

Examiners' Report  
June 2016

GCSE Biology 5BI3F 01

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## **Introduction**

This paper was for candidates entered for the Foundation tier of GCSE Biology Unit 3: Using Biology. It was written to test the full range of skills and specification content as described in the 2011 GCSE Specification. The paper included a range of question styles as usual, with multiple choice, missing words, short answer and longer 6-mark questions. The longer questions were designed to test candidates' ability to write and communicate scientific ideas and tested their quality of written communication.

Areas of unit three that were covered included behaviour, fermentation, cheese production, sperm cells, historical scientists and the kidney. Many areas of the specification were addressed well by candidates, however there are still some areas that require more thought and deeper learning in order to be able to access the full range of marks available.

This report hopes to identify areas of strength and weakness shown by the broad majority of candidates and also tries to highlight possible misconceptions that could be addressed by both teachers and pupils as an aid to teaching and revision in preparation for forthcoming examinations.

### Question 1 (a)(i)

In this question candidates were asked to explain the benefits of parental care. Expected answers included an example of parental care (such as teaching young or protection from danger) and an outcome - either increased chances of survival or passing on of genes to the next generation.

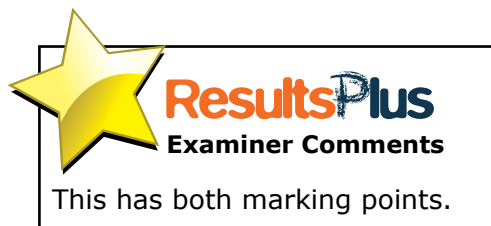
Most candidates did well but many simply described two examples of parental care and did not explain the benefits.

(a) This gesture helps the chimpanzee to care for its young.

(i) Explain the benefit of parental care.

(2)

Protect young and teach them how to hunt or catch/get food to enable them in having the best survival chances to pass on desirable genes.



### Question 1 (a)(ii)

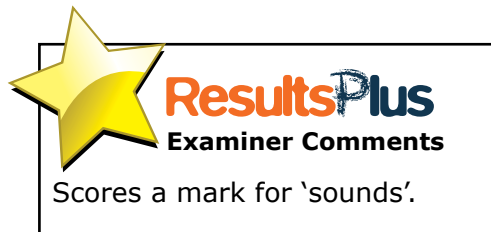
Here candidates were asked to identify other ways in which chimpanzees could communicate.

Most gave 'sound' or 'making noises' as an answer, but chemical communication was also acceptable. A few failed to read the question and stated another gesture.

(ii) Other than using gestures, suggest one way chimpanzees communicate.

(1)

Sound, making noises.



(ii) Other than using gestures, suggest one way chimpanzees communicate.

(1)

Chemical signals



### Question 1 (b)

With this question the candidates simply had to fill in the correct response. Most correctly identified 'reward' was part of conditioning, but there was considerable confusion between classical and operant conditioning.

### Question 1 (c)

This question asked candidates to explain how habituation was used to train police horses.

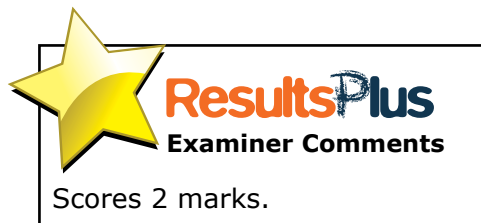
Expected answers included repeated exposure to loud noises with the horses eventually ignoring the harmless stimuli.

Many candidates gained marks for the idea of exposure to loud sounds, but many were confused with conditioning and described how rewards or punishment were given if the horse responded.

(c) Explain how habituation is used to train police horses not to respond to loud noises.

(2)

They get used to loud noises  
when they interact continuously  
with the loud noises.



(c) Explain how habituation is used to train police horses not to respond to loud noises.

(2)

Habituation trains horses in the ~~the~~ Police by putting them in different habitats creating different noises. The horse then eventually gets used to the noises and no longer is scared of them.



**ResultsPlus**  
Examiner Comments

Two marks – one for the idea of exposing horses to the noises and one for the idea of them becoming used to them.

### Question 2 (b)(i)

Candidates were required to identify conditions that should remain constant during the investigation shown. Any sensible variable apart from the dependent and independent variable could have been chosen.

Common answers included the temperature ('heat' was not accepted), speed of stirring, concentration of yeast (candidates should avoid using the word 'amount') and concentration of nutrients.

(b) (i) State two conditions that should remain constant during the investigation.

(2)

1 temperature should remain constant

2 the stirrer should never change speed or direction, remaining constant



**ResultsPlus**  
Examiner Comments

Two control variables are described.

## Question 2 (b)(ii)

This was a more challenging question in which candidates were asked to identify a method for measuring the rate of growth of yeast. Candidates should be able to identify a dependent variable (such as carbon dioxide production or even number of yeast cells) and measure the time taken to measure the variable (in order to calculate rate).

Many students simply described the apparatus or gave vague answers.

(ii) Describe how the fermenter could be used to measure the rate of growth of yeast.

The could pot be used in and <sup>(2)</sup>  
measure how much CO<sub>2</sub> is being  
released.



**ResultsPlus**  
Examiner Comments

Measurement of one variable gained a mark.

(ii) Describe how the fermenter could be used to measure the rate of growth of yeast.

The CO<sub>2</sub> cross could be measured <sup>(2)</sup>  
before and after a time period  
in different pH's



**ResultsPlus**  
Examiner Comments

Some indication of time also gains a mark.



## Question 2 (c)(i)

Here one mark was available for a simple description of the results while one was given for any quote using figures.

A common error for some candidates was simply to state a linear relationship, either a positive or negative correlation.

(c) The table shows the results of the investigation.

pH	rate of growth / arbitrary units
5	20
7	45
9	15

(i) Describe the effect of pH on the rate of growth of yeast.

(2)

at 5pH the rate of growth is 20  
and at 9pH the rate of growth is  
15 however at 7pH the rate of  
growth is 45



**ResultsPlus**  
Examiner Comments

Marks given for quoting data.



**ResultsPlus**  
Examiner Tip

When asked to describe data, either in a table or in a graph, always quote comparative data points. A mark won't always be given for this but it is good practice.

(c) The table shows the results of the investigation.

pH	rate of growth / arbitrary units
5	20
7	45
9	15

(i) Describe the effect of pH on the rate of growth of yeast.

(2)

The higher pH amount used,  
the less amount of yeast  
grows.



**ResultsPlus**  
Examiner Comments

No marks for a statement showing a linear relationship.

## Question 2 (c)(ii)

Here the reasons for the change in rate of growth were asked for. Possible answers needed to include a reference to enzymes or the fact that yeast cells might be being killed by high or low pH.

Many candidates gained a mark here but common errors included giving a simple description of the results or stating that the organisms were being denatured.

*and acidic.*

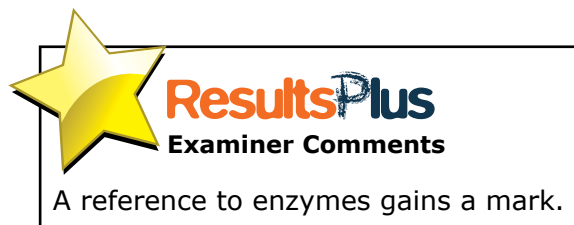
(ii) Suggest why changing the pH affects the rate of growth of yeast.

(1)

*it isn't their optimum pH level so it*

*could de-nature the* (Total for Question 2 = 8 marks)

*organisms.*



(ii) Suggest why changing the pH affects the rate of growth of yeast.

(1)

*The enzymes denature*



### Question 3 (a)(i)

Candidates scored well here with two comparative statements required about cheese and yogurt.

Most errors occurred because candidates used the term 'nutrients' too vaguely. To say cheese has more nutrients than yogurt is wrong as we don't know what the 'other nutrients' are.

(a) (i) Compare the nutritional content of cheese with that of yogurt.

The nutrients / nutritional content of cheese is significantly<sup>(2)</sup> less than the nutritional value of yogurt



**ResultsPlus**  
Examiner Comments

Two marks for describing two differences between cheese and yogurt.

(a) (i) Compare the nutritional content of cheese with that of yogurt.

Cheese has a lot more fat and protein than yogurt, but yogurt has more carbohydrates and other nutrients and water than cheese<sup>(2)</sup>



**ResultsPlus**  
Examiner Comments

Unclear statements about nutrients gained no marks.

### Question 3 (a)(ii)

Two marks for a simple calculation.

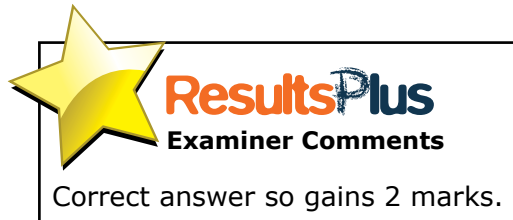
(ii) Calculate the mass of protein in 25 g of cheese.

(2)

100g =

fat 32	÷ 4	8
pro 18	÷ 4	4.5
car 4	÷ 4	1
onaw 46	÷ 4	11.5

4.5 g



### Question 3 (b)

Candidates were asked how enzymes were used to produce vegetarian cheese.

Many candidates found this a very challenging question and the level of understanding of vegetarian cheese production was poor.

(b) Describe how enzymes are used to produce vegetarian cheese.

(2)

The enzyme chymosin separates milk to make solid curds and liquid whey.  
It is put in alginate beads to make vegetarian cheese.



**ResultsPlus**  
Examiner Comments

One mark for chymosin and one for forming curds.

(b) Describe how enzymes are used to produce vegetarian cheese.

(2)

The enzyme chymosin is added to separate the solution ~~and~~ of curds and whey. The ~~solid~~ solid cheese is produced by adding pressure.



**ResultsPlus**  
Examiner Comments

An example of a response gaining all three possible marking points.

### Question 3 (c)(i)

This question was looking for lactic acid or lactate as possible causes for the pH change in yogurt. Lactase and lactose were both seen in candidate responses but scored no marks.

### Question 3 (d)

Another question that candidates found challenging. Possible answers included the formation of urea for one mark and the location for this (liver) for a second mark.

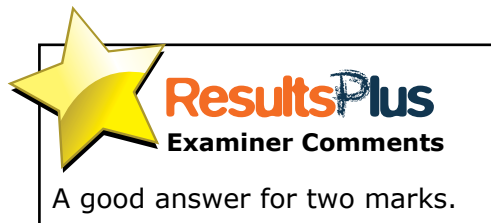
Some candidates mentioned the kidney and the excretion of urea but most candidates gave descriptions of digestion of amino acids in the gut using enzymes.

(d) Proteins are broken down into amino acids.

Describe how excess amino acids are broken down in the body.

(2)

~~Amino acids are~~ Excess amino acids are broken down in the kidneys and turned into urea.

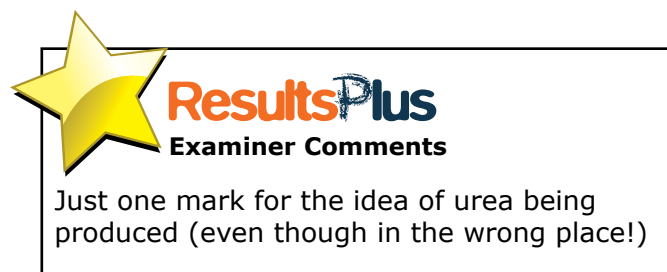


(d) Proteins are broken down into amino acids.

Describe how excess amino acids are broken down in the body.

(2)

The liver breaks amino acids down, turning them into urea, which is excreted through the kidneys.



(d) Proteins are broken down into amino acids.

Describe how excess amino acids are broken down in the body.

(2)

§

The stomach has hydrochloric acid that breaks down the <sup>excess</sup> amino acids. In the kidneys the <sup>excess</sup> amino acids are broken down into urea.



**ResultsPlus**

**Examiner Comments**

A large number of candidates described the digestion of proteins or amino acids in the gut.



### Question 4 (a)

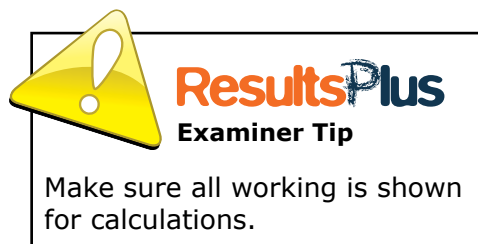
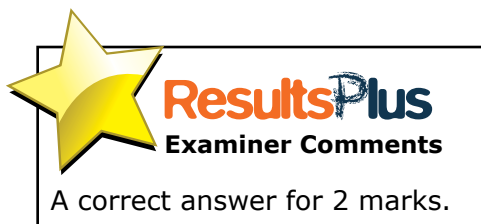
Two marks for a standard calculation. Candidates should be aware of any units involved (none were expected in this case).

- (a) Calculate how many times longer the mouse sperm cell is compared with the human sperm cell.

(2)

$$100 \div 40 = 2.5$$

2.5 times.



### Question 4 (b)(i)

One mark was available here for a simple description of the relationship seen from the graph, while one was for quoting data from the graph.

Most candidates scored at least one mark here, although a few failed to see any relationship.

- (i) Using data from the graph, describe the relationship between the sperm cell swimming speed and length of the middle region. (2)

The longer the length of the middle region the faster the sperm cell swims.



**ResultsPlus**  
Examiner Comments

One mark for a description with no reference to data.

- (i) Using data from the graph, describe the relationship between the sperm cell swimming speed and length of the middle region. (2)

The faster the sperm cell swimming speed, the longer the length of middle region. I know this because on the graph it says that the sperm cell swimming speed is 45 and the length of middle region is 15 and another one's sperm cell swimming length



**ResultsPlus**  
Examiner Comments

One mark for a description and one for use of data.

### Question 4 (b)(ii)

Here candidates were asked to explain the results seen in the graph. Expected answers included a link between length of middle region, mitochondria, respiration and energy release.

A large number of candidates gave good answers here and scored all 3 marks. Candidates who had not made the link with mitochondria scored badly.

(ii) Suggest an explanation for the results shown in the graph.

(3)

If the middle section is longer, it will likely contain more mitochondria, which through respiration provides the body with more energy to swim faster.



**ResultsPlus**  
Examiner Comments

A good answer covering all three marking points.

(ii) Suggest an explanation for the results shown in the graph.

(3)

The body covers more area and is able to create more power from swimming and also the sperm is stronger so it can swim faster.



**ResultsPlus**  
Examiner Comments

No marks were given for references to 'power'.

### **Question 4 (d)**

This question required candidates to recall how sex was determined by X and Y chromosomes.

Most candidates did this correctly but some used M and F instead of X and Y.

### Question 5 (a)(i)

Two marks for a correct answer to the calculation. One mark was awarded for candidates showing that the bacteria increased by a factor of 3. Unfortunately many candidates simply multiplied 200 by 3 and scored only 1 mark.

#### Historical scientists

5 Robert Koch (1843–1910) discovered that bacteria cause some diseases.

As part of his work, he isolated bacteria from patients and grew the bacteria in the laboratory.

(a) (i) A nutrient broth contained 200 bacteria.


These bacteria double in number every 20 minutes.

Calculate the number of bacteria in this broth after 1 hour.

$$\begin{aligned}60 \div 20 &= 3 \\ 200 \times 3 &= 600\end{aligned}$$


(2)

.....600..... bacteria



**ResultsPlus**  
Examiner Comments

One mark.



**ResultsPlus**  
Examiner Tip

It is always worth showing your working for a calculation as marks can be awarded for the correct steps in the procedure.

## Historical scientists

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(a) (i) A nutrient broth contained 200 bacteria.

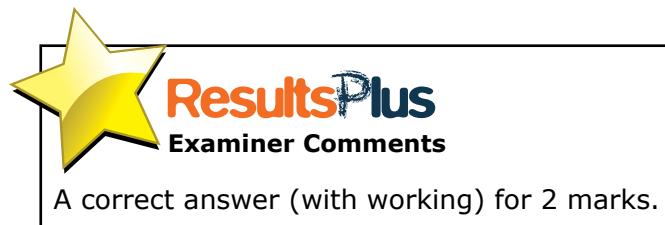
These bacteria double in number every 20 minutes.

Calculate the number of bacteria in this broth after 1 hour.

(2)

$$60 \div 20 = 3$$
$$200 \times 2^3 = 1600$$

.....1600..... bacteria



### Question 5 (b)(i)

The colour should have been stated as 'blue' and candidates should have recognised that at 80°C the bacteria would not be respiring and using oxygen.

### Question 5 (b)(ii)

In this question candidates were asked to explain why tube C (at 40°C) was colourless. Answers should have referred to the growth of bacteria, respiration, and lower oxygen.

Few candidates scored full marks but the majority identified low oxygen. A significant number described how reassuring was decolourised by heat.

(ii) Explain why the dye in sample C is colourless.

(2)

The sample C has low concentration of oxygen and it has reached ~~on~~ at the highest temperature (40°C).



**ResultsPlus**  
Examiner Comments

One mark for identifying that C has low oxygen, but failing to explain why.

(ii) Explain why the dye in sample C is colourless.

(2)

The bacteria multiplied more so more oxygen was used.



**ResultsPlus**  
Examiner Comments

A simple answer for two marks.

## Question 5 (c)

This was the first of the six-mark questions. It asked candidates to describe the work of Jenner and Pasteur.

Candidates in general performed exceptionally well on this question with a good deal of knowledge about both scientists (although on balance more was known about Jenner). A large proportion of candidates scored full marks. Some candidates described the work of only one of the scientists while others described the work of Watson and Crick, Darwin, Mendel and even Joseph Priestly.

\*(c) Robert Koch knew about the work of Edward Jenner (1745–1823) and Louis Pasteur (1822–1895).

Describe the work of Edward Jenner and Louis Pasteur.

(6)

Edward Jenner

- created immunisation
- he took scabs off a girl with cowpox and put them on a little boy the boy was ill then recovered. Edward then ~~made~~ <sup>exposed</sup> the boy ~~to~~ <sup>to</sup> small pox but the boy didn't catch it. This is because his immune system produced memory lymphocytes.

Louis Pasteur

- created the process called pasteurisation
- ~~pasteurisation~~ <sup>pasteurisation</sup> is when something is heated up ~~to~~ <sup>to</sup> a high temperature around 70°C and then cooled down
- this process kill off unwanted and harmful germs.



**ResultsPlus**  
Examiner Comments

A reasonable account of the work of both Jenner and Pasteur. This would just about be enough for a level 3 response gaining 6 marks.

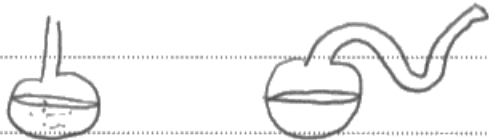


\*(c) Robert Koch knew about the work of Edward Jenner (1745–1823) and Louis Pasteur (1822–1895).

Describe the work of Edward Jenner and Louis Pasteur.

(6)

~~Edward~~ Louis Pasteur did an experiment with 2 flasks: 1 with Air and broth 2: with just broth flask 2 had a bendy neck of the flask 1: flask 2.



flask whereas flask 1 was straight. Pasteur realised after his experiment that the flask 1 broth had got off and flask 2 had stayed fresh. This proved to Pasteur that it is not the microorganisms that make food go off it is the bacteria from the air. Because the bacteria in the air couldn't get to the broth in flask 2 this allowed it to stay fresh much longer than the broth in flask 1 as the air could get straight to the broth.



**ResultsPlus**  
Examiner Comments

A reasonably good description of Pasteur but no information on Jenner. This type of answer is typical of a level 2 response gaining 4 marks.

### Question 6 (a)(i)

Very few candidates could identify the structures that make up a nephron.

Commonly names were given from other parts of the question such as ureter, urethra, renal vein and renal artery from 6b.

### Question 6 (a)(ii)

This was the second of the 6-mark questions and one in which candidates were asked to explain how nephron structure was related to its functions.

It was clear that a large number of candidates did not have a good knowledge of nephron function and found it difficult to even name the parts involved. A few candidates had learnt this well however and scored full marks.

\* (ii) Explain how the structures that make up the nephron are related to its function.

(6)

The glomerulus is a knot of small capillaries which helps ~~the~~ filter water, glucose, urea and other small molecules into the bowman's capsule. After the bowman's capsule the tubules has blood vessels near them where glucose goes back into the blood using active transport. This is because there is more glucose in the blood than in the tubules. So energy must be used to go against the concentration gradient. Then in the collecting duct osmoregulation happens where water is reabsorbed. The amount that is reabsorbed depends ~~of~~ on the amount of water in the body. Hormones from the

brain ~~that~~ tell the body how much water needs to be reabsorbed.

Larger molecules such as protein can't pass into the bowman's capsule.



**ResultsPlus**

**Examiner Comments**

A very good account of nephron function covering many of the main areas. This would score full marks (level 3 response , 6 marks)

\*(ii) Explain how the structures that make up the nephron are related to its function.

(6)

The structure that make up is permable, it allow water and ions to be able to go through it.

The nephron allows substances that the kidney decides useful such as water to be reabsorbed back into the blood stream.



**ResultsPlus**

**Examiner Comments**

A typical level 1 response where only one area is covered. Scores 2 marks.

### Question 6 (c)

Here candidates were asked to describe treatments for kidney failure. Possible answers included dialysis and kidney transplant.

The vast majority of candidates scored well here, usually being able to describe both processes.

(c) Describe the possible treatments for kidney failure.

(2)  
Kidney dialysis which clears out blood in the kidney, using a ~~more~~ machine. & or a kidney transplant from family or close relationships, which removes the non ~~functioning~~ functioning kidney with one that works.



**ResultsPlus**

**Examiner Comments**

Both kidney dialysis and transplant described for 2 marks.

## Paper Summary

Based on their performance on this paper, candidates are offered the following advice.

- All topics must be learned in sufficient depth.
- All areas of the specification should be covered in your revision, as any specification statement could be tested on any examination.
- Read the questions carefully and look for the command words such as 'describe' and 'explain' as these will require very different responses.
- Pay particular attention to the 6-mark questions that test quality of written communication, thinking carefully about how the full 6 marks might be required based on the question stem.
- Answers should be structured carefully with a view to the number of marks available (two facts or statements are unlikely to gain full marks on a 3-mark question).
- When carrying out mathematical calculations, always show your workings.

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