



# **Examiners' Report**

## **June 2022**

**International GCSE Biology 4BI1 2BR**

## Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. 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).

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).



### Giving you insight to inform next steps

ResultsPlus is Pearson's free online service giving instant and detailed analysis of your students' exam results.

- See students' scores for every exam question.
- Understand how your students' performance compares with class and national averages.
- Identify potential topics, skills and types of question where students may need to develop their learning further.

For more information on ResultsPlus, or to log in, visit [www.edexcel.com/resultsplus](http://www.edexcel.com/resultsplus). Your exams officer will be able to set up your ResultsPlus account in minutes via Edexcel Online.

### Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. 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 students at: [www.pearson.com/uk](http://www.pearson.com/uk).

June 2022

Publications Code 4BI1\_2BR\_2206\_ER

All the material in this publication is copyright

© Pearson Education Ltd 2022

## Introduction

The new qualification was examined in June 2022 for the second time in a full summer series. The examiners were impressed with the standard of student responses. Centres have prepared students well for the new style of questions and the new areas of specification content. Generally, despite the interruption and disruptions to student learning, most students were able to demonstrate very good levels of knowledge and understanding of the specification content. There was no evidence of students running out of time on the paper and most students attempted all questions.

Students did better than in previous series on the longer prose items which used the command word 'comment'. Students also did well on applying their knowledge to novel scenarios including those describing practical experiments. Most students did well on the items examining the mathematical skills outlined in the appendix at the end of the specification. In the calculations most students showed their working so that even if they did not get the final answer they were able to gain some credit.

## Question 1 (a)

Question 1 provided students with a passage about human kidney disease and the possible treatments.

In item 1(a) students were asked to give one way that a person can change their diet to lower their risk of developing high cholesterol. Almost all students were able to gain one mark by stating that the consumption of less lipid would reduce the risk of developing high cholesterol.

- (a) Give one way that a person can change their diet to lower their risk of developing high cholesterol (lines 4 to 6).

(1)

Eat less fat, eat more healthy food like  
vegetables, reduce fat in diet.



**ResultsPlus**  
Examiner Comments

This response gains the mark.

- (a) Give one way that a person can change their diet to lower their risk of developing high cholesterol (lines 4 to 6).

(1)

Intake less food containing fat



**ResultsPlus**  
Examiner Comments

This response also gains the mark.

## Question 1 (b)

See below.

- (b) One function of the kidney is excretion (line 9). Another function is osmoregulation.

Explain what is meant by the term **osmoregulation**.

(2)

The process of maintaining a suitable concentration of the blood <sup>and urine</sup> by increasing/decreasing reabsorption of water. The ~~anti~~ anti-diuretic hormone is responsible for osmoregulation in the collecting duct.

osmoregulation aids in adequately hydrating the body.



This response gains both marks for maintaining the concentration of the blood.

- (b) One function of the kidney is excretion (line 9). Another function is osmoregulation.

Explain what is meant by the term **osmoregulation**.

(2)

~~Having an~~ maintaining a osmotic balance between water and salt concentrations.



This answer also scores two marks for balance between water and salt concentrations.

## Question 1 (c)

In item 1(c) students were asked to explain why a person with severe kidney disease will need dialysis to continue for life. Only the best answers gained both marks for explaining that urea or metabolic waste needs to be excreted from the body to prevent it accumulating. They also explained that this is incurable and must continue unless a transplant takes place.

(c) Explain why a person with severe kidney disease will need dialysis to continue for life (lines 15 to 16).

(2)

If a person has severe kidney failure, they won't be able to properly excrete ~~waste~~ toxic metabolic waste in their body. A dialysis will allow them to filter out metabolic waste and pump back "clean" blood to the body. ~~Filtering~~ Filtering blood is a regular occasion in a normal human body, therefore ~~the~~ dialysis must be done regularly to avoid complications.



**ResultsPlus**  
Examiner Comments

This answer gains two marks for explaining that metabolic waste needs to be excreted.

(c) Explain why a person with severe kidney disease will need dialysis to continue for life (lines 15 to 16).

(2)

Dialysis is required because otherwise urea, excess water and ions cannot be excreted and will build up to harmful levels in the body. Osmoregulation would also not be possible / they cannot regulate the water content in their blood.



**ResultsPlus**  
Examiner Comments

This answer also gains both marks for explaining that urea needs to be excreted.

(c) Explain why a person with severe kidney disease will need dialysis to continue for life (lines 15 to 16).

(2)

~~Dialysis is mean to clean the kidney.~~  
Peritoneal dialysis is mean to clean the kidney that are unclean and have a lot of waste in it. They clean by pumping dialysis fluid into ~~water~~ a space inside your abdomen. This solution remove metabolic waste products so the kidneys can filter the water that come into body.



**ResultsPlus**  
Examiner Comments

This response also scores two marks for removal of metabolic waste.



## Question 1 (d)(i)

This item asked students to explain what is meant by a partially permeable membrane. Most responses scored at least one mark and the best responses explained that a partially permeable membrane only lets through small molecules.

(d) The peritoneum acts as a partially permeable membrane.

(i) Explain what is meant by a partially permeable membrane (lines 23 to 24).

(2)

Partially permeable membrane is a membrane which allows smaller particles to go through but larger particles can't go through it.



This response gains both marks.

(d) The peritoneum acts as a partially permeable membrane.

(i) Explain what is meant by a partially permeable membrane (lines 23 to 24).

(2)

A partially ~~permeable~~ permeable membrane is a membrane (usually surrounding a cell) that allows smaller substances such as water to freely permeate, but may only allow a one-way entry for ~~substance~~ substances such as glucose.



This response also gains both marks.



(d) The peritoneum acts as a partially permeable membrane.

(i) Explain what is meant by a partially permeable membrane (lines 23 to 24).

(2)

membrane that is selectively permeable to specific substance, that only some molecule could diffuse through that membrane



**ResultsPlus**  
Examiner Comments

This response scores one mark for explaining that the membrane only allows some molecules to enter.



**ResultsPlus**  
Examiner Tip

To gain the second mark the response would need to refer to only small molecules can pass through, or the membrane not allowing large molecules to pass through.

## Question 1 (d)(ii)

In item 1(d)(ii) students needed to explain why the dialysis solution must contain purified water, glucose and mineral ions. Some gained one mark but only the best answers explained that the solution contains glucose and ions so that they do not leave the blood or so that they can diffuse into the blood, as glucose is required for respiration.

(ii) Explain why the dialysis solution must contain purified water, glucose and mineral ions (lines 19 to 21).

(2)

~~It is to mimic the actual ~~environment~~ fluid in the body so that waste products of high concentration can diffuse out of the blood, while more useful substances like glucose and mineral ions will stay in the blood due to ~~the~~ no concentration gradient.~~  
To prevent glucose and mineral ions diffusing away from the ~~solution~~ blood and water by osmosis.



**ResultsPlus**  
Examiner Comments

This scores both marks for explaining that glucose is prevented from diffusing out of the blood.

(ii) Explain why the dialysis solution must contain purified water, glucose and mineral ions (lines 19 to 21).

(2)

~~Since the dialysis~~

It help maintain a same concentration ~~of~~ ~~of needed~~ ~~substance~~ in blood. ~~it~~ It prevent a concentration gradient of useful substances ~~in~~ ~~the~~ <sup>like</sup> prevent useful ~~in~~ water, glucose and mineral ions to diffuse out; prevent loss of useful nutrient like water, glucose and mineral ions. The useful substances like water will stay in blood as no ~~concentration~~ concentration gradient



**ResultsPlus**  
Examiner Comments

This gains both marks for explaining that a concentration gradient prevents glucose diffusing out of the blood.

## Question 1 (e)

This asked students to explain how the composition of the dialysis solution results in the waste products being removed from the blood. Students gained marks for explaining that a lower concentration of waste products such as urea would mean that it diffuses out of the blood into the solution.

(e) Explain how the composition of the dialysis solution results in the waste products being removed from the blood (lines 21 to 22).

(2)

If there is a higher concentration of waste products <sup>in the blood</sup> as compared to the dialysis solution, the waste products can be removed from the blood. This is because of osmosis and diffusion where particles move from an area of high to low concentration and in osmosis, water particles move from an area of high to low water potential across a semi permeable membrane.



**ResultsPlus**  
Examiner Comments

Lower concentration in the dialysis solution means that the waste products can diffuse out of blood.

(e) Explain how the composition of the dialysis solution results in the waste products being removed from the blood (lines 21 to 22).

(2)

There is a low concentration of waste products in the dialysis solution.  
urea, salt ~~and~~ and other metabolic waste diffuse from a high concentration in the body to a low concentration into the dialysis solution across a semi-permeable membrane.



**ResultsPlus**  
Examiner Comments

This response also scores both marks for explaining a lower concentration of urea means that it diffuses from the blood into the dialysis solution.

## Question 1 (f)(i)

See below.

(f) (i) A person is using APD.

Calculate the percentage of their time used for treatment in a week  
(lines 33 to 35).

(2)

9 hours a day

24

$$\frac{9}{24} \times 100 = 37.5$$

percentage = ..... 37.5 %



**ResultsPlus**  
Examiner Comments

This scores two marks for the correct calculation.



**ResultsPlus**  
Examiner Tip

This student realised that the percentage of time each day is the same as the percentage time over a week. This made their calculation simpler.

(f) (i) A person is using APD.

Calculate the percentage of their time used for treatment in a week  
(lines 33 to 35).

(2)

$$\begin{array}{l} 9 \text{ per day} \\ 9 \times 7 = 63 \text{ hours} \\ \hline 7 \times 24 \\ 168 \end{array}$$

$$\frac{63}{168} = 0.375$$

percentage = 37.5 %



**ResultsPlus**  
Examiner Comments

This student also got both marks for the correct percentage.



**ResultsPlus**  
Examiner Tip

However there is no need to multiply the 9 or the 24 by seven as the percentage per day is the same as the percentage per week.



### **Question 1 (f)(ii)**

Almost all students could suggest why people may prefer to use CAPD instead of haemodialysis. Suitable answers included freedom to walk about and not requiring a machine or a visit to hospital.

## Question 1 (g)

In this item students were asked to describe how the structures in a human kidney result in the correct substances being retained in the blood. Many students gained full credit for describing how large molecules such as proteins are unable to pass from the glomerulus into the Bowman's capsule so stay in the blood. They also described how glucose is reabsorbed in the proximal convoluted tubule and how water is reabsorbed in the collecting duct.

(g) Describe how the structures in a human kidney result in the correct substances being retained in the blood.

(3)

A human kidney is made up of nephrons which perform ultrafiltration of the blood. At the glomerulus urea, water, salts and glucose are forced into the Bowman's capsule due to high blood pressure and these molecules are small enough to be forced out of the blood. However, glucose is not meant to be taken out of the blood and is thus immediately reabsorbed in the proximal convoluted tubule. Water is also reabsorbed at the Loop of Henle. Any salts that may need to be retained is then reabsorbed at the distal convoluted tubule.



**ResultsPlus**  
Examiner Comments

This response gains three marks for glucose being reabsorbed in the proximal convoluted tubule and water being reabsorbed in the collecting duct.

## Question 2 (a)

In item 2(a) almost all students could calculate the increase in water temperature, the energy released in joules by the third sample. And most could also calculate the energy released in joules by 1g.

The table shows some of the student's results.

Initial temperature of water in °C	Final temperature of water in °C	Increase in water temperature in °C	Energy released in J	Mass of bread sample in g	Energy released by 1 g of bread in J
20	33	13	1092	0.25	4368
20	34	14	1176	0.30	3920
21	36	15	1260	0.20	

- (a) To calculate the energy released from the burning bread the student uses this formula.

$$\text{energy (in J)} = \text{mass of water (in g)} \times 4.2 \times \text{increase in temperature (in } ^\circ\text{C)}$$

They then calculate the energy in joules released by 1 g of bread.

- (i) Calculate the increase in water temperature for the third sample of bread.

~~$$20 \times 4.2 \times (36 - 21)$$~~

(1)

~~$$20 \times 4.2 \times 15$$~~

$$36 - 21 = 15 \quad \text{temperature increase} = \underline{15} \quad ^\circ\text{C}$$

- (ii) Calculate the energy released in joules by the third sample of bread.

[1 cm<sup>3</sup> of water has a mass of 1 g]

$$20 \times 4.2 \times 15$$

(1)

$$\text{energy released} = \underline{1260} \quad \text{J}$$

- (iii) Calculate the energy released in joules by 1g of bread for the third sample of bread.

$$0.20 \times 5 = 1$$

(1)

$$1260 \times 5 = 6300$$

$$= 6300$$

$$\text{energy released by 1 g} = \underline{6300} \quad \text{J}$$



This gains three marks for all three answers being correct.

The table shows some of the student's results.

Initial temperature of water in °C	Final temperature of water in °C	Increase in water temperature in °C	Energy released in J	Mass of bread sample in g	Energy released by 1 g of bread in J
20	33	13	1092	0.25	4368
20	34	14	1176	0.30	3920
21	36	15	1260	0.20	6300

- (a) To calculate the energy released from the burning bread the student uses this formula.

$$\text{energy (in J)} = \text{mass of water (in g)} \times 4.2 \times \text{increase in temperature (in } ^\circ\text{C)}$$

They then calculate the energy in joules released by 1 g of bread.

- (i) Calculate the increase in water temperature for the third sample of bread.

(1)

temperature increase = ..... 15 ..... °C

- (ii) Calculate the energy released in joules by the third sample of bread.

[1 cm<sup>3</sup> of water has a mass of 1 g]

(1)

$$\begin{array}{r} 1260 \\ 1260 \end{array}$$

energy released = ..... 1260 ..... J

- (iii) Calculate the energy released in joules by 1g of bread for the third sample of bread.

(1)

$$\begin{array}{r} 1260 \\ \hline 0.20 \end{array}$$

energy released by 1 g = ..... 6300 ..... J



This also gains all three marks.



The table shows some of the student's results.

Initial temperature of water in °C	Final temperature of water in °C	Increase in water temperature in °C	Energy released in J	Mass of bread sample in g	Energy released by 1 g of bread in J
20	33	13	1092	0.25	4368
20	34	14	1176	0.30	3920
21	36	15	1260	0.20	-

- (a) To calculate the energy released from the burning bread the student uses this formula.

$$\text{energy (in J)} = \text{mass of water (in g)} \times 4.2 \times \text{increase in temperature (in } ^\circ\text{C)}$$

They then calculate the energy in joules released by 1 g of bread.

- (i) Calculate the increase in water temperature for the third sample of bread.

(1)

temperature increase = 15 °C

- (ii) Calculate the energy released in joules by the third sample of bread.

[1 cm<sup>3</sup> of water has a mass of 1 g]

(1)

energy released = 1260 J

- (iii) Calculate the energy released in joules by 1g of bread for the third sample of bread.

4020

(1)

energy released by 1 g = 4020 J



This gains two marks for the first two calculations.

## Question 2 (b)

Students were told that the energy value given on the packaging of the bread is 10 400 J for 1 g of bread: comment on why the student's method gives a different value. Most responses scored at least two marks with the best responses gaining all five marks for noting that the student value was much lower. They also commented that not all of the energy was released from the bread as it was not completely burnt. They also explained that energy was lost to the atmosphere such as when transferring the bread to the tube or relighting the sample. Credit was also given for the flame being affected by draught or the water not being stirred.

(b) The energy value given on the packaging of the bread is 10400J for 1 g of bread.

Comment on why the student's method gives a different value.

Combustion  
(5)

incomplete combustion took place instead of complete.  
Heat energy loss to surrounding.  
human error such as misreading the number shown on thermometer.  
Distance  
times of repetition not enough to enderminate ~~anome~~ errors.

The result on packaging is obtained with a more accurate method.

~~relit~~  
a energy lost during ~~removing~~ relighted bread back to place.



This answer scores full marks for reference to misreading of temperature rise, incomplete combustion, energy loss to surroundings, the method not being repeated enough times, and energy lost during moving or relighting the bread.

(b) The energy value given on the packaging of the bread is 10400J for 1 g of bread.

Comment on why the student's method gives a different value.

(5)

The mass of sample of bread are different each time, this will effect the result; There are heat loss in this process, the room temperature or the wind may effect the temperature increase of water. Also the <sup>distance between</sup> ~~mounted~~ ~~needle~~ and burning bread and boiling tube may different each time, this will affect the ~~give~~ conduction of heat to water, the result also might be effected. There may be some human error, like the reading of ~~the~~ temperature, the student might not read it horizontally. There are heat loss in environment.  
also



**ResultsPlus**  
Examiner Comments

This answer scores four marks for heat loss, wind affecting flame, misreading the thermometer and the bread being different distances from the tube.

## Question 2 (c)

In item 2(c) students were asked to give two ways that the student could modify this apparatus to achieve an answer nearer to the energy value given on the packaging of the bread. Most responses scored one with the best ones giving using a stirrer or a lid or insulating the tube.

(c) Give two ways that the student could modify this apparatus to achieve an answer nearer to the energy value given on the packaging of the bread.

(2)

1 Use insulating material on test tube to prevent heat loss (eg foil)

2 Use bung to trap heat in ~~the~~ boiling tube to prevent heat loss.



**ResultsPlus**  
Examiner Comments

This scores both marks for insulation and using a bung.

(c) Give two ways that the student could modify this apparatus to achieve an answer nearer to the energy value given on the packaging of the bread.

(2)

1 Add a lid on top of the boiling tube

2 Change the needle into plastic marble



**ResultsPlus**  
Examiner Comments

This scores one mark for using a lid.

### Question 3 (b)

See below.

(b) These cells form the lining of the small intestine.

Explain how the structure of the small intestine is adapted for absorption.

(4)

The wall of villi is one cell thick, which shortens the diffusion distance between the absorbed food and the capillaries.

Numerous microvilli present on the surface of ~~the~~ villi to increase surface area for the ~~absorb~~ absorption of food substances.

There's a broad network network of capillaries in the cells, which allowed absorbed food to be transported away rapidly to maintain a steep diffusion gradient.



This answer scores four marks for describing the wall of the villi as one cell thick for faster diffusion, villi and microvilli to increase surface area, and capillaries to carry away substances maintaining diffusion gradient.



(b) These cells form the lining of the small intestine.

Explain how the structure of the small intestine is adapted for absorption.

(4)

the ileum is supplied with millions of villus.

- villus has millions of microvillus projections increasing surface area to volume ratio for diffusion and active transport.
- villus is supplied by capillaries creating a steep concentration gradient for diffusion.
- lacteal is present so larger molecules like triglycerides can be absorbed.
- the villus wall ~~and~~ wall is only one cell thick, minimising diffusion distance.
- lumen <sup>of intestine</sup> is narrow so increasing contact surface area with food.
- it has lots of mitochondria producing ATP for active transport.



**ResultsPlus**  
Examiner Comments

This response also scores four marks for describing how villi and microvilli increase the surface area, capillaries to maintain the diffusion gradient, lacteals to absorb triglycerides, and the villi walls are only one cell thick minimising diffusion distance.



**ResultsPlus**  
Examiner Tip

This response gives each structure and explains how they improve absorption.

### Question 3 (c)

In this item students were asked to describe the role of the human placenta. Most responses were able to describe how the foetus receives glucose or amino acids from the placenta and the placenta removes waste products such as urea and carbon dioxide from the foetus. The better responses also described how the placenta provides oxygen from the mother to the foetus.

(c) Cells in the human placenta also have microvilli.

Describe the role of the human placenta.

(3)

Allows substances such as glucose, oxygen, vitamins and minerals to be transferred from the mother's blood to the developing foetus's blood via diffusion. Waste products such as carbon dioxide, and urea can also be transferred from the foetus's blood to the mother's blood. Also prevents the entry of pathogens from the mother's blood to the foetus's blood.



This response gains all three marks for describing the passage of oxygen and glucose from the mother to the foetus and the removal of carbon dioxide and urea from the foetus to the mother.

(c) Cells in the human placenta also have microvilli.

Describe the role of the human placenta.

(3)

The human placenta's function is to provide a fetus with nutrients, ~~blood~~ oxygen and water. The placenta diffuses these substances from the human's blood to the fetus', which help it ~~stay~~ grow.



**ResultsPlus**  
Examiner Comments

This response scores two marks for the passage of oxygen and nutrients from the mother to the foetus.

## Question 4 (a)

In this item students were given three graphs showing how the oxygen level, the number of bacteria, the number of mayfly nymphs, and the number of tubifex worms in the river changed with the distance from a sewage outlet. They were asked to comment on the changes in the measurements as the distance from the sewage outlet increases. Almost all responses gained some credit with many responses gaining full credit.

(a) Comment on the changes in the measurements as the distance from the sewage outlet increases.

You should use information from the graphs and your own knowledge in your answer.

(5)

As the distance from the sewage outlet increases the oxygen levels have a sudden drop followed by an increase. We also see high bacteria at the sewage outlet which later on decreases. The third graph shows a very drastic drop in mayflies and a high population of tubifex worm. These sources suggest that the sewage waste is very high near the sewage outlet causing an imbalance in population of species. This waste also attracts a very high population of bacteria, and since they respire aerobically there are low amounts of oxygen present. This also means there is very less population of mayfly as there is a lack of oxygen. Tubifex worms thrive as they probably anaerobically survive allowing them to survive amid a lack of oxygen.



**ResultsPlus**  
Examiner Comments

This response scores five marks for commenting that the oxygen level falls near the outlet but rises further away, and that the bacteria numbers fall further away and that it is bacterial respiration that causes the oxygen levels to drop near the outlet. They also note that near the outlet mayfly numbers fall but tubifex can live in low oxygen.

(a) Comment on the changes in the measurements as the distance from the sewage outlet increases.

You should use information from the graphs and your own knowledge in your answer.

(5)

Near the sewage outlet, number of bacteria is high. It decompose the sewage and reproduce and use up oxygen for respiration. Oxygen level drops a lot. The number of tubifex worm is high as it can survive without ~~may~~ <sup>oxygen</sup> and there is no competition for food with mayfly. There is no mayfly as it ~~survive~~ <sup>die,</sup> without oxygen.

As distance from sewage increase, water is oxygenated again and sewage is diluted. Bacteria has decomposed all sewage so number of bacteria decrease. Number of mayfly increase as oxygen level rise back to normal. There is competition so number of tubifex worm decrease.



**ResultsPlus**  
Examiner Comments

This response also scores five marks making many creditworthy points including: bacteria decompose sewage using up oxygen in respiration so that oxygen falls. The tubifex numbers are high as they can survive in low oxygen but the mayfly numbers drop.



## Question 4 (b)(i)

Many students struggled to fully explain what is meant by the term biodiversity. The best answers explained that biodiversity is a measure of variation shown by organisms in an ecosystem based on the number of different species and their relative abundance.

(b) Scientists often use information about the organisms present in a habitat as an indication of the level of pollution and as a measure of biodiversity.

(i) Explain what is meant by the term **biodiversity**.

(2)

biodiversity is the ~~of~~ measure of ~~both~~ both the amount (number) of different species as well as the abundance (population) of each species.



**ResultsPlus**  
Examiner Comments

This answer scores both marks. It mentions the number of different species and their abundance.

(b) Scientists often use information about the organisms present in a habitat as an indication of the level of pollution and as a measure of biodiversity.

(i) Explain what is meant by the term **biodiversity**.

(2)

A ~~large~~ variety of different species that are in the same ecosystem.  
e.g. many plants and animals of different species and the measurement of how many there are.



**ResultsPlus**  
Examiner Comments

This response also scores both marks.



## Question 4 (b)(ii)

In this item many students could use the information from the graphs to suggest how the number of mayfly nymphs and the number of tubifex worms can be used to indicate the level of pollution. High mayfly and low tubifex indicate low pollution whilst high tubifex and low mayfly indicate high pollution.

- (ii) Suggest how the number of mayfly nymphs and the number of tubifex worms can be used to indicate the level of pollution.

(2)

If the number of mayfly nymphs are low and the number of tubifex worms are high, it indicates that the level of pollution is high.



This response scores both marks.

- (ii) Suggest how the number of mayfly nymphs and the number of tubifex worms can be used to indicate the level of pollution.

(2)

Tubifex worms thrive in polluted areas whereas mayfly nymphs cannot survive so an indicator of a polluted river area is a large number of tubifex worms and low numbers of mayfly nymphs.



This response also gains both marks.

## Question 5 (a)

5 (a) The table gives some information about different hormones.

Hormone	Organ that releases hormone	Location of target cells	Effect on target cells and tissues
FSH	Pituitary <del>Ovaries</del>	ovary	growth of follicle
LH	pituitary	ovaries	release of egg cell
progesterone	ovaries	uterus	maintain uterine lining
testosterone	testes	skin surface.	growth of body hair

Complete the table by giving the missing information.

(6)



**ResultsPlus**  
Examiner Comments

This response gains all six marks for correct hormones, organs that release them, target cells and effects.

5 (a) The table gives some information about different hormones.

Hormone	Organ that releases hormone	Location of target cells	Effect on target cells and tissues
FSH	pituitary	ovaries	growth of follicle
LH	pituitary	ovaries	release of egg <del>during me</del>
progesterone	ovaries	uterus	thicken the uterus lining
testosterone	testes	skin	growth of body hair

Complete the table by giving the missing information.

(6)



**ResultsPlus**  
Examiner Comments

This response also gains all six marks for correct hormones, organs that release them, target cells and effects.

5 (a) The table gives some information about different hormones.

Hormone	Organ that releases hormone	Location of target cells	Effect on target cells and tissues
FSH	ovaries	ovaries	growth of follicle
LH	pituitary	ovaries	stimulates release of egg cell
progesterone	ovaries	uterus	maintains lining of uterus
testosterone	testes	face, armpit, penis	growth of body hair

Complete the table by giving the missing information.

(6)



**ResultsPlus**  
Examiner Comments

This scores five marks as the organ that releases FSH is incorrectly named as the ovary.

## Question 5 (b)

In item 5(b) students were asked to give three differences between hormones and neurotransmitters. Only the best students were able to gain all three marks for answers that included hormones are carried in the blood plasma whilst neurotransmitters are discharged into synapses. Hormones are produced in endocrine glands whilst neurotransmitters are produced in the presynaptic cell; that hormones have target cells throughout the body whilst a neurotransmitter effects one neurone; finally that hormones produce long term effects whilst neurotransmitters effects are shorter.

(b) Give three differences between hormones and neurotransmitters.

(3)

1. Hormones are part of the endocrine system, neurotransmitters are part of the nervous system. Hormones travel in blood, not in synapses.
2. Neurotransmitters are released from the presynaptic membrane, hormones are released from the <sup>endocrine</sup> glands.
3. Neurotransmitters convert electrical impulses to chemical impulses for a short period of time (diffusion). Hormones remain over a long time <sup>period</sup>.



This response gains all three marks for reference to hormones travelling in the blood. Neurotransmitters being released from presynaptic cell and neurotransmitters having a short term effect.

(b) Give three differences between hormones and neurotransmitters.

(3)

1 Hormones travel in the blood, neurotransmitters don't

2 Hormones ~~take~~ take longer to act than neurotransmitters

3 Hormones have a longer lasting effect than neurotransmitters.



**ResultsPlus**  
Examiner Comments

This answer scores two marks for two correct differences.



## Question 6 (a)

In this item many students could clearly describe the stages scientists could use to clone a male horse.

- 6 Scientists can now produce farm animals by cloning. Since Dolly the sheep was born in 1996 many different species have been cloned.

The form of cloning used is called somatic cell cloning.

The first ever clone of a champion racehorse was announced in 2005 in Italy.

The foal was cloned from Pieraz, a world champion in long-distance horse races.

(a) Describe the stages scientists could use to clone a male horse.

(4)

Take an adult cell from the male horse needed to be cloned  
Take an <sup>enucleated</sup> egg cell from a volunteered female horse  
Insert the nucleus from adult cell into an enucleated female egg cell.  
Pass electricity to start/trigger the cell division by mitosis  
enter the zygote in a surrogate female horse's uterus.  
Take care and wait for birth.  
The offspring is a clone of the male horse.



This answer clearly describes taking a nucleus from a body cell of the male horse and inserting it into an enucleated egg cell. The cell is given an electric shock to stimulate mitosis. It also refers to the use of a surrogate mother.

- 6 Scientists can now produce farm animals by cloning. Since Dolly the sheep was born in 1996 many different species have been cloned.

The form of cloning used is called somatic cell cloning.

The first ever clone of a champion racehorse was announced in 2005 in Italy.

The foal was cloned from Pieraz, a world champion in long-distance horse races.

- (a) Describe the stages scientists could use to clone a male horse.

(4)

To clone a male horse, the scientists would need to take the nucleus out of a somatic cell from one male horse (the parent horse) and insert it into a denuded egg cell from another horse<sup>(female)</sup>. The scientists must then take this cell and put it inside a third horse known as a surrogate horse and electrocute it. This will trigger mitosis (cell division) in the surrogate horse to create a clone of the original male horse.



**ResultsPlus**  
Examiner Comments

This response also scores four marks.



**ResultsPlus**  
Examiner Tip

This answer could be improved by including reference to cell division to produce an embryo that is inserted into the uterus of a surrogate mother.



## Question 6 (b)

In 6(b) students were told that Pieraz was castrated (had his testicles removed) at a young age. They were then asked to explain why this stopped him reproducing normally but did not stop him being used to produce a foal by cloning. The best answers referred to him being unable to produce sperm so not being able to fertilise an egg; however he still has normal diploid body cells that can be used for cloning.

(b) Pieraz was castrated (had his testicles removed) at a young age.

Explain why this stopped him reproducing normally but did not stop him being used to produce a foal by cloning.

(3)

Testicles produce semen which contains sperms that contain male gametes. Without it the Pieraz cannot produce sperm to fertilise an egg therefore it cannot reproduce sexually so it is infertile. Cloning ~~is~~ do not require Pieraz to have male gamete so it only require nucleus of its body cell to clone.



**ResultsPlus**  
Examiner Comments

This answer scores all three marks.

(b) Pieraz was castrated (had his testicles removed) at a young age.

Explain why this stopped him reproducing normally but did not stop him being used to produce a foal by cloning.

(3)

He cannot ~~pro~~ reproduce normally since he cannot produce any sperm, <sup>due to absence of testes</sup> the gamete needed for fertilisation. However, since cloning only requires a nucleus from any body cell, he is still able to provide that.



This response also gains all three marks.

(b) Pieraz was castrated (had his testicles removed) at a young age.

Explain why this stopped him reproducing normally but did not stop him being used to produce a foal by cloning.

(3)

It can't produce sperm as his testicles are removed, <sup>so</sup> he can't ~~still~~ reproduce normally. But cloning does not require sperm, just the nucleus from body cell is needed, so cloning is still possible on him.



This answer gains two marks. One for not being able to produce sperm and the second for explaining that cloning uses the nucleus from a body cell.

## Question 6 (c)

This item asked students to suggest why horseracing does not allow the use of non-natural methods of breeding, including cloning. Most students gained a mark for suggesting that using cloning would make the competition unfair. Other possible answers are listed in the mark scheme.

- (c) Suggest why horseracing does not allow the use of non-natural methods of breeding, including cloning.

(1)

Cloning results in desirable characteristics without training the horse, and this isn't fair to other competitors. Also, cloning may be banned due to ethical reasons.



This response gained the mark.

- (c) Suggest why horseracing does not allow the use of non-natural methods of breeding, including cloning.

(1)

Unethical and all horses may be identical making it impossible to make horseracing.



This also gained the mark.

(c) Suggest why horseracing does not allow the use of non-natural methods of breeding, including cloning.

(1)

Cloning is unethical as it can lead to genetic diseases being passed down



This also gained the mark.

## Question 6 (d)

Finally in question 6 students were asked to state one difference between cloning an organism and genetically modifying an organism. Most answers stated that clones are genetically identical whilst gene modification produces an organism with a different genome.

(d) State one difference between cloning an organism and genetically modifying an organism.

(1)

Cloning produces a genetically identical copy of an organism while GM ~~uses~~ modifies one organisms DNA

(Total for Question 6 = 9 marks)



This scores the mark.

(d) State one difference between cloning an organism and genetically modifying an organism.

(1)

Cloning an organism is producing another genetically identical organism while genetically modifying an organism is changing the ~~the~~ genes of an organism.



This also scores the mark.

## Question 7 (a)(ii)

See below.

(ii) State why leaves of the same species were selected.

(1)

So that the experiment will be a fair test.



This scored the mark.

(ii) State why leaves of the same species were selected.

(1)

Act as control variable and keep ~~open~~, since different species may transpire differently.



This also gains the mark for stating that different species may transpire differently.

### Question 7 (b)(i)

In this item most students could calculate the percentage change in mass for leaf 3.

(b) The table shows some of the student's results.

Leaf	Surface covered	Initial mass in g	Final mass in g	Percentage change in mass (%)
1	upper surface	3.2	2.4	25
2	lower surface	3.2	3.0	6.3
3	both	3.1	3.0	3.2
4	none	3.1	2.2	29

(i) Calculate the percentage change in mass for leaf 3.

(2)

$$3.1 - 3.0 = 0.1$$

$$\frac{0.1}{3.1} \times 100 = 3.2\%$$

percentage change = .....3.2..... %



**ResultsPlus**  
Examiner Comments

This answer scores both marks.

(b) The table shows some of the student's results.

Leaf	Surface covered	Initial mass in g	Final mass in g	Percentage change in mass (%)
1	upper surface	3.2	2.4	25
2	lower surface	3.2	3.0	6.3
3	both	3.1	3.0	3.2
4	none	3.1	2.2	29

(i) Calculate the percentage change in mass for leaf 3.

(2)

$$\begin{aligned} 3.1 - 3.0 &= 0.1 \\ 0.1 \div 3.1 &= \underline{\underline{3.2\%}} \end{aligned}$$

percentage change = 3.2 %



This answer also scores both marks.



## Question 7 (b)(ii)

(ii) Explain the differences in water loss from the four leaves in the student's experiment.

(3)

- Leaf 4 lost the most mass as both faces of the leaf were left uncovered. ∴ water could escape through the stomata
- leaf 1 lost a lot of water still as most of a leaf's stomata are on the lower surface
- leaf 3 lost the least amount as water could not escape as carbon dioxide could not enter either through either surface



This answer scores three marks for explaining that most water was lost when the leaf surfaces were uncovered, that water is lost through the stomata, and that most of the stomata are on the lower surface.

(ii) Explain the differences in water loss from the four leaves in the student's experiment.

(3)

Most water was lost when no surfaces were covered as the stomata could still open and allow for water to evaporate. When the upper surface was covered, less water evaporated compared to when no surfaces were covered due to water loss mainly occurring on the lower surface. The upper surface already has a waxy cuticle that prevents most water loss on the upper surface. Least transpiration occurred when both surfaces were covered as no water was allowed to evaporate or be lost. The guard cells on the lower surface control the opening and closing of the stomata which causes transpiration when left open.



**ResultsPlus**  
Examiner Comments

This response also scores three marks for explaining that most water is lost when no surfaces are covered, that most water is lost from the lower surface, and that the waxy cuticle reduces water loss from the upper surface.

(ii) Explain the differences in water loss from the four leaves in the student's experiment.

(3)

The ~~upper~~ lower surface of the leaf is where most of the water loss in a leaf occurs. This is because the stomata are located at the bottom and there is a waxy cuticle on the top layer, minimising evaporation. Water is evaporated through the stomata however if the petroleum jelly is covering evaporation



This response also gains three marks. It explains that most water loss occurs from the lower surface as this contains most stomata. It also explains that the upper surface has a waxy cuticle which reduces water loss.

## Paper Summary

Based on their performance on this paper, students are offered the following advice:

Ensure that you read the question carefully and include sufficient points to gain full credit

In comment items include as many points as there are marks available

Make sure you have practised calculations, especially percentages, and understand and know how to apply formulae

Write in detail and use correct and precise biological terminology

Revise practical work to help in questions about unfamiliar or novel practical procedures. Questions require students to make links between different parts of the specification, so when considering a question remember to use all the knowledge and understanding you have gained throughout the specification

In questions about experiments you need to be able to identify the independent variable, the dependent variable, and control variables

Always read through your responses and ensure that what you have written makes sense and answers the question fully

## **Grade boundaries**

Grade boundaries for this, and all other papers, can be found on the website on this link:

<https://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html>

