. (2)



Only the best learners were able to write a fully correct word equation.

(e) Write a word equation for the reaction used to make aluminium sulfate. (2)



### Q3ai and Q3aii

Question 3ai and 3aii were well attempted, although many learners did not believe that they could give the same answer for both the number of protons of a potassium atom and the number of electrons and therefore usually just one mark over the two questions.

3 Frankie is learning about elements in the periodic table. She finds out that potassium is in group 1 on the periodic table. The diagram shows how potassium is represented on her periodic table.

39
<b>K</b>
Potassium
19

(a) (i) How many protons does an atom of potassium have? (1)

19

### Q3b

Generally, answered at least one

Again, they copied of the

(b) Sodium is also in group 1. Frankie knows that sodium and potassium are both alkali metals. Explain why sodium and potassium are placed in the same group in the periodic table. (2)

They are both in the same group because ~~they~~ they are both alkali metals.

Question 3b was well with most learners scoring mark.

many learners lost marks as information from the stem question 'both are alkali

metals' and thought that they had answered the question.

Many learners were able to state that potassium and sodium both had similar reactions or properties or that they had the same number of electrons in the outer shell. Unfortunately, not so many learners were able to link these ideas together. Learners should be taught that when a question asks for an explanation, that the answer should give a piece of information which is then linked to another piece of information for the two available marks.

(b) Sodium is also in group 1.

Frankie knows that sodium and potassium are both alkali metals.

Explain why sodium and potassium are placed in the same group in the periodic table.

(2)

Because Sodium and potassium in these blocks of their atom's they only have 1 Electron on the outer shell.

### Q3C

Learners found question 3c hard. Many thought that chlorine had 35.5 isotopes. Some learners knew that the fact that there was a decimal was relevant but were not able to develop this further.



Use the information in the diagram to explain how Frankie knows that chlorine-35.5 has isotopes.

(4)

She knows that chlorine has isotopes in because the top number has a decimal point in the which tells her that it's a isotope.

## Q5

In general, question 5 was well attempted by learners with the majority understanding that the type of energy used to power the television was electrical. In part bi and bii, learners were able to state the parts of the electromagnetic spectrum used in a remote control and when the television is watched.

Part C of question 5 was less well answered; learners were able to substitute the values into the equation. However only the better learners remembered to convert the minutes into seconds before substitution into the equation and so ended up with a value of 4800 watts. It is still clear that learners are being disadvantaged as they are not bringing essential equipment such as calculators into the exam.

(c) Emma watches the television for ten minutes.  
In ten minutes the television uses **48000 joules** of energy.  
Calculate the power of the television.

$$\text{power (watts)} = \frac{\text{energy (joules)}}{\text{time (seconds)}}$$

Show your working. (2)

$$48,000 \div 10 = 4800$$

4800 watt

---

(Total for Question 5 = 5 marks)

Some learners converted the minutes into seconds but then used this value incorrectly so gained no further credit.

(c) Emma watches the television for ten minutes.  
In ten minutes the television uses **48000 joules** of energy.  
Calculate the power of the television.

$$\text{power (watts)} = \frac{\text{energy (joules)}}{\text{time (seconds)}}$$

Show your working. (2)

$$\frac{48000 \times 60}{6000}$$

## Q6

Question 6 was well attempted by most learners. X-rays and gamma rays were the most frequently identified parts of the electromagnetic spectrum for which correct harmful effects and benefits could be described.

A large number of answers referred to heart monitors and keeping patients alive. They may have been referring to ECG traces, and misunderstood the meaning of waves. Many learners also made references to sound waves, showing a confusion between sound and electromagnetic waves.

In the following example, the learner has given a benefit and harmful effect of both x-rays and gamma rays to score 4 marks.

6 Different parts of the electromagnetic spectrum are used in hospitals when diagnosing and treating patients.  
Discuss the use of different electromagnetic waves in hospitals in terms of the benefits for and harmful effects on patients. (6)

x rays - to discover broken bones, but  
can damage skin cells and cause  
cancer.

gamma rays - to treat cancer, but  
kill cell and <sup>damage</sup> DNA cells.

In some cases learners referenced the electromagnetic spectrum in general, rather than specific parts and so therefore could not gain credit as it was not clear as to what part of the spectrum the learner was referring to.

6 Different parts of the electromagnetic spectrum are used in hospitals when diagnosing and treating patients.  
Discuss the use of different electromagnetic waves in hospitals in terms of the benefits for and harmful effects on patients. (6)

A harmful affect from using electromagnetic waves in the hospital by diagnosing or treating patients using this type of treatment it can cause cancer.

### Q7Cii

Learners found question 7cii very difficult. This was, in general, because the question was not read carefully and learners considered the leaves or the plant rather than the plant cells that were referred to in the question. Due to this error, many learners gave answers such as big leaves rather than specific components of the cell.

(ii) State how some plant cells are specialised to carry out photosynthesis. (1)

Big leaves

(Total for Question 7 = 4 marks)

The correct response shown here was rarely seen.

(ii) State how some plant cells are specialised to carry out photosynthesis. (1)

the leaves have lots of chloroplast which absorbs light.

(Total for Question 7 = 4 marks)

### Q8ai

In question 8ai The purpose of shivering to warm up the body was not articulated clearly by many learners. Some simply stated that shivering occurred because Sheena didn't have a coat or because she was cold.

## Q8aii

In Question 8aii some candidates misinterpreted the question to mean, *what effects does cold cause* rather than *how does the body respond to the cold*. A significant number thought that the reference to cold meant the *common cold*. This part of question 8a was answered much better than the second part.

## Q8C

Learners found question 8c very difficult, with very few scoring and many not attempting the question. Learners that did attempt the question often lost marks as they were not using the correct scientific terminology often receptors were not made reference to, many learners referred to nerves rather than sensory neurones for the signal to travel along. A common misconception was that signals go to the brain indicating a lack of understanding of a simple spinal reflex.

Some learners were able to use correct terminology but then had the sequence of events incorrect or did not detail how a signal moves from one to another.

In the following example, although the learner has attempted to describe a reflex action, no specific details have been given and therefore no credit was awarded.

(c) Sheena is cooking her dinner and picks up a pan by its very hot handle.

Describe how the nervous system responds, so that she immediately drops the hot pan.

(4)

this is cold a fear reflex that happens with out the body b person thinking the body reflexes to keep the body safe. In this case her hand drops the pan as a reflex to stop her hand burning.

This example the learner has provided a partial description of a reflex arc. Correct reference has been made to (nerve) impulses, sensory neurones and the motor neurone for three marks, examples such as these were quite rare.

(c) Sheena is cooking her dinner and picks up a pan by its very hot handle.

Describe how the nervous system responds, so that she immediately drops the hot pan.

(4)

The sensory neuron carries out impulses to the central nervous system which the motor neuron receives and then carries impulses back to <sup>the hand</sup> make the hand let go quickly.

## Q9

In Question 9 the majority of learners attempted Punnett squares, these were generally well completed, however the majority started with the wrong gametes.

The use of scientific terminology was generally poor with learners using terms in their responses such as stronger genes rather than dominant allele and less dominant rather than recessive. However, 'homozygous' and 'heterozygous' were used with better understanding. Many responses referred to mum and dad passing on genes to their children. Many learners gave answers that related to the plants having not enough water, sun or fertilizer for the small strawberries.

The following response scored 5 marks in the distinction level. The learner has drawn a completely correct Punnett square with correct alleles and correct offspring. They have then gone on to explain that one plant must have heterozygous alleles and one must have homozygous alleles.

Whilst this information has already been credited in the correct Punnett square, the understanding and use of these key scientific terms took this answer just into the distinction level for 5 marks.

► Cemile grows strawberries.

She has two different types of strawberry plant

- one plant with big strawberries
- one plant with small strawberries.

Cemile knows that the allele for big strawberries is dominant.

When she bred her strawberry plants, half of the offspring had big strawberries and half of the offspring had small strawberries.

In this example, the learner has drawn a correct Punnett square using the correct alleles which would produce a 50:50 mix of big and small strawberries. The accompanying explanation below however seems a little confused and does not add to the correct Punnett square. A mark at the top of the merit level was therefore awarded.

Cemile knows that the allele for big strawberries is dominant.

When she bred her strawberry plants, half of the offspring had big strawberries and half of the offspring had small strawberries.

Use your knowledge of genetics to explain why half of the offspring had big strawberries and half of the offspring had small strawberries.

You may draw a Punnett square to help you explain this.

<del>S</del>	<del>S</del>	<del>S</del>
<del>Ss</del>	<del>Ss</del>	<del>Ss</del>
<del>s</del>	<del>s</del>	<del>s</del>

	S	s
s	Ss	ss
S	Ss	ss

because 50% of the offspring have of (cf) and for dominant you the have to have 1 allele are the same and have the one gene for the big and one small Strawberry gene.

(Total for Question 9 = 6 marks)



Further copies of this publication are available from  
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467

Fax 01623 450481

Email [publication.orders@edexcel.com](mailto:publication.orders@edexcel.com)

Order Code BF040244 November 2014

For more information on Edexcel qualifications, please visit  
[www.edexcel.com/quals](http://www.edexcel.com/quals)

Pearson Education Limited. Registered company number 872828  
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE

**Ofqual**  
.....



Llywodraeth Cynulliad Cymru  
Welsh Assembly Government

