Pearson Edexcel

INTERNATIONAL GCSE

Biology (9-1)

EXEMPLARS WITH EXAMINER COMMENTARIES

PAPER 1

Pearson Edexcel International GCSE in Biology (4BI1)

Pearson Edexcel International GCSE in Science (Double Award) (4SD0)

Contents

Introduction

1.1 About this booklet

This booklet has been produced to support teachers delivering the Pearson Edexcel International GCSE in Biology (9-1) specification. The Paper 1 exemplar materials will enable teachers to guide their students in the knowledge and skills required to successfully complete this course. The booklet looks at questions 1 to 10 from the June 2019 examination series, showing real candidate responses to questions and how examiners have applied the mark schemes to demonstrate how student responses should be marked.

1.2 How to use this booklet

Each example covered in this booklet contains:

- Question
- Mark scheme
- Exemplar responses for the selected question
- Example of the marker grading decision based on the mark scheme, accompanied by examiner commentary including the rationale for the decision and where relevant, guidance on how the answer can be improved to earn more marks.

The examples highlight the achievement of the assessment objectives at lower to higher levels of candidate responses.

Centres should use this content to support their internal assessment of students and incorporate examination skills into the delivery of the specification.

1.3 Further support

A range of materials are available from the Pearson qualifications website to support you in planning and delivering this specification.

Centres may find it beneficial to review this document in conjunction with the Examiner's Report and other assessment and support materials available on the Pearson Qualifications website.

Question 1(b)(ii)

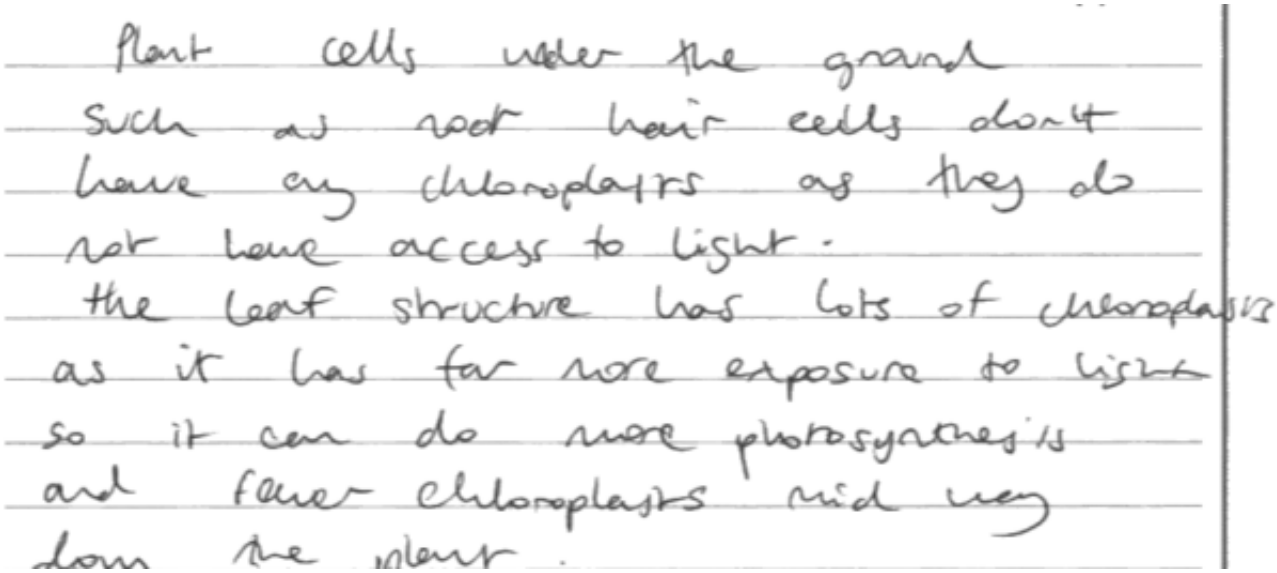
(ii) Explain why some plant cells contain many chloroplasts, some plant cells contain few chloroplasts and some plant cells contain no chloroplasts.

Marks available: 3

Mark scheme

Question Number	Answer	Additional guidance	Mark
1 (b)(ii)	An explanation that makes reference to three of the following: • photosynthesis (1) • (sun)light (1) • many in palisade (1) • few in spongy / few in guard (cells) (1) • none in upper epidermis / root (cells) (1)		**3**

Exemplar response A

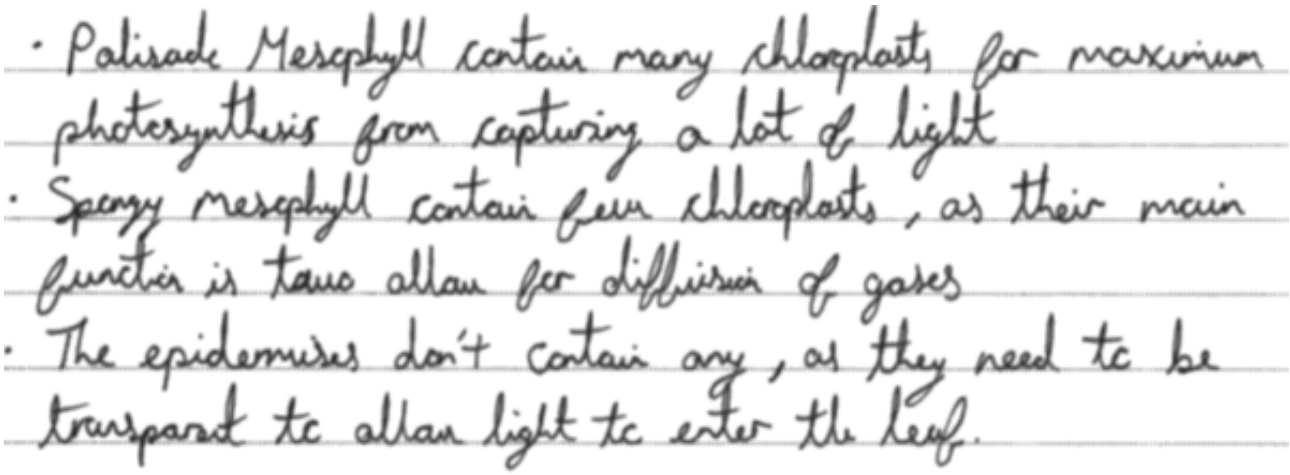

Plant cells under the ground such as root hair cells don't have any chloroplasts as they do not have access to light.
the leaf structure has lots of chloroplasts as it has far more exposure to light so it can do more photosynthesis and fewer chloroplasts mid way down the plant.

Examiner's comments:

This response was given 3 marks.

Line 2, marking point 5: for writing that root hair cells do not have any chloroplasts. The response also gains marking point 2 for reference to no access to light. Finally, on line 7, it gains marking point 1 for reference to photosynthesis.

Exemplar response B



Examiner's comments:

This response was also given 3 marks.

Line 1, marking point 3: for writing that palisade cells contain many chloroplasts. The response also gains marking point 1: for reference to photosynthesis and marking point 2: for 'capturing a lot of light'. The candidate also mentions that spongy mesophyll contains few chloroplasts, which is marking point 4. However, the response had already gained 3 marks.

Question 2(c)(ii)

(c) A student investigates the effect of genetic modification on the growth of salmon.

The student measures the mass and length of one normal salmon and one genetically modified salmon when both salmon are 18 months old.

The table shows the student's results.

Type of salmon	Mass in g	Length in cm
normal	1250	33
genetically modified	3000	61

(ii) The student concludes that his results show that genetically modified (GM) salmon are useful in providing a balanced diet.

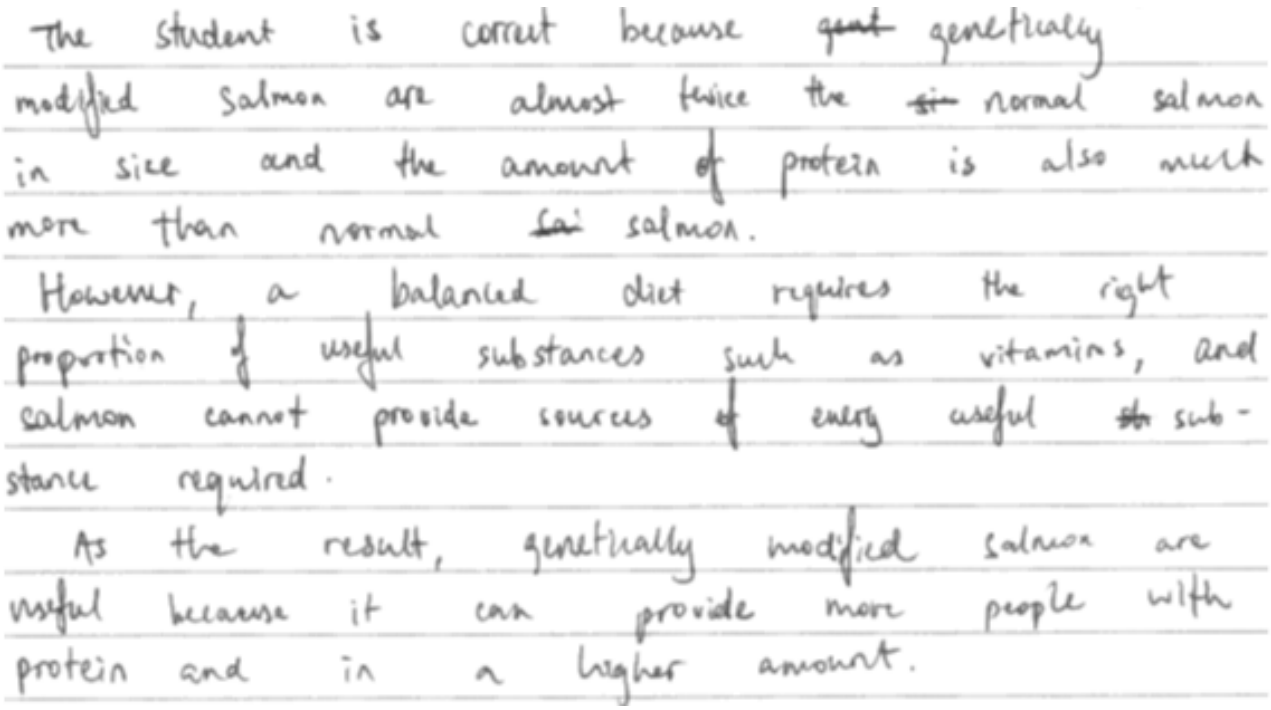
Discuss the student's conclusion.

(6)

Mark scheme

Question Number	Answer	Mark
2(c)(ii)	An answer that makes reference to six of the following points: • GM salmon grow more / heavier / longer / larger / more mass / grow faster / eq (1) • (more) protein provided (1) • only need protein in correct amount / only need sufficient protein / only need 50g / too much protein / excess protein / eq (1) • balanced diet also needs vitamins / carbohydrate / lipid / minerals / fibre / no idea of other **named** component in salmon (1) • one salmon used / not repeated/ should use several fish (1) • (data) not reliable / result may be anomalous (1) • no information on food supply to salmon / temperature / oxygen / pollution (1) • protein need depends on age / sex / activity / eq (1)	**6** **Mp1 Allow converse**

Exemplar response A


The student is correct because ~~gent~~ genetically modified salmon are almost twice the ~~si~~ normal salmon in size and the amount of protein is also much more than normal ~~Sai~~ salmon.

However, a balanced diet requires the right proportion of useful substances such as vitamins, and salmon cannot provide sources of every useful ~~sb~~ substance required.

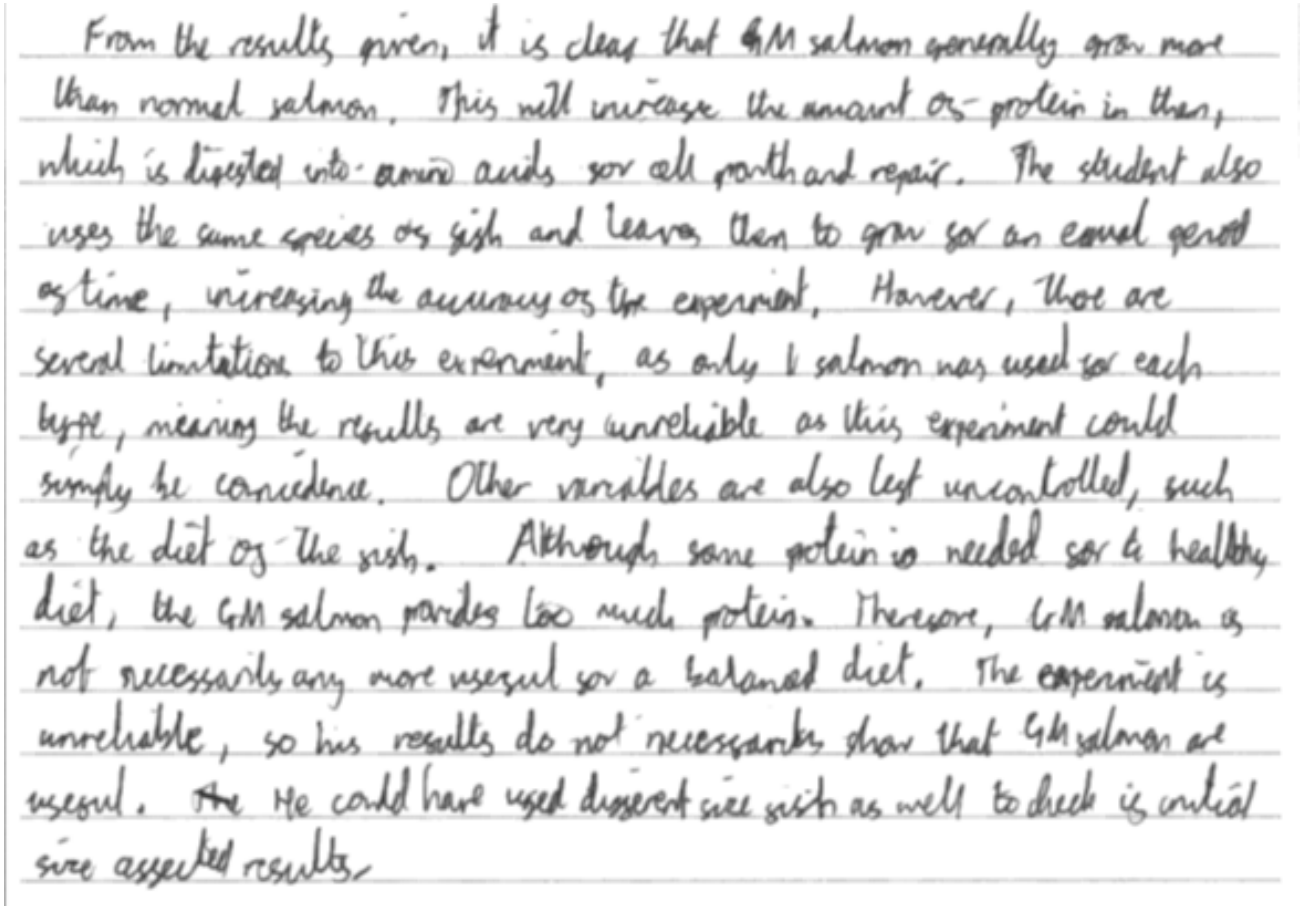
As the result, genetically modified salmon are useful because it can provide more people with protein and in a higher amount.

Examiner's comments:

This response was given 3 marks.

Lines 1–3, marking point 1: for the idea that the GM salmon is larger. Lines 3–4, marking point 2: 'contains more protein'. Lines 5–6, marking point 4: that a balanced diet requires vitamins.

Exemplar response B



From the results given, it is clear that GM salmon generally grow more than normal salmon. This will increase the amount of protein in them, which is digested into amino acids for cell growth and repair. The student also uses the same species of fish and leaves them to grow for an equal period of time, increasing the accuracy of the experiment. However, there are several limitations to this experiment, as only 1 salmon was used for each type, meaning the results are very unreliable as this experiment could simply be coincidence. Other variables are also left uncontrolled, such as the diet of the fish. Although some protein is needed for a healthy diet, the GM salmon provides too much protein. Therefore, GM salmon is not necessarily any more useful for a balanced diet. The experiment is unreliable, so his results do not necessarily show that GM salmon are useful. ~~The~~ He could have used different size fish as well to check if critical size affected results.

Examiner's comments:

This response was given 6 marks.

This excellent response gains all 6 marks. On line 1, marking point 1: GM salmon grow more. Line 2, marking point 2: 'increase amount of protein'. Lines 5–6, marking point 5: 'only one salmon was used', and line 7, marking point 6: 'unreliable'. Line 9, marking point 7: no idea of diet of fish. Finally, line 10, marking point 3: idea that GM salmon provides too much protein.

Question 3(b)

(b) Explain why the energy in some the mud worms is not all transferred to the organisms that eat them.

Marks available: 4

Mark scheme

Question Number	Answer	Additional guidance	Mark
3(b)	An explanation that makes reference to the following points: • respiration / movement / heat loss (1) • egested / undigested / faeces / not absorbed / not assimilated (1) • excreted / urine / urea (1) • uneaten (1) • death / <u>decomposition</u> (1)	Mp1 Ignore exercise / metabolism Mp3 excreted from the digestive system = 0	**4**

Exemplar response A

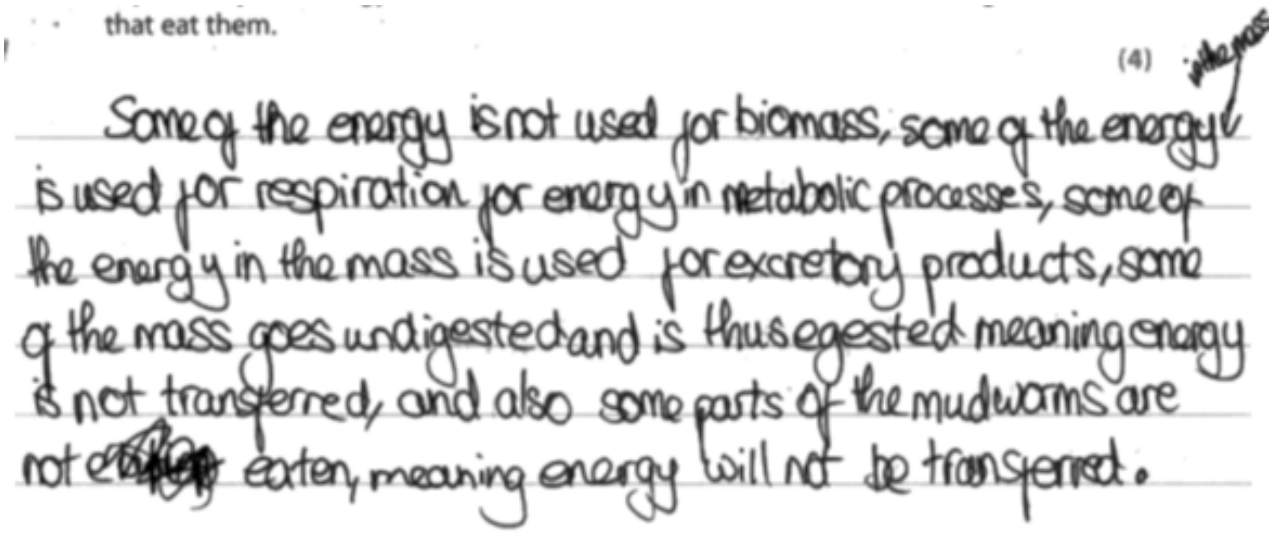
Energy is lost at each trophic level in a foodchain. It is predicted that around 90% is lost at each trophic level. Energy is also lost in processes such as respiration which releases heat as a by-product. The organisms that eat them may not also eat all of the mud worms meaning some parts are left which loses energy. Energy is also lost through egestion when undigested substances past through the body and are removed as faeces through the anus.

Examiner's comments:

This response was given 3 marks.

Lines 2–3, marking point 1: energy (lost) in respiration - although it is used, not lost. Line 4, marking point 4: not all mud worm consumed. Line 5, marking point 2: energy lost in egestion. Some candidates confused 'egestion' with 'excretion'.

Exemplar response B


that eat them.

(4)

Some of the energy is not used for biomass, some of the energy is used for respiration for energy in metabolic processes, some of the energy in the mass is used for excretory products, some of the mass goes undigested and is thus egested meaning energy is not transferred, and also some parts of the mudworms are not eaten, meaning energy will not be transferred.

Examiner's comments:

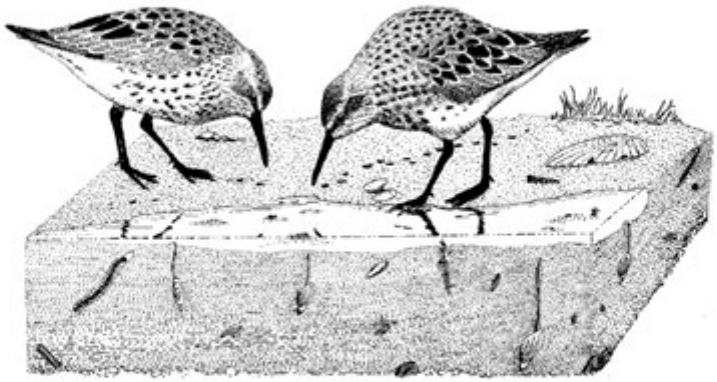
This response was given 4 marks.

This very good response scores 4 marks. Line 2, marking point 1: 'energy is used for respiration'. Line 3, marking point 3: 'excretory products'. Line 4, marking point 2: 'undigested'. Lines 5–6, marking point 4: 'some parts (...) not eaten'.

Question 3(c)

(c) The diagram shows sandpipers feeding.

Sandpipers have long beaks so that they can dig for worms in the mud.



(Source: © Birchside www.fotosearch.com)

Explain how sandpipers evolved to have long beaks.

(4)

Mark scheme

Question Number	Answer	Additional guidance	Mark
3 (c)	An answer that makes reference to four of the following points: • <u>variation</u> / <u>variety</u> / <u>varied</u> (1) • mutation (1) • longer beak means more worms/food / longer beak can reach deeper for worms/food (1) • <u>survival</u> and reproduction / breeding / offspring (1) • pass on gene / allele / DNA (1)	Allow converse for Mps 3, 4 and 5 mutation passed on = 1	**4**

Exemplar response A

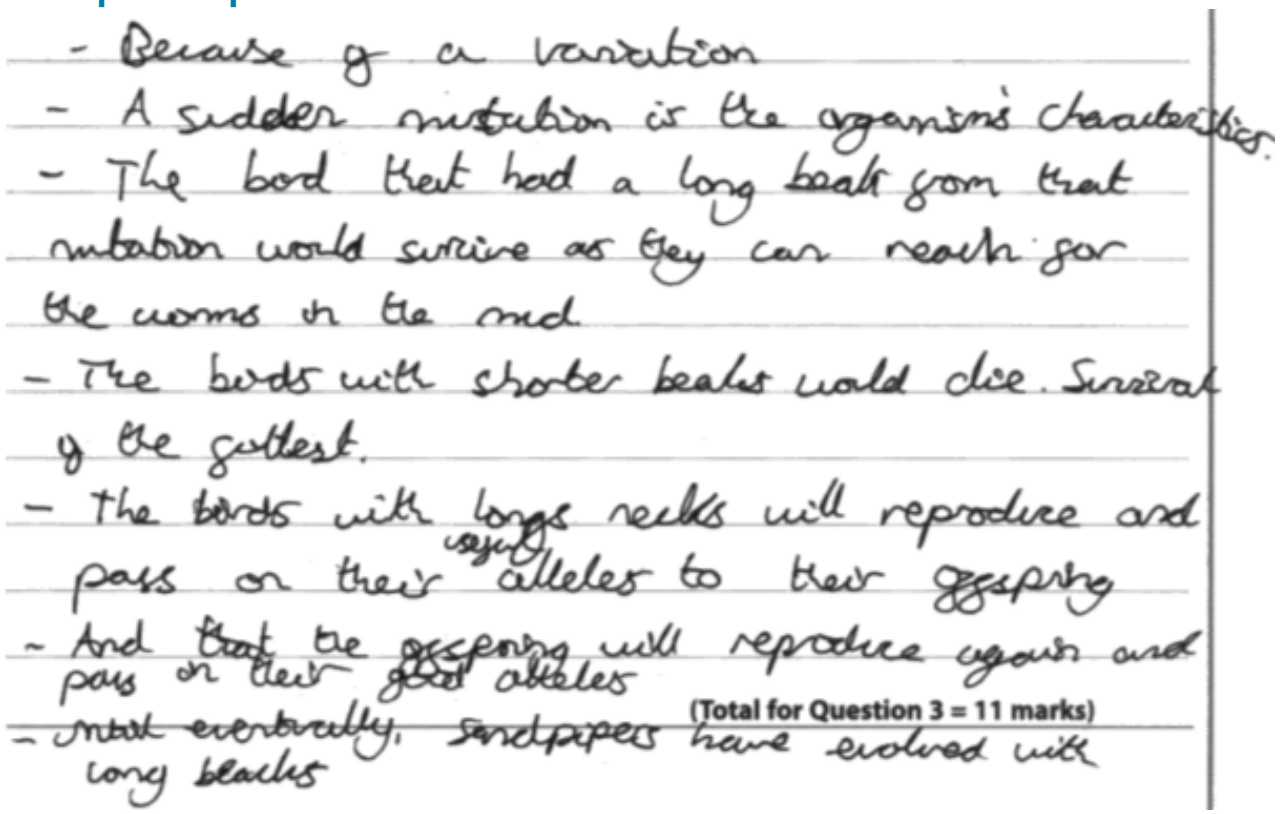
Due to mutations that cause variation in beak length, some birds have been able to obtain more food as their beaks have been longer and can reach the worms. This allows them to survive and reproduce, passing on the allele that causes the beak length to be passed onto offspring, allowing them to obtain food like the parent. The birds with unsuitable beaks die due to lack of food. This continues over many generations.

Examiner's comments:

This response was given 4 marks.

This excellent response scored 4 marks and made all five marking points. Line 1, marking point 2: mutation. Lines 1–2, marking point 1: 'variation in beak length'. Lines 2–4, marking point 3: longer beak reaches more worms. Line 5, marking point 4: survive and reproduce. Lines 5–6, marking point 5: pass on allele.

Exemplar response B


- Because of a variation
- A sudden mutation is the organisms characteristics.
- The bird that had a long beak from that mutation would survive as they can reach for the worms in the mud
- The birds with shorter beaks would die. Survival of the fittest.
- The birds with longs necks will reproduce and pass on their useful alleles to their offspring
- And that the offspring will reproduce again and pass on their good alleles
- most eventually, sandpipers have evolved with long beaks

(Total for Question 3 = 11 marks)

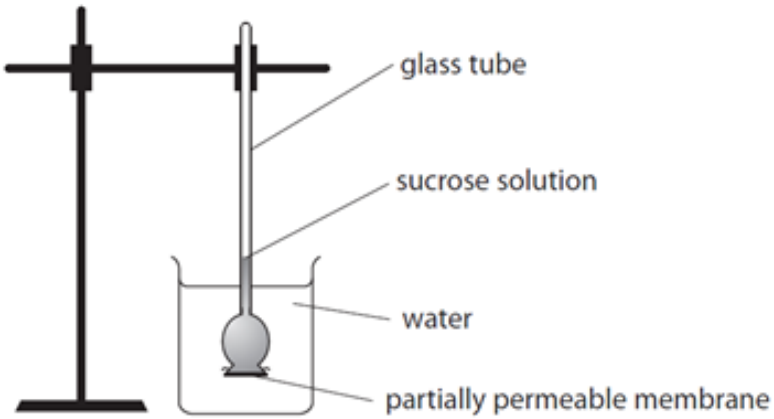
Examiner's comments:

This response was given 4 marks.

This very good response also scores 4 marks and makes all five marking points.

Question 4(a)

4 This apparatus can be used to show osmosis.



(a) Explain what happens to the level of the sucrose solution in the glass tube.

(3)

Mark scheme

Question Number	Answer	Additional guidance	Mark
4(a)	An explanation that makes reference to the following points: • moves up / increases (1) • water enters / water passes through membrane (1) • sucrose is a concentrated solution / sucrose has a low(er) water potential / high water potential to low water potential / down a water potential gradient / dilute to concentrated (1)	Mp3 Allow high conc. to low conc. of <u>water</u> / down water conc gradient	**3**

Exemplar response A

As the water has a higher water potential than the sucrose solution the water would move (through the partially permeable membrane) down the water potential gradient by osmosis into the sucrose solution. The level of the solution would actually increase as although the amount of sucrose is the same there would be more water and so a higher volume inside the glass tube

Examiner's comments:

This response was given 3 marks.

This excellent response scored all 3 marks. Line 1, marking point 3: 'water has a higher water potential than sucrose solution'. Lines 2–3, marking point 2: water passes through membrane. Lines 4–5, marking point 1: level of solution increases.
This response uses water potential to describe the direction of water movement rather than concentration of solution.

Exemplar response B

(3)

molecules move
Water ~~across~~ into the thistle funnel via osmosis down a water concentration gradient across the partially permeable membrane. This increases the level of fluid in the glass tube, so the level of the sucrose solution in the glass tube rises.

Examiner's comments:

This response was given 3 marks.

This response also scores all 3 marks. However, it uses the notion of water concentration which can be confusing. We suggest describing osmosis in terms of water potential gradient or movement of water from a dilute solution (or water) to a more concentrated solution.

Question 4(b)

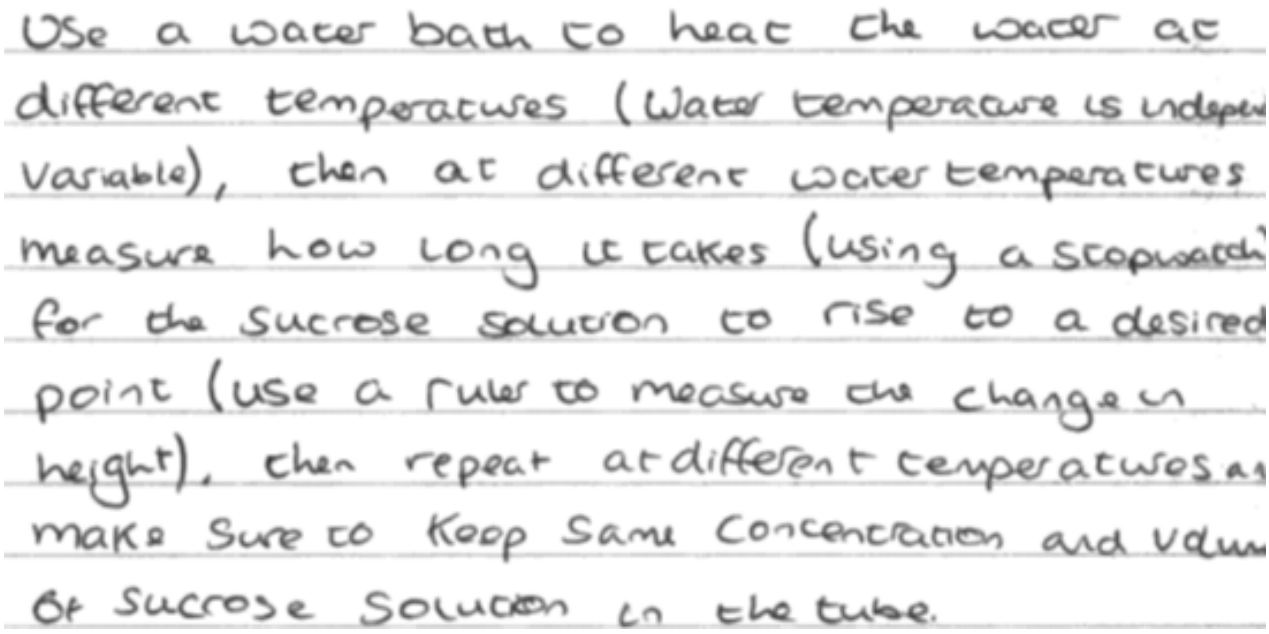
(b) Describe how this apparatus could be modified to measure the rate of osmosis at different temperatures.

Marks available: 3

Mark scheme

Question Number	Answer	Mark
4(b)	An explanation that makes reference to the following points: • use water bath / use Bunsen (1) • use scale / measurements (on tube)/ ruler / (use pen to) mark tube (1) • use clock / timer / stopwatch (1)	**3**

Exemplar response A

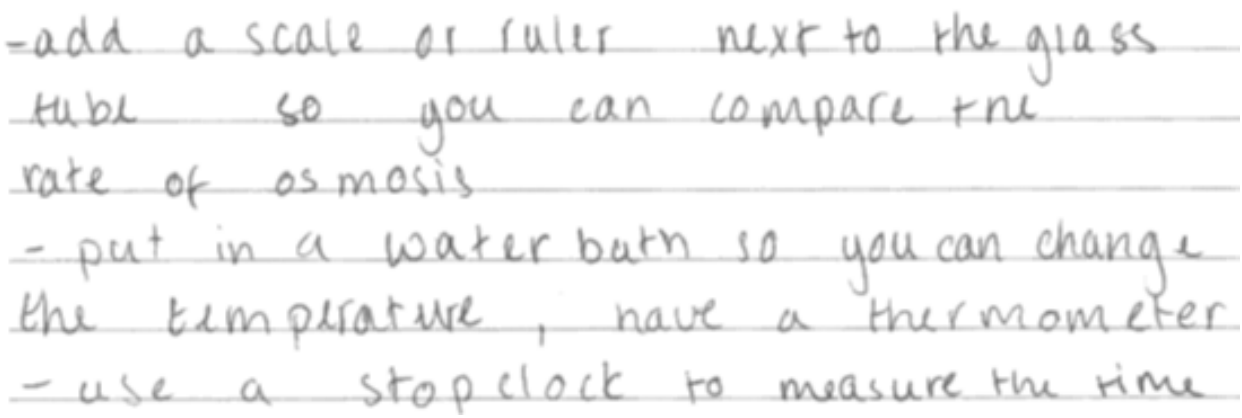


Examiner's comments:

This response was given 3 marks.

This response scores all 3 marks. Line 1, marking point 1: use water bath. Line 4, marking point 3: use stopwatch; and line 6, marking point 2: use ruler.
Often candidates failed to read the question carefully and did not describe the apparatus.

Exemplar response B



Examiner's comments:

This response was given 3 marks.

This response also scores all 3 marks for marking point 2: scale; marking point 1: water bath; and marking point 3: stop clock.

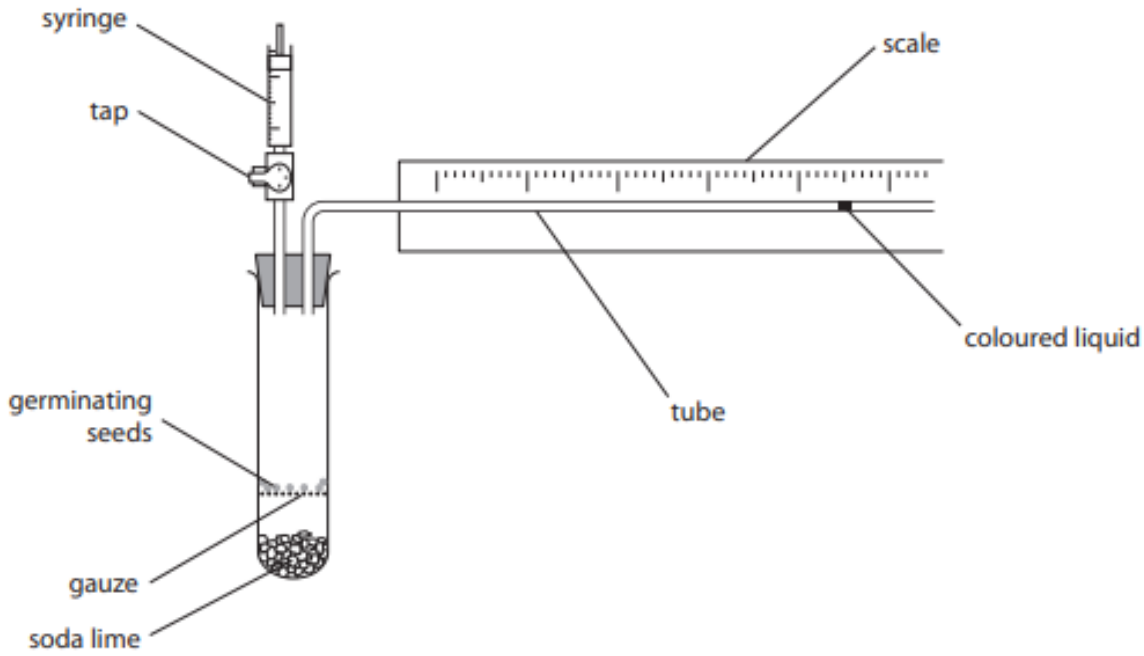
Question 5(b)(i)

5 Wheat seeds contain stores of a large insoluble molecule.

This molecule is digested by amylase as the seeds germinate.

(b) A student investigates the oxygen absorbed by germinating seeds at different temperatures.

The diagram shows some of the student's apparatus.



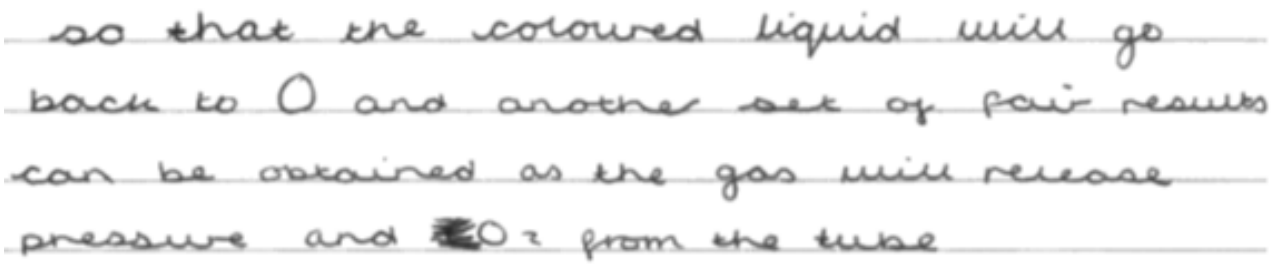
(i) Suggest why the student opens the tap after obtaining one set of results.

(2)

Mark scheme

Question Number	Answer	Mark
5(b)(i)	An answer that makes reference to two of the following points: • reset (the coloured water) / eq (1) • repeat readings / reliable results / more results (1) • allow oxygen in / (aerobic) respiration / prevent anaerobic respiration (1)	**2**

Exemplar response A



Examiner's comments:

This response was given 2 marks.

Line 1, marking point 1: for equivalent of reset the coloured liquid; and line 2, marking point 2: so another set of results can be obtained.

Question 5(c)(ii)

(ii) Suggest why the rate of oxygen absorption is greater at 22°C than at 12°C.

Marks available: 2

Mark scheme

Question Number	Answer	Additional guidance	Mark
5(c)(ii)	An answer that makes reference to two of the following points: • (more) respiration (1) • enzymes (1) • (more)(kinetic) energy / collisions / enzyme substrate complexes / move faster / eq (1)	Allow converse	**2**

Exemplar response A

~~At~~ 22°C is a higher temperature than 12°C. The enzymes used for aerobic respiration (which is what the oxygen is needed for) will work more efficiently at this higher temperature because there will be more successful collisions with the substances, therefore more oxygen needed to keep the reaction going.

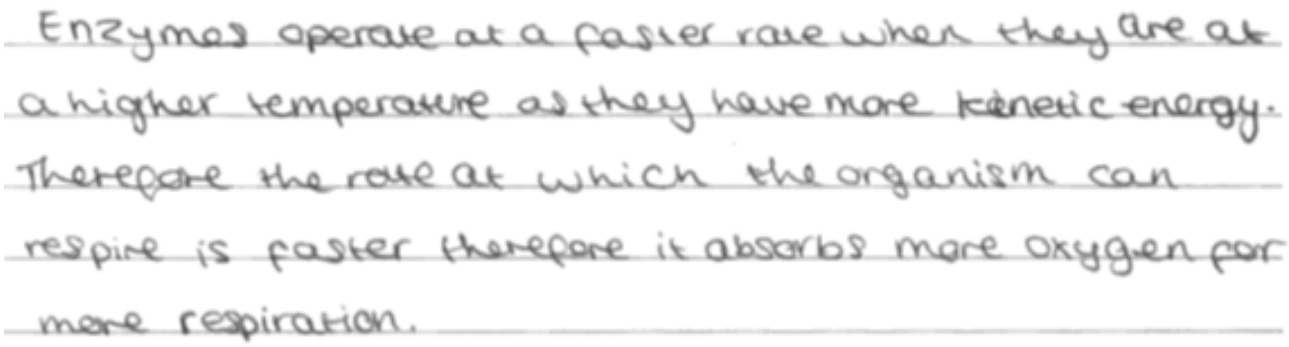
(Total for Question 5 = 11 marks)

Examiner's comments:

This response was given 2 marks.

This response scores 2 marks but makes all three marking points. Lines 1-2, marking point 2: enzymes. Line 2, marking point 1: (more) respiration; and lines 5-6, marking point 3: more collisions.

Exemplar response B


Enzymes operate at a faster rate when they are at a higher temperature as they have more kinetic energy. Therefore the rate at which the organism can respire is faster therefore it absorbs more oxygen for more respiration.

Examiner's comments:

This response was given 2 marks.

This response also scores 2 marks but makes all three marking points. Line 1, marking point 2: enzymes. Line 2, marking point 3: more kinetic energy; and line 4, marking point 1: respire faster.

Question 6(b)(ii)

(b) Nicotine is a chemical found in cigarettes.

A scientist investigates how nicotine affects sperm cells.

The scientist gives male rats different concentrations of nicotine.

He then calculates the percentage of damaged sperm cells in the semen produced by each rat.

The table shows his results.

Concentration of nicotine in mg per kg of rat	Percentage of damaged sperm cells (%)
0.0	6.4
0.5	16.8
1.0	24.8

(ii) The scientist concludes that cigarette smoking could make male humans infertile.

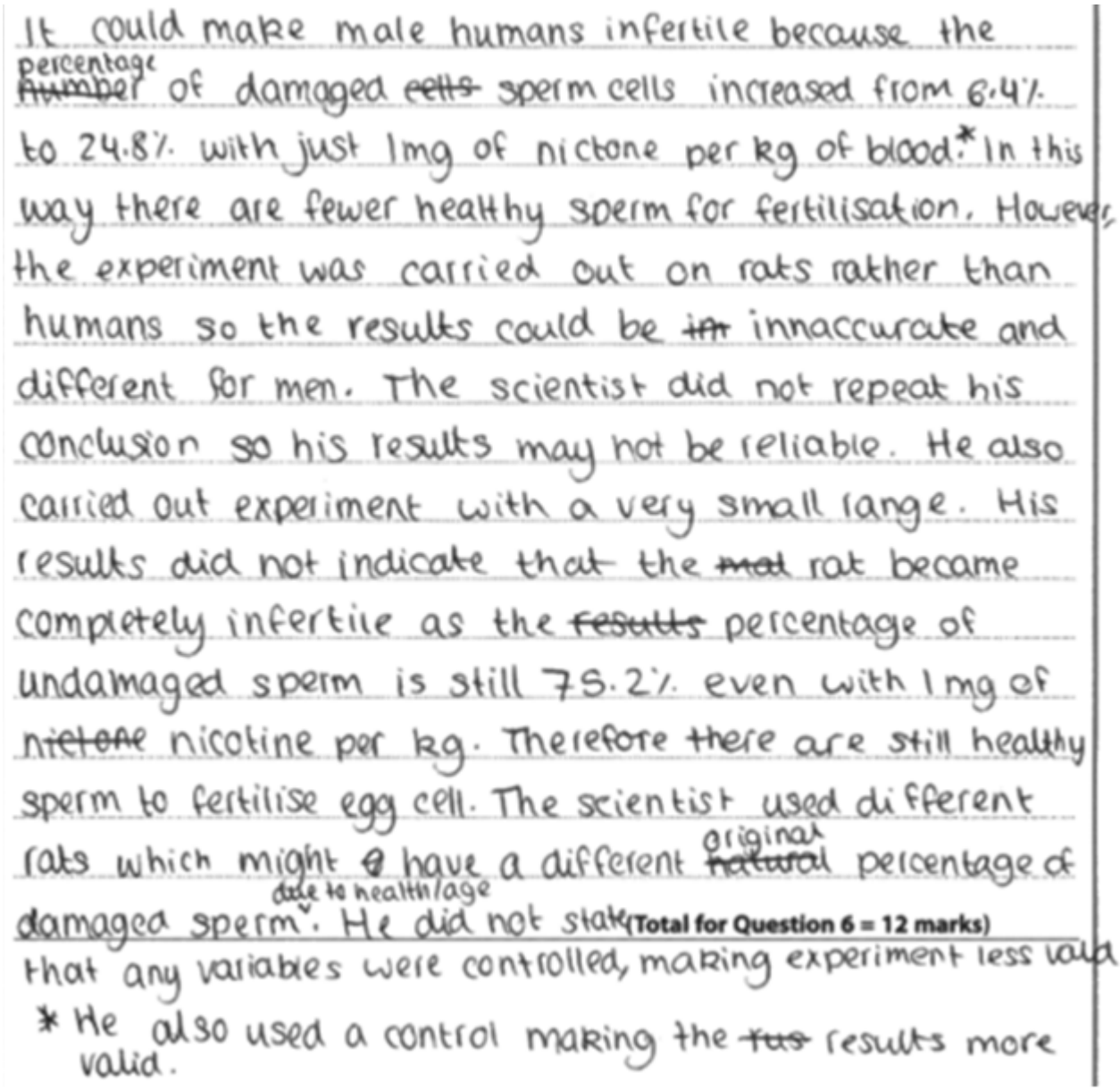
Discuss this conclusion.

(5)

Mark scheme

Question Number	Answer	Mark
6(b)(ii)	An explanation that makes reference to five of the following points: <u>Arguments for:</u> • nicotine reduces normal/undamaged cells / nicotine increases damaged cells (1) • less (chance of) fertilisation / eq (1) • rats are similar to humans / rats are mammals / eq (1) <u>Arguments against:</u> • there are normal/undamaged sperm cells in nicotine samples / there are damaged cells with no nicotine (1) • investigation on rats (not humans) / eq (1) • rats were not smoking / small range(of concentrations) / no idea of nicotine concentration in cigarettes / eq (1) • not repeated / no idea of number of rats / not reliable (1)	**5**

Exemplar response A



It could make male humans infertile because the ~~number~~ percentage of damaged ~~cells~~ sperm cells increased from 6.4% to 24.8% with just 1mg of nictone per kg of blood.* In this way there are fewer healthy sperm for fertilisation. However, the experiment was carried out on rats rather than humans so the results could be ~~in~~ innaccurate and different for men. The scientist did not repeat his conclusion so his results may not be reliable. He also carried out experiment with a very small range. His results did not indicate that the ~~mal~~ rat became completely infertile as the ~~results~~ percentage of undamaged sperm is still 75.2% even with 1mg of ~~nictone~~ nicotine per kg. Therefore there are still healthy sperm to fertilise egg cell. The scientist used different rats which might have a different ~~natural~~ original percentage of damaged sperm due to health/age. He did not state that any variables were controlled, making experiment less valid

(Total for Question 6 = 12 marks)

* He also used a control making the ~~fair~~ results more valid.

Examiner's comments:

This response was given 5 marks.

This excellent response scores all 5 marks but actually makes six marking points.
Line 2, marking point 1: 'percentage of damaged sperm cells increased'. Line 4, marking point 2: less fertilisation. Lines 5–6, marking point 5: rats, not humans. Line 8, marking point 7: not reliable. Line 9, marking point 6: small range; and lines 11–12, marking point 4: some undamaged sperm at 1mg nicotine.

Exemplar response B

- The conclusion is correct, however the conclusion has been obtained from rat sperm, human sperm may be affected differently.
- He is correct that smoking could make humans infertile because damaged sperm may have problems with fertilising the egg.
- However, only if the cigarette smoking is extreme will the man become infertile as all of the sperm will have to be damaged, even high concentration of nicotine in mg per kg of rate has around 75% healthy sperm.
- Therefore the conclusion/experiment should be done again testing human sperm to make the results/ conclusion more accurate & reliable for humans.

Examiner's comments:

This response was given 4 marks.

This response earned 4 marks. Line 2, marking point 5: using rat sperm. Lines 4–5, marking point 2: problems fertilising an egg. Lines 8–9, marking point 4: not all sperm damaged. Lines 13–14, marking point 7: idea of repeating to improve reliability.

Question 7(a)(iii)

(iii) The student is now given sugar solutions with concentrations of 1%, 5%, 10% and 20%. Explain how the student could use these solutions to estimate the concentration of sugar in the four fruit juices.

Marks available: 3

Mark scheme

Question Number	Answer	Additional guidance	Mark
7 (a)(iii)	An explanation that makes reference to three of the following: • use 5cm^3 / same volume of each (sugar) solution **and** use 5cm^3 / same volume of Benedict's (1) • heat at same temperature **and** for 3 minutes / heat at 70°C **and** for 3 minutes (1) • match / compare <u>colour</u> of sugar solutions with fruit juices / eq (1)	use the original/ same method alone = 1 only if mp1 or mp2 are not awarded	**3**

Exemplar response A

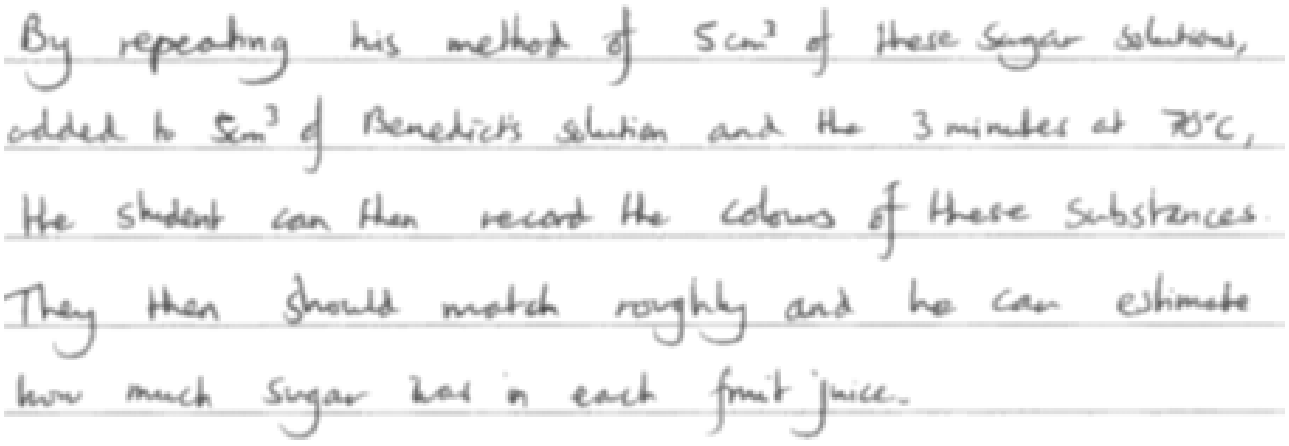
add 5cm^3 of sugar solution to a boling tube, then add 5cm^3 of Benedict's solution to the boling tube. place the boling tube in a water bath at 70°C for three minutes, remove the boiling tube and record the colour. Match the colour ~~with~~ of sugar solution with the fruit juice to find out the concentration of sugar in the fruit juice. Repeat the experiment with other concentration of sugar solution.

Examiner's comments:

This response was given 3 marks.

This response scored all 3 marks for marking point 1 for adding 5 cm^3 of solution and 5 cm^3 of Benedict's. It also gains marking point 2 for heating in water bath at 70°C for 3 minutes, and finally marking point 3 for matching the colours.

Exemplar response B



Examiner's comments:

This response was also given 3 marks.

This also scores all 3 marks for marking point 1 for adding 5 cm^3 of solution and 5 cm^3 of Benedict's.
It also gains marking point 2 for heating in water bath at 70°C for 3 minutes, and finally marking point 3 for matching the colours.

Some responses stated 'repeat the first experiment', did not specify volumes, temperature or time.

Question 8(a)(ii)

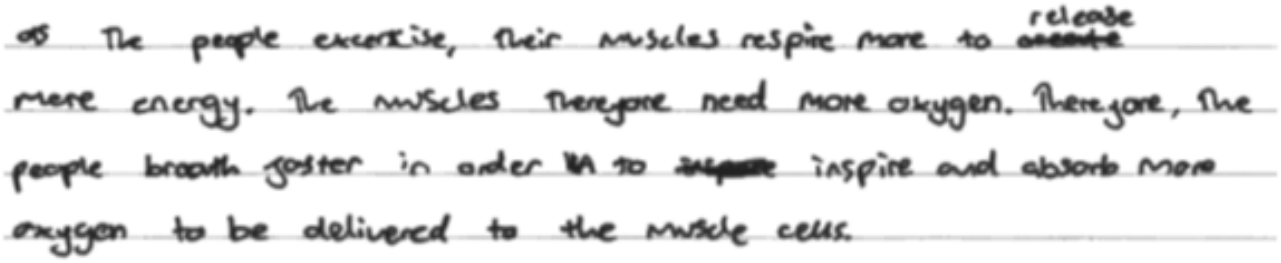
(ii) Explain the change in breathing rate during exercise.

Marks available: 3

Mark scheme

Question Number	Answer	Mark
8(a)(ii)	An explanation that makes reference to three of the following points: • increases (1) • oxygen for respiration / aerobic respiration (1) • muscle (1) • remove carbon dioxide (1)	**3**

Exemplar response A

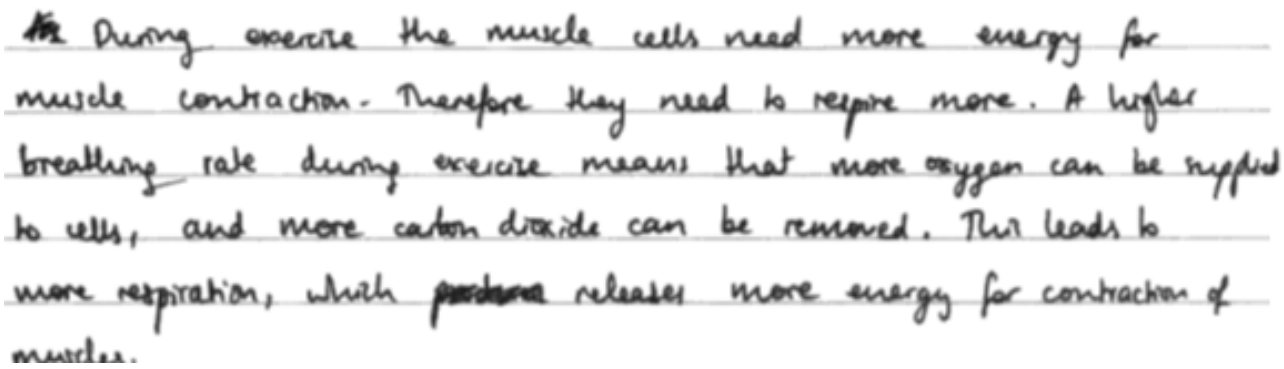


Examiner's comments:

This response was given 3 marks.

This gains all 3 marks. Marking point 3: muscles; marking point 2: respire and need more oxygen; and marking point 1: breathe faster.

Exemplar response B


During exercise the muscle cells need more energy for muscle contraction. Therefore they need to respire more. A higher breathing rate during exercise means that more oxygen can be supplied to cells, and more carbon dioxide can be removed. This leads to more respiration, which releases more energy for contraction of muscles.

Examiner's comments:

This response was also given 3 marks.

This excellent answer scores 3 marks but makes all four marking points. Marking point 3: muscles; marking point 1: higher breathing rate; marking point 2: for more oxygen for respiration, and finally marking point 4: for more carbon dioxide can be removed.

Question 8(b)

8 A scientist investigates the effect of exercise on breathing rate.

She measures the breathing rate in breaths per minute of two people, P and Q, every 5 minutes for 30 minutes.

This is her method.

- measure their breathing rate every 5 minutes while they exercise for 20 minutes
- measure their breathing rate every 5 minutes for a further 10 minutes while they recover from the exercise

The table shows her results.

Time in minutes	Breathing rate in breaths per minute	
	Person P	Person Q
0	12	15
5	20	24
10	22	24
15	25	23
20	24	20
25	16	19
30	12	15

(b) The time taken to recover from exercise is often a good measure of fitness.

The scientist concluded that person P is much fitter than person Q.

Comment on the validity of this conclusion.

(4)

Mark scheme

Question Number	Answer	Mark
8(b)	An answer that makes reference to four of the following points: (P may be fitter): • P has lower breathing rate at rest / Q has higher breathing rate at rest (1) • P drops more (after exercise) / Q drops less (after exercise)/ P recovers faster (after exercise)/ Q recovers slower (after exercise) (1) (P may not be fitter): • both return to normal in same time / both return to normal by 30 minutes (1) • P breathing rate higher /Q breathing rate lower/ P increase more than Q /Q increase less than P (1) (Design): • no data on age / sex / mass / lung size (1) • may have lung disease / asthma / smoke / drugs / medication / altitude training / nervousness / adrenaline / eq (1) • no data on exercise intensity /type/amount/hardness/ only one measure of fitness / no information on heart rate (1) • not repeated / only tested once / eq (1)	**4**

Exemplar response A

This conclusion may be invalid as it actually took the same amount of time for person P and person Q to return to their initial breathing rates. However, person P had a lower resting breathing rate so in fact had a faster rate of recovery, potentially showing they are fitter. Also, person P, whilst exercising had a higher peak breathing rate so their rate of recovery was faster. However, the conclusion may not be entirely valid as the results are not reliable. The experiment was not repeated or averaged so some results may be anomalies.

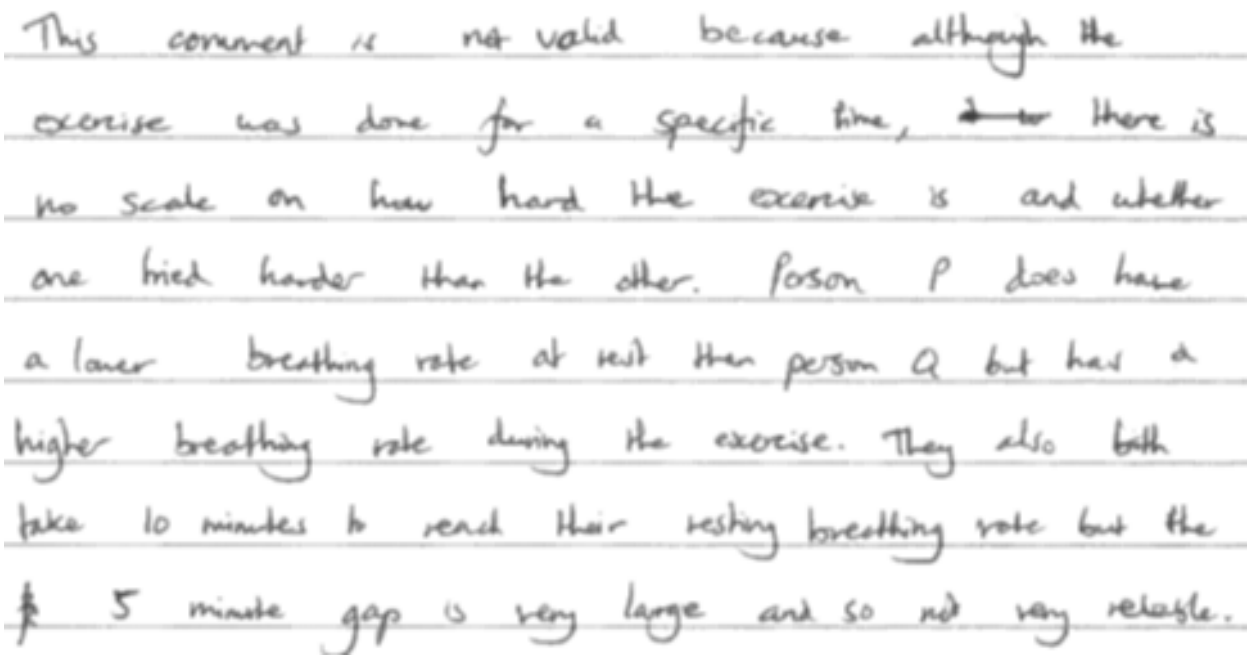
(Total for Question 8 = 15 marks)

Examiner's comments:

This response was given 4 marks.

This excellent response gained 4 marks but made five of the marking points. Lines 1–3, marking point 3: same time to return to initial rates. Lines 3–4, marking point 1: person P has lower resting breathing rate. Lines 6–7, marking point 4: person P had a higher peak breathing rate. Line 8, marking point 2: recovers faster; and line 10, marking point 8: not repeated.

Exemplar response B


This comment is not valid because although the exercise was done for a specific time, there is no scale on how hard the exercise is and whether one tried harder than the other. Person P does have a lower breathing rate at rest than person Q but has a higher breathing rate during the exercise. They also both take 10 minutes to reach their resting breathing rate but the 5 minute gap is very large and so not very reliable.

Examiner's comments:

This response was also given 4 marks.

This scores 4 marks for lines 3–4, marking point 7: no indication of intensity/how hard the exercise was. Lines 4–5, marking point 1: P had lower breathing rate at rest. Lines 5–6, marking point 4: Q had higher rate during exercise; and lines 6–7, marking point 3: both take 10 minutes to reach resting rate after exercise.

Some candidates wrote about heart rate rather than breathing rate.

Question 9(b)

(b) Water pollution can occur if sewage enters a river.

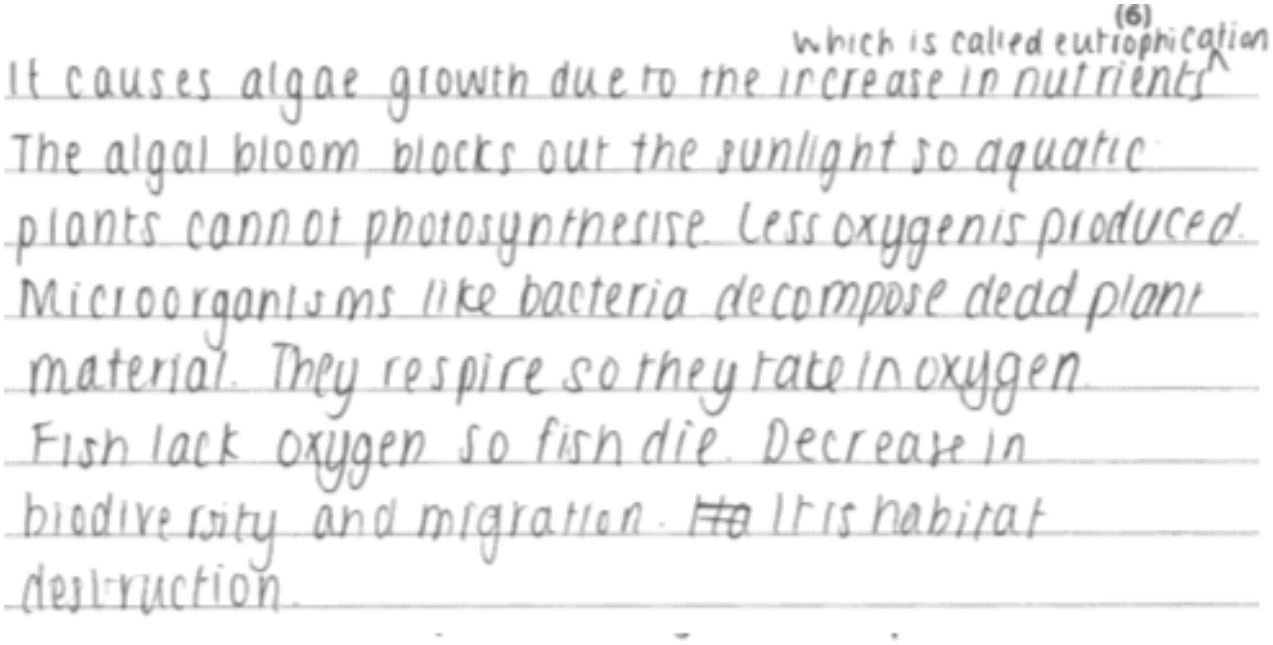
Explain the biological consequences of sewage pollution on a river ecosystem.

Marks available: 6

Mark scheme

Question Number	Answer	Mark
9(b)	An explanation that makes reference to six of the following points: • pathogenic bacteria / cause disease (1) • urea / urine / nitrogenous waste / nitrate / phosphate (1) • decomposition / decomposed / decomposers (ONCE) (1) • eutrophication / plant growth / algae growth (1) • (plants) block light / prevents photosynthesis (1) • respiration (ONCE) (1) • (less) oxygen (1) • death of organisms (ONCE) / reduce biodiversity / eq (1)	**6**

Exemplar response A



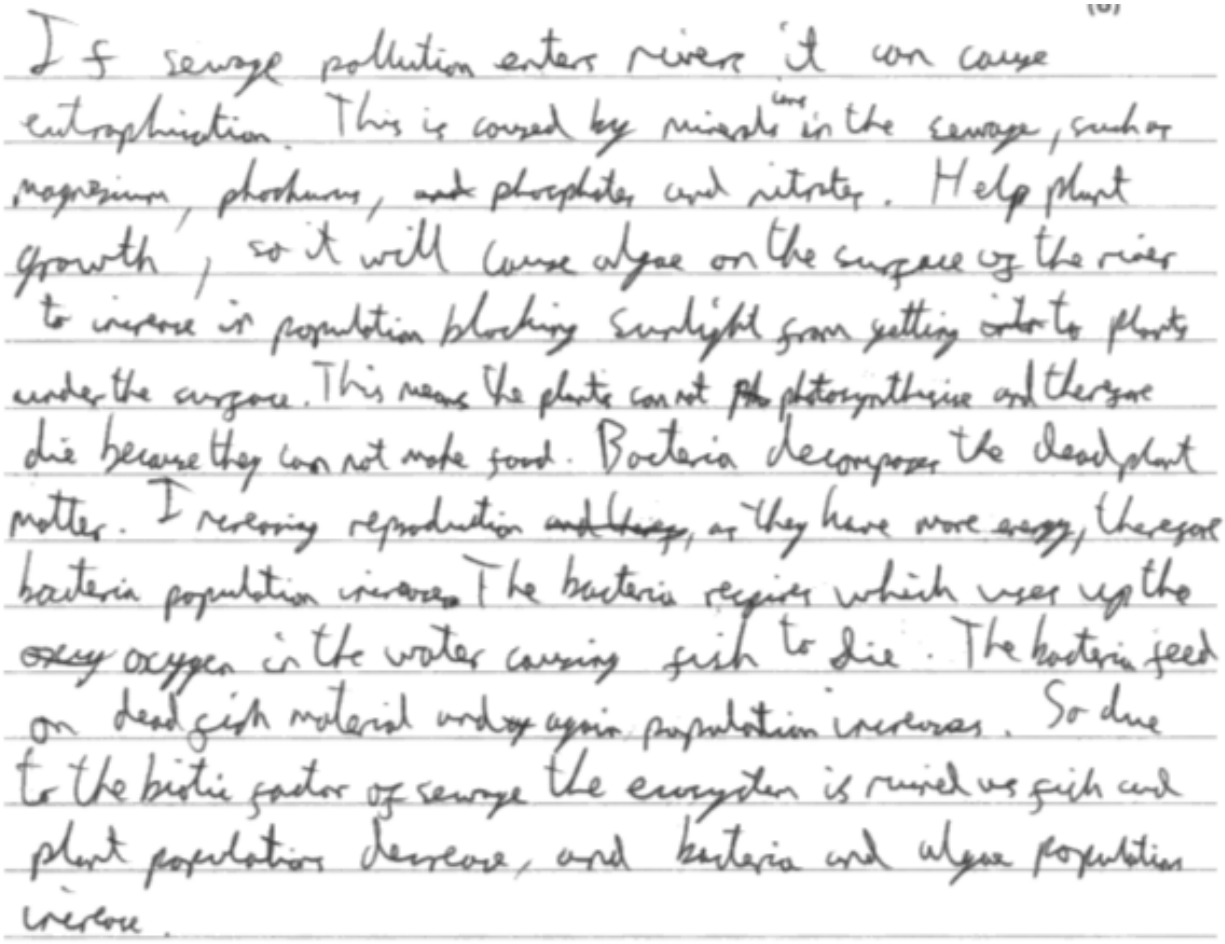
Examiner's comments:

This response was given 6 marks.

This concise response scores full marks. Line 1, marking point 4: algal bloom. Line 2, marking point 5: blocks light. Line 3, marking point 7: less oxygen. Line 4, marking point 3: decomposition. Line 5, marking point 6: respire; and line 6, marking point 8: organisms die.

This shows that candidates can gain full marks with concise and well thought-out answers.

Exemplar response B



If sewage pollution enters rivers it can cause eutrophication. This is caused by minerals in the sewage, such as magnesium, phosphorus, and phosphates and nitrates. Help plant growth, so it will cause algae on the surface of the river to increase in population blocking sunlight from getting into to plants under the surface. This means the plants can not photosynthesise and therefore die because they can not make food. Bacteria decomposes the dead plant matter. Increasing reproduction and they, as they have more energy, therefore bacteria population increases. The bacteria respires which uses up the oxygen in the water causing fish to die. The bacteria feed on dead fish material and they again population increases. So due to the biotic factor of sewage the ecosystem is ruined as fish and plant population decrease, and bacteria and algae population increase.

Examiner's comments:

This response was given 6 marks.

Line 2, marking point 4: eutrophication. Line 3, marking point 2: nitrates. Line 5, marking point 5: blocks light. Lines 6–7, marking point 8: plants die. Line 7, marking point 3: decompose' and lines 10–11, marking point 7: use oxygen.

Question 10(c)

(c) Plant growth substances stimulate root growth from a cut stem.
Describe an investigation to find the best concentration of plant growth substance to stimulate root growth.
You should include experimental details in your answer and write in full sentences.

Marks available: 6

Mark scheme

Question Number	Answer	Additional guidance	**Mark**
10(c)	A description that makes reference to six of the following points: • C change / different concentrations of growth substances (1) • O same species / same plant / same type of plant/ named plant / same age / same size / eq (1) • R repeat (1) • M1 count number of roots / length of roots / measure roots with ruler / eq (1) • M2 stated time period of one day plus (1) • S1 same (control) temperature / oxygen / light / carbon dioxide (1) • S2 same compost / water / humidity / soil / mineral ions / named mineral ion / same <u>volume</u> of plant growth substance (1)	Auxin and no auxin = 0 M1 Ignore mass S2 Ignore nutrients	**6**

Exemplar response A

- Have a range of different concentrations (and up.
- At same time, place ~~the~~ a plant in each concentration of plant growth substance.
- After 4 weeks, measure and record the length of each plant.
- Repeat this ~~for~~ process.
- whilst doing this ~~e~~xperiment, you should:
  - have all the same species of plant
  - keep the temperature the same for each plant
  - keep volume of concentration the same
  - keep them in the same area.
- these ensure that the experiment is fair so that it produces the best results
- ∴ you can see what the best concentration of plant growth substance is.

Examiner's comments:

This response was given 6 marks.

This scores 6 marks but makes 7 points - line 1: C for range of concentrations, line 5: M2 for 4 weeks, line 5: M1 for record length, line 7: R repeat, line 9: O for same species, line 10: S1 for temperature, and line 11: S2 for same volume.

Exemplar response B

Take 5 disjerent stem cuttings all grom the same plant* ~~&~~ be 5 disjerent concentrations g plant growth substances with the same dissference in concentration between them. Then leave them to grow gor a set period g time e.g 5 days. You should keep all g the other variables the same like the same light, same volume g water, same temperature. Then agter the period g time remove the stems grom the plant growth substance and reweigh them. the heaviest plant has had the highest root growth. You should then repeat your experiment and plot your results on a graph.

* They should all be the same weight aswell.

Examiner's comments:

This response was also given 6 marks.

This scores 6 - line 1: O, line 2: C, line 5: M2, line 7: S1, line 7: S2 and finally line 10: R.

For information about Pearson Qualifications, including Pearson Edexcel, BTEC and LCCI qualifications visit qualifications.pearson.com

Edexcel and BTEC are registered trademarks of Pearson Education Limited

Pearson Education Limited. Registered in England and Wales No. 872828
Registered Office: 80 Strand, London WC2R 0RL

VAT Reg No GB 278 537121

Getty Images: Alex Belmonlinsky

Pearson
Edexcel