ResultsPlus

Introduction

Examiners were once again pleased with the level of knowledge and understanding shown by the candidates taking the examination this Summer. Centres and candidates have worked hard to prepare for this examination and this hard work was evident in many of the answers. Responses showed that candidates were not only able to demonstrate knowledge and understanding across the specification topics but also able to apply this knowledge to new and unfamiliar contexts. The question on a printed passage proved to be challenging to some candidates despite it being on a familiar specification topic. There was little evidence of candidates running out of time on the paper and all marking points were accessible to some candidates.

Question 1 (a)

Question1 was on the topic of offshore or freshwater fish farming. Although this was a familiar topic to candidates some items proved more challenging than expected.

In Q01(a) candidates were asked to suggest why deep sea fishing has a risk of serious injury or death to people. Most responses gained this mark with reference to drowning or effects of storms out at sea. A number of responses however wrote about the risks of deep sea diving such as high pressure.

> The main species produced by freshwater farming are carp, tilapia and catfish. These fish are herbivores or omnivores. In the farms they are fed small amounts of fish to speed up growth, but their main diet is the by-products of crops like rice, groundnut and soy. Farmed freshwater fish are an affordable food for millions of low- and middle-income consumers.
>
> (a) Suggest why deep sea fishing has a risk of serious injury or death to people. (lines 2 to 3)
>
> (1)

(30) 29

Chances of drowning are high as people may dive in to collect fish or the larger fish may pull fishermen inside.

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Examiner Comments

This scores one mark for suggesting drowning as a risk.

2⁶The main species produced by freshwater farming are carp, tilapia and catfish. These
2⁸fish are herbivores or omnivores. In the farms they are fed small amounts of fish to
2⁹speed up growth, but their main diet is the by-products of crops like rice, groundnut
2⁹and soy. Farmed freshwater fish are an affordable food for millions of low- and
3⁰middle-income consumers.

number 29.   (30)

(a) Suggest why deep sea fishing has a risk of serious injury or death to people.
(lines 2 to 3)

(1)

could lead to disease and exposure to high
winds and water speeds, person could fall in sea

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Examiner Comments

This also gains the mark for reference to high winds and falling into the sea.

The main species produced by freshwater farming are carp, tilapia and catfish. These
fish are herbivores or omnivores. In the farms they are fed small amounts of fish to
speed up growth, but their main diet is the by-products of crops like rice, groundnut
and soy. Farmed freshwater fish are an affordable food for millions of low- and
middle-income consumers.

30 2+

(a) Suggest why deep sea fishing has a risk of serious injury or death to people.
(lines 2 to 3)

(1)

Unpredictable tides and storms are more likely to occur deeper into
sea than closer to shore, there are more dangerous factors
deeper at sea than closer to shore

⭐ ResultsPlus
Examiner Comments

This also scores the mark for reference to storms.

Question 1 (b)

In Q01(b) candidates were asked to give three reasons why the scientists' prediction of an increase in ocean fish production to 44 million tonnes by 2050 is only an estimate. This item proved to be challenging to some candidates with only the best responses gaining two or more marks.

Many candidates gained the first marks by appreciating that 30 years or 2050 was a long time in the future or numbers could not be guaranteed. Some responses also mentioned the effect of global warming and pollution. Some candidates wrote about immediate problems associated with risk of disease and predation or escape of fish without considering a long-term view and what might happen in the future.

(b) Give three reasons why the scientists' prediction of an increase in ocean fish production to 44 million tonnes by 2050 is only an estimate. (lines 4 to 6)

(3)

1 growing fish is affected by many factors such as O_2 concentration in water, level of pollution and fish disease

2 5 years is quite a long time enviroments or trend of fish farming might vary through time

3 due to climate change it might not be possible to do ocean fish farming in the future due to very high sea level.

ResultsPlus Examiner Comments

This scores three marks for level of pollution, that the prediction is in the future and climate change.

(b) Give three reasons why the scientists' prediction of an increase in ocean fish production to 44 million tonnes by 2050 is only an estimate. (lines 4 to 6)

(3)

1 Because other estimates say it might produce the same amount of regard as all of the world will ~~~~ caught fishes

2 2050 is still in the future and not exactly accountable for changes

3 It is not exact as there are only based on the 2/ million tonnes and it is also an estimate and impacts of diseases and pollution may pose future threats to limiting numbers

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Examiner Comments

This response scores two marks. It mentions that 2050 is in the future. It also mentions the effect of pollution.

(b) Give three reasons why the scientists' prediction of an increase in ocean fish production to 44 million tonnes by 2050 is only an estimate. (lines 4 to 6)

(3)

1 it is based on pest trends that do not necesarily apply to the future

2 it may not take all factors into account like desiese

3 there may not be a demand for this many fish in the future

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Examiner Comments

This response also gains two marks. It refers to is in the future and based on past trends and that the demand for fish may change.

Question 1 (c)

In Q01(c) candidates were asked to explain how fish farms cause pollution. The responses were better on this item with more candidates gaining two or three marks. Answers often mentioned fish faeces, uneaten food and the best responses then explained how this can lead to increased nitrate levels, algal growth and subsequent reduction in oxygen due to decomposition by bacteria.

(c) Explain how fish farms cause pollution. (lines 12 to 16)

(3)

when fish produce faeces or die, this causes minerals to leech into the water, resulting in an algal bloom and an abundance of decomposers

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This response scores three marks for faeces, algal bloom and increase in decomposers.

(c) Explain how fish farms cause pollution. (lines 12 to 16)

(3)

Fish farms can attract pests, waste from the fish not disposed prpaly can lead to polluted water with bacteria and algae growth.

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Examiner Comments

This response also gains three marks for fish waste, bacteria and algal growth.

(c) Explain how fish farms cause pollution. (lines 12 to 16)

(3)

Fishes will produce waste / faeces containing nitrogen compounds such as urea. These compounds can cause algal bloom / eutrophication, if absorbed by seaweeds, which will cause them to block out the sun so aquatic plants beneath them die. They also die and get decomposed and this uses up oxygen. When fishes die, sometimes they are not removed fast enough so the water is contaminated and disease can spread

(c) Explain how fish farms cause pollution. (lines 12 to 16)

(3)

Fish farms requires chemicals and various modes of electricities which can emitt harmful substences like carbon and chemicals which can pollute the water. The fishes in the fish farm may egest waste which on again cause pollution in the water. Water cleaning chemicals such as chlorine may also be harmful as when consumed, fishes can die.

Question 1 (d)(i)

Q01(d)(i) asked candidates to describe the methods a fish farmer could use to reduce the incidence of disease in a fish farm. Most responses could gain one or two marks for describing use of pesticides, antibiotics, selective breeding and isolating diseased fish. Some weaker responses wrote about medicines or confused antibodies with antibiotics.

Question 1 (d)(ii)

In Q01(d)(ii) candidates were asked to explain how these methods may affect the local ecosystem. Only the best candidates were able to explain the effect that these methods could have on the ecosystem. The best responses explained that pesticides could kill other organisms and that antibiotic use could lead to antibiotic resistant bacteria increasing. Other responses explained that pesticides could bioaccumulate in food chains and that selectively bred or GM fish could escape and interbreed with wild fish.

(ii) Explain how these methods may affect the local ecosystem.

(2)

· Pesticides can kill of ther ~~are~~ organisms which leads to a decrease in biodiversity and affects feeding relationships.
· Genetically modified fish may escape and reproduce to spread their genes decreasing genetic variation and ~~kills~~ affecting ocean biodiversity.

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Examiner Comments

This response scores both marks. Pesticides killing other organisms and GM fish escaping and reproducing.

(ii) Explain how these methods may affect the local ecosystem.

(2)

The antibiotics may be toxic to other types of sea ~~are~~ creatures which might cause bioaccumiliation and biomagnification.

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Examiner Comments

This response also gains both marks for antibiotics being toxic to other organisms and reference to bioaccumulation.

(ii) Explain how these methods may affect the local ecosystem.

(2)

Using antibiotics ^constantly may make the bacteria resistent to it which may cause more harm.

Question 1 (e)

In Q01(e) many responses could explain why locating the fish farms further out to sea may help reduce the effects on the local ecosystem. The best responses explained that fast moving water would disperse pollutants or that deep water would dilute any pollutants.

(e) Explain why locating the fish farms further out to sea may help reduce the effects on the local ecosystem. (lines 12 to 16)

(2)

Less risk of desease when located furthure at sea Since the water are constantly changed due to high wind and water speeds & meaning less pathogens collect together and waste products are driven away

ResultsPlus
Examiner Comments

This response scores two marks for water speeds dispersing waste products.

(e) Explain why locating the fish farms further out to sea may help reduce the effects on the local ecosystem. (lines 12 to 16)

(2)

They The fish farms are not close to the further so the water movement is faster so it keeps water flowing and any chemicals are moved away.

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Examiner Comments

This response also gains two marks for fast water dispersing chemicals.

(e) Explain why locating the fish farms further out to sea may help reduce the effects on the local ecosystem. (lines 12 to 16)

(2)

Out in Sea the ecosystem has a higher chance to find food as it is not enclosed by the shore. Also, Water moves faster so light pests and bacteria are more likely to be pushed away.

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Examiner Comments

This response also gains two marks for fast water movement dispersing bacteria.

Question 1 (f)

In Q01(f) candidates were asked to suggest why fish farming further out at sea will be more difficult to monitor and regulate. Many responses correctly noted that distant ocean farms would take longer to reach.

(f) Suggest why fish farming further out at sea will be more difficult to monitor and regulate. (lines 14 to 16)

(1)

Costly and difficult to perform check-ups since further away, farmers may disobey regulation, less likely to be caught.

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Examiner Comments

This response also gains the mark for being further away so costly and difficult to reach.

(f) Suggest why fish farming further out at sea will be more difficult to monitor and regulate. (lines 14 to 16)

(1)

There are strong winds and high wave speeds, It is also far from land so it ~~it hard~~ transportation is hard.

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Examiner Comments

This gains the mark for transport is hard as further from land.

Question 1 (g)

In Q01(g) almost all responses could give a reason why farming fish that are herbivores is an advantage for the fish farmer. Most candidates wrote that plant material is readily available or cheaper. Other responses correctly wrote that this would prevent intraspecific predation.

(g) Give a reason why farming fish that are herbivores is an advantage for the fish farmer. (lines 27 and 28)

(1)

Herbivorous fish are an advantage as it helps the farmers save money and gain more profit, as they dont have to buy food pellets or small fish.

ResultsPlus
Examiner Comments
This gains the mark for reference to feeding being cheaper.

(g) Give a reason why farming fish that are herbivores is an advantage for the fish farmer. (lines 27 and 28)

(1)

Can put them in same cageth regardless of size as they won't eat each other since they are herbivorous

ResultsPlus
Examiner Comments
This scores the mark for reference to not eating each other.

(g) Give a reason why farming fish that are herbivores is an advantage for the fish
farmer. (lines 27 and 28)

(1)

They won't eat other fish

ResultsPlus
Examiner Comments

This also scores the mark.

Question 1 (h)

In Q01(h) candidates were asked to explain why small, local freshwater fish farms would have less impact on global warming than large fish farms at sea. Only the best candidates gained full marks for explaining that large farms far from land would require boats to transport materials, resources and fish produced, and large plants would require more energy and power to run. This would lead to more fossil fuels being combusted and more release of carbon dioxide.

(h) Explain why small, local freshwater fish farms would have less impact on global warming than large fish farms at sea.

(2)

Small, ~~local~~ local freshwater fish farms will have less fish and will be nearby so it is easier to access them, without using ships that burn coal to power themselves, producing CO_2 gas, ~~that is~~ a greenhouse gas, which traps heat, so less CO_2 will be produced.

ResultsPlus
Examiner Comments

This scores both marks for less use of ships burning fossil fuels with local farms.

(h) Explain why small, local freshwater fish farms would have less impact on global warming than large fish farms at sea.

(2)

As it's controlled and the population is controlled too. There is barly any need for delivery vehicles and ships to transport the fish which means less CO_2 in the air.

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Examiner Comments

This response also gains both marks for less transport by ships so less carbon dioxide released.

(h) Explain why small, local freshwater fish farms would have less impact on global warming than large fish farms at sea.

(2)

Small fish farm would require less power and energy to provide optimum temprature for fish releasing less carbon dioxide and less heat trapped

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Examiner Comments

This response gains two marks for the idea of small fish farms requiring less power and energy to be generated so less carbon dioxide released.

Question 2 (b)(i)

In Q02(b)(i) most candidates were able to calculate the percentage of the water loss that is classified as insensible.

(b) Table 1 shows the water input and output per day for a person in normal temperature conditions.

Water input (intake)		Water output (losses)	
source	volume in litres	source	volume in litres
drinking	1.5	urine	1.5
food	0.5	gas exchange	0.4
metabolism	0.5	sweating	0.5
		faeces	0.1

Table 1

The water loss from gas exchange plus the loss from sweating are referred to as the insensible water loss. This water loss is called insensible because it cannot be measured directly.

(i) Calculate the percentage of the water loss that is classified as insensible.

(2)

$0.4 + 0.5 = 0.9$

$\dfrac{0.9}{2.5} \times 100$

percentage = ...36...... %

ResultsPlus
Examiner Comments

This answer is correct and gains both marks.

(b) Table 1 shows the water input and output per day for a person in normal temperature conditions.

Water input (intake)		Water output (losses)	
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Table 1

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(i) Calculate the percentage of the water loss that is classified as insensible.

(2)

$$\frac{0.9}{2.5} \times 100 = 36\%$$

percentage = ...36............ %

(b) Table 1 shows the water input and output per day for a person in normal temperature conditions.

Water input (intake)		Water output (losses)	
source	volume in litres	source	volume in litres
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		faeces	0.1

Table 1

The water loss from gas exchange plus the loss from sweating are referred to as the insensible water loss. This water loss is called insensible because it cannot be measured directly.

(i) Calculate the percentage of the water loss that is classified as insensible.

(2)

$$0.4 + 0.5 = 0.9$$

$$\frac{0.5 + 0.4}{1.5} \times 100$$

$$= 60\%$$

percentage = ...60%...... %

ResultsPlus
Examiner Comments

This answer is incorrect but gains one mark for 0.9 in the working.

ResultsPlus
Examiner Tip

Always show the stages in a calculation. As even if the final answer is incorrect some marks can be gained for working.

Question 2 (b)(ii)

In Q02(b)(ii) candidates had to calculate the water input from food for a person who has a mass of 110 kg. Most responses gained some credit with many scoring both marks. Candidates are reminded to always show the stages of their calculations.

(ii) This data comes from a person who has a mass of 70 kg.

Assuming the same proportions, calculate the water input from food for a person who has a mass of 110 kg.

(2)

water input = 0.5
for food

0.5 = 70 kg

0.785? = 110 kg

0.8 =

input from food = ...0.8................litres

(ii) This data comes from a person who has a mass of 70 kg.

Assuming the same proportions, calculate the water input from food for a person who has a mass of 110 kg.

(2)

$1.5 + 0.5 + 0.5 = 2.5$

$2.5 \div 70 = \dfrac{1}{28}$

$\dfrac{1}{28} \times 110 = 3.929$

input from food = ...3.9........litres

ResultsPlus
Examiner Comments

This gains one mark for x100 in their working.

ResultsPlus
Examiner Tip

Candidates who show the stages in their working can gain some credit even if the final answer is incorrect.

(ii) This data comes from a person who has a mass of 70 kg.

Assuming the same proportions, calculate the water input from food for a person who has a mass of 110 kg.

(2)

0.785714

= 0.8 Liters.

input from food = ~~0.79~~ ....litres

Question 2 (b)(iii)

In Q02(b)(iii) candidates were told that illnesses such as food poisoning can produce symptoms including vomiting, diarrhoea and a high temperature. These symptoms can change water balance in the body. They were then asked to explain how the symptoms of food poisoning can change water balance in the body. This item produced the whole range of scores with many candidates gaining three or four marks. The best candidates wrote that more water is lost in faeces or by vomiting. Sweating will also increase leading to an increase in blood concentration. This stimulates the osmoreceptors in the hypothalamus to release more ADH from the pituitary gland increasing the permeability of the collecting duct wall and reducing the volume of water released in the urine.

(iii) Water loss in faeces is usually relatively low.

Illness such as food poisoning can produce symptoms including vomiting, diarrhoea and a high temperature. These symptoms can change water balance in the body.

Explain how the symptoms of food poisoning can change water balance in the body.

(4)

Symptoms of food poisoning increases the amount of water lost by the body as more water is lost through vomiting and diarrhoea and even high temperatures which could cause sweating. ~~More food is to A~~ Food is egested from the body or vomited out ~~ent~~ so water from food is ~~lost~~ as well. This will stimulate the release of more ADH by the pituitary gland, making the collecting duct more permeable to water making more water to be reabsorbed. This produces a lesser volume of more concentrated urine. High body temperatures could lead to sweating which means more water loss. From food poisoning, more water is lost than taken in.

(iii) Water loss in faeces is usually relatively low.

Illness such as food poisoning can produce symptoms including vomiting, diarrhoea and a high temperature. These symptoms can change water balance in the body.

Explain how the symptoms of food poisoning can change water balance in the body.

(4)

Vomiting removes water from the body and diarrhoea expels water from the body. High temperatures leads to more sweat and dehydration Since water is being lost ⊖ , osmoreceptors in the by hypothalamus detects low water content in the blood stimulating

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Examiner Comments

This response also scores four marks. It mentions increased water loss by vomiting and increased sweating. Lower water content in blood is noted and that this is detected by osmoreceptors in hypothalamus.

(iii) Water loss in faeces is usually relatively low.

Illness such as food poisoning can produce symptoms including vomiting, diarrhoea and a high temperature. These symptoms can change water balance in the body.

Explain how the symptoms of food poisoning can change water balance in the body.

(4)

Food poisoning causes vomiting, diarrhoea, and ~~brighten~~ high body temperature. ~~Vomiting is a ~~the~~ mixture of~~ By Vomiting, the body will lose some of the water intake from food, and the water contained in the stomach, so this changes the water balance. Also, diarrhoea causes the amount of water in the faeces to increase, losing more water. High body temperature suggests more sweating, leading to an increase of ~~water~~ ~~to the~~ loss of water from the body as well.

Question 2 (c)

In Q02(c) candidates were told that a degu is a rodent that lives in a very dry environment in South America. The degu gets its water input by feeding on plants. The water intake of the degu changes during the winter and summer months. Candidates were given a table showing the body mass, water intake and urine concentration of the degu in the winter and in the summer. It also showed the total rainfall in winter and in summer. Candidates were asked to comment on the differences in body mass, water intake and urine concentration in winter and summer.

Candidates did really well on this evaluative item and many gained full marks. They commented on the lower body mass in winter and linked this to fewer plants available as less sunlight. They also commented on the higher rainfall leading to higher water intake. They noted that this led to a more dilute urine containing more water.

Comment on the differences in body mass, water intake and urine concentration in winter and summer.

Use the data in the table and your own knowledge in your answer.

(4)

The body mass increases in the summer, and the water intake in summer is low, hence resulting in a higher concentration of urine because most of the water is reabsorbed by the collecting duct due to its increased permeability done by the release of more ADH. The volume of ~~water~~ urine decreases and less urine is produced. The body mass increases because there is less water loss from the body. However in winter the water intake is high resulting in less concentrated urine because less water is reabsorped which also decreases the body mass as water is lost from the body resulting in more volume of urine. However there are other factors that influence this such as

(Total for Question 2 = 13 marks)

the sweat production and etc.

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Examiner Comments

This answer gains full marks. It comments on increased body mass in summer, lower water intake and more concentrated urine containing less water.

Comment on the differences in body mass, water intake and urine concentration in winter and summer.

Use the data in the table and your own knowledge in your answer.

(4)

- The body mass is more in summers as there ain't much water to secrete the waste materials out of the rodent whereas they get secreted in winters.
- Water intake as more during the winters than summers as rainfall was more in winters whereas on 12mm in summer. - Moving on the urine concentration is less in winters as its more diluted with water whereas in summer it's less diluted.

ResultsPlus
Examiner Comments

This response also gains full marks. It comments on more mass in summer, more water intake in winter, more rainfall in winter. Less concentrated urine in winter.

Comment on the differences in body mass, water intake and urine concentration in winter and summer.

Use the data in the table and your own knowledge in your answer.

(4)

Total rainfall in winter is way higher than in summer. The body mass of the degu is lower in winter than in summer by 5.1 g. The water intake in winter is higher than in summer because of heavy rainfall in winter, degu is able to easily get water than in summer. Since in winter there's a higher water intake, its blood is more dilute. So less water is reabsorbed back into the blood by the reducing levels of ADH collecting becomes less permeable, less water is reabsorbed, keeping the urine more dilute and so the urine concentration will be lower in winter. and volume will be higher.

(Total for Question 2 = 13 marks)

since more urine is produced body mass also decreases in winter.

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Examiner Comments

This answer also gains full marks for higher rainfall in winter, body mass lower in winter, water intake higher in winter, more dilute urine in winter.

Question 3 (a)(iii)

Q03(a)(iii) asked candidates to describe how the skin responds when a person enters a cold environment. This descriptive item also produced a range of scores with many responses gaining full marks. The most complete responses described how vasoconstriction is brought about by arterioles narrowing to reduce blood flow to the superficial capillaries. This reduces heat loss from the skin surface by radiation or convection. The hair erector muscle will contract trapping a layer of insulating air. Sweating will reduce so less heat is lost due to evaporation.

(iii) The skin responds to changes in temperature.

Describe how the skin responds when a person enters a cold environment.

(4)

When a person enters a cold environment, it's muscle will shiver to produce more heat; it's hair will erect be and try to trap air to insulate themselves, controlled by muscles; they will stop not sweating, less evaporation on skin to cool down temperature; vasoconstriction, blood vessel constricting, getting away from the skin to reduce heat loss by radiation.

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This response scores full marks. It describes hairs erecting to trap air, less sweating so less cooling due to evaporation. It also describes vasoconstriction.

(iii) The skin responds to changes in temperature.

Describe how the skin responds when a person enters a cold environment.

(4)

The erector muscles found under the skin contract causing the hair on the skin to stand up. Air is trapped between these hairs which provides insulation and thus warmth. Furthermore, shivering takes place as muscles contract and because muscles contracting is an exothermic process, heat energy is released. This heat energy provides heat warmth to the body. Furthermore, vasoconstriction takes place in which arteries / blood vessels constrict and so blood does not reach the skin as efficiently / fast. Blood carries heat energy and so vasoconstriction takes place to reserve the heat / make sure it isn't lost.

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Examiner Comments

This response also scores full marks. It describes how erector muscles contract raising hair and air is trapped. It also describes vasoconstriction with blood vessels constricting reducing blood flow to the skin.

(iii) The skin responds to changes in temperature.

Describe how the skin responds when a person enters a cold environment.

(4)

In a cold environment, vaso constriction takes place. The capillaries constrict and are away from the surface of the ~~water~~ skin so that there is minimum heat loss. The hair becomes erect and stands up so that a layer of air can be present to trap the heat. Air is a poor conductor of heat so heat loss is reduced. The sweat glands secrete less sweat so that the skin does not cool down and stays warm.

Question 3 (b)

In Q03(b) candidates were told scientists investigated the effect of heat strain on two groups of men. Heat strain is caused by increasing the external temperature. The scientists measured the skin temperature with no heat strain, low heat strain and moderate heat strain. They also measured the rate of sweating with low and moderate heat strain. The question gave a table showing the scientists' results. Candidates were asked to discuss the relationship between age and the effect of heat strain on the mean skin temperature and the mean rate of sweating. Candidates were also told to use information from the table and their own knowledge in their answer. Most responses scored well on this evaluation item with the majority of candidates gaining four or five marks.

> Discuss the relationship between age and the effect of heat strain on the mean skin temperature and the mean rate of sweating.
>
> Use information from the table and your own knowledge in your answer.
>
> (5)

— The sample size is quite small and needs more repeats to be more accurate.

— There is no information on other factors such as health issues, and how active they are.

— The range between ages is too large.

— In all age groups, more sweating rat is increased in moderate heat strain as the temperature is higher than the normal body temperature. More sweating must occur so that enzymes in the body do not denature.

— Sweating rate is higher in younger individuals. as this could be because their mean skin temperature is higher than old people.

— There could be more sweating as younger people are more active, have more muscle

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This response gained full marks. It noted that the sample size is small. It also noted that no information is given about activity or health. It notes that sweating increases with moderate heat strain, and that (skin) temperature also increases with heat strain. It also notes that there is more sweating in the younger group and a higher skin temperature.

Discuss the relationship between age and the effect of heat strain on the mean skin temperature and the mean rate of sweating.

Use information from the table and your own knowledge in your answer.

(5)

• As the heat strain increases the mean skin temprature also increases

• There is More increase in temp of young people

• heigher heat strain causes more sweating

• Young people sweat more in low and high heat strain

• ~~Strating~~ on no heat strain the temprature of the skin of the young people was heigher

• Because young people have more blood flow and their body functions properly

• There is no information on the diet, weight and genes of the people

• Should be tested on more people.

Question 4 (a)(i)

Question 4 described how a teacher investigated gas exchange in different conditions. They used orange hydrogen-carbonate indicator solution, which changes colour depending upon the concentration of carbon dioxide in the tube. In Q04(a)(i) most candidates could identify the dependent variable in this investigation.

4 A teacher investigates gas exchange in different conditions.

They use orange hydrogen-carbonate indicator solution, which changes colour depending upon the concentration of carbon dioxide in the tube.

This is their method.

Step 1   put 5 cm³ of hydrogen-carbonate indicator solution into each of five test tubes A, B, C, D and E

Step 2   place a wire mesh and two green leaves in test tube A

Step 3   set up tubes A to D so that they contain leaves or maggots as shown in the diagrams

Step 4   set up tube E without leaves or maggots

Step 5   place test tubes A, C and E in bright light for two hours

Step 6   place test tubes B and D in the dark for two hours

Step 7   observe the colour of the indicator in each test tube

Test tube A in light — leaves on wire mesh — orange hydrogen-carbonate indicator solution

Test tube B in dark — leaves on wire mesh

Test tube C in light — maggots on wire mesh — orange hydrogen-carbonate indicator solution

Test tube D in dark — maggots on wire mesh

Test tube E in light — wire mesh — orange hydrogen-carbonate indicator solution

(a) (i) State the dependent variable in this investigation.

(1)

colour of the indicator

4 A teacher investigates gas exchange in different conditions.

They use orange hydrogen-carbonate indicator solution, which changes colour depending upon the concentration of carbon dioxide in the tube.

This is their method.

Step 1 put 5 cm³ of hydrogen-carbonate indicator solution into each of five test tubes A, B, C, D and E

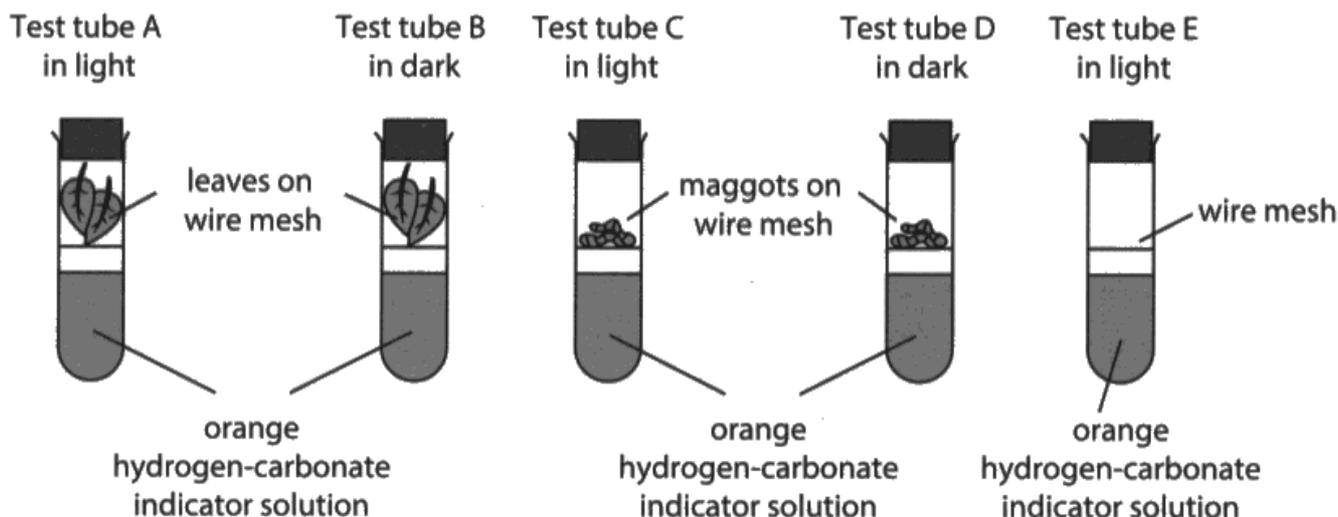Step 2 place a wire mesh and two green leaves in test tube A

Step 3 set up tubes A to D so that they contain leaves or maggots as shown in the diagrams

Step 4 set up tube E without leaves or maggots

Step 5 place test tubes A, C and E in bright light for two hours

Step 6 place test tubes B and D in the dark for two hours

Step 7 observe the colour of the indicator in each test tube

Test tube A in light — leaves on wire mesh — orange hydrogen-carbonate indicator solution

Test tube B in dark

Test tube C in light — maggots on wire mesh — orange hydrogen-carbonate indicator solution

Test tube D in dark

Test tube E in light — wire mesh — orange hydrogen-carbonate indicator solution

(a) (i) State the dependent variable in this investigation.

(1)
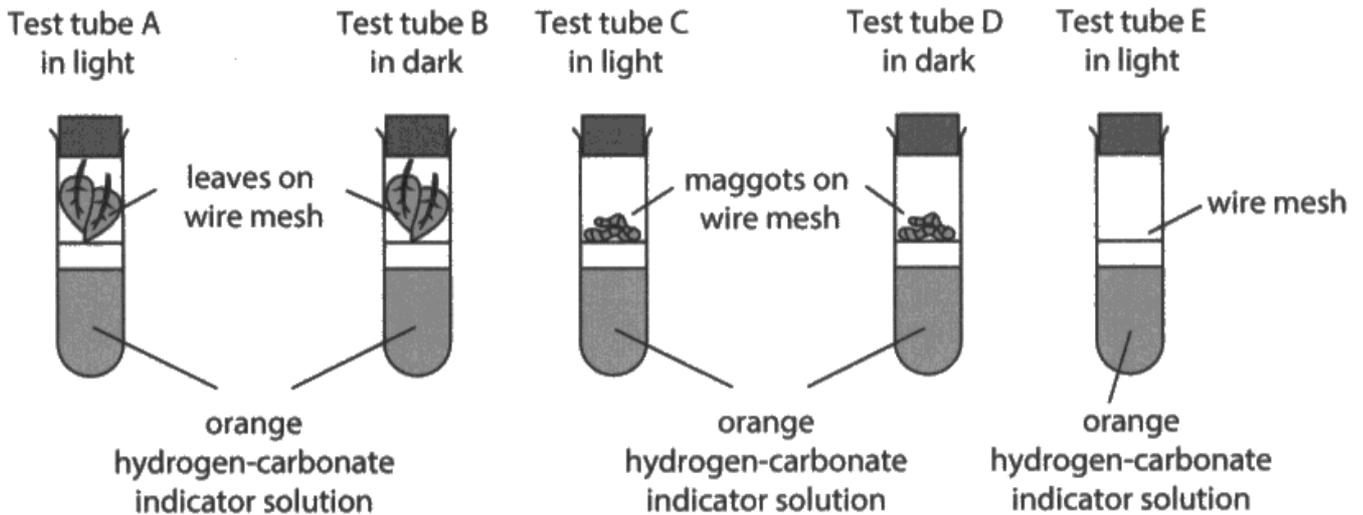
The colour of the indicator

4 A teacher investigates gas exchange in different conditions.

They use orange hydrogen-carbonate indicator solution, which changes colour depending upon the concentration of carbon dioxide in the tube.

This is their method.

Step 1   put 5 cm³ of hydrogen-carbonate indicator solution into each of five test tubes A, B, C, D and E

Step 2   place a wire mesh and two green leaves in test tube A

Step 3   set up tubes A to D so that they contain leaves or maggots as shown in the diagrams

Step 4   set up tube E without leaves or maggots

Step 5   place test tubes A, C and E in bright light for two hours

Step 6   place test tubes B and D in the dark for two hours

Step 7   observe the colour of the indicator in each test tube

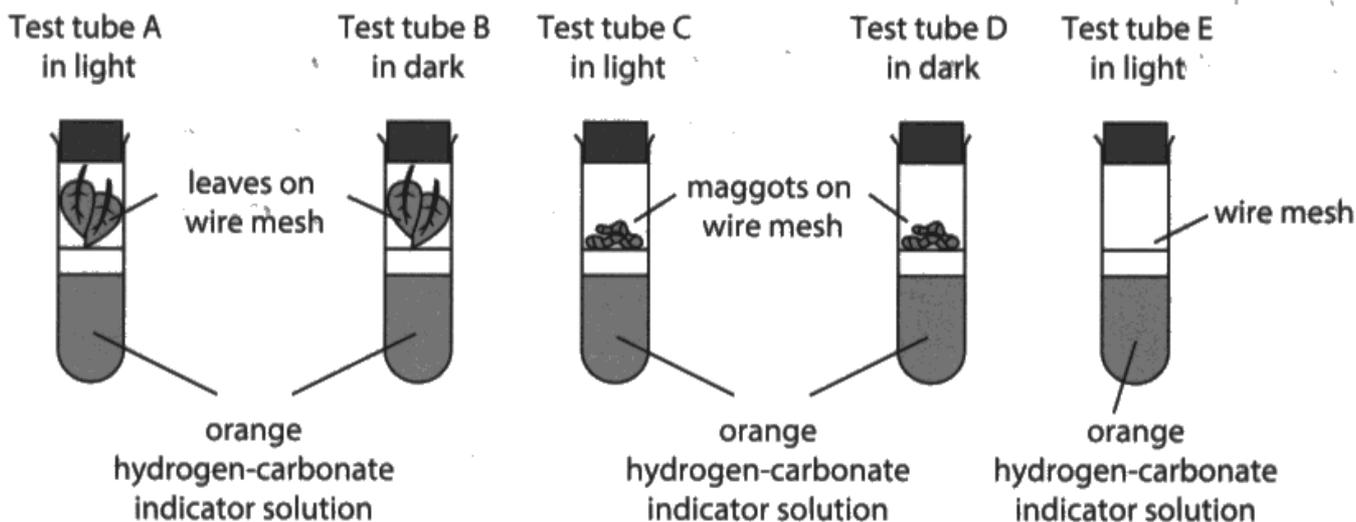(a) (i) State the dependent variable in this investigation.

(1)

temperature

Question 4 (a)(ii)

In Q04(a)(ii) almost all candidates could give the function of the wire mesh in the test tubes.

(ii) Give the function of the wire mesh in the test tubes.

(1)

The gives ae proper execute So that the leaves and maggots do not dip into the solution.

ResultsPlus
Examiner Comments

This is a correct response.

(ii) Give the function of the wire mesh in the test tubes.

(1)

To prevent direct contacts of the maggots and leaves with Hydrogen carbonat solution

ResultsPlus
Examiner Comments

This is a correct response.

(ii) Give the function of the wire mesh in the test tubes.

(1)

It ensures that the leaves don't touch the hydrogen carbonate indicator solution

ResultsPlus
Examiner Comments

This is also a correct response.

Question 4 (a)(iii)

In Q04(a)(iii) most candidates could also state one variable that the teacher has controlled in their investigation.

(iii) State one variable that the teacher has controlled in their investigation.

(1)

concentration of hydrogen - carbonate

ResultsPlus
Examiner Comments

Concentration of indicator is a suitable control variable.

(iii) State one variable that the teacher has controlled in their investigation.

(1)

Volume of indicator are (cm³)

ResultsPlus
Examiner Comments

Volume of indicator is a suitable control variable.

(iii) State one variable that the teacher has controlled in their investigation.

(1)

amount of solution in each tube

ResultsPlus
Examiner Comments

No credit for amount of solution.

Question 4 (b)

In Q04(b) candidates were given a table showing the results of this investigation. They were asked to explain the relationship between the test tube contents, the light condition and the colour of the indicator after two hours. Candidates did very well on this item with many scoring full marks. These responses explained that the tubes with maggots had an increase in carbon dioxide as the maggots respired. The leaves absorbed carbon dioxide in the light due to photosynthesis but released carbon dioxide in the dark. In the control tube there was no change in carbon dioxide concentration.

(b) The table shows the results of this investigation.

Tube	Contents of test tube	Light condition	Colour of indicator after two hours
A	leaves	light	dark red
B	leaves	dark	yellow
C	maggots	light	yellow
D	maggots	dark	yellow
E	empty	light	orange

Explain the relationship between the test tube contents, the light condition and the colour of the indicator after two hours.

(4)

Test tube A and B have leaves and they are left at different light intensities. At a darker light condition respiration occurs at a higher rate which produces more Carbon dioxide than it uses for photosynthesis making the indicator yellow. While at light with brighter conditions, the leaves photosynthesise produce a lower concentration of CO_2 which turns the indicator dark red. For test tubes C and D, maggots can only respire aerobically in both light and dark so more CO_2 is produced making the indicator yellow. At test tube E, the test tube is empty so it is a control showing the colour of indicator at normal air conditions.

ResultsPlus
Examiner Comments

This response gains full marks for leaf releases carbon dioxide in the dark by respiration. In the light leaves result in a lower concentration of carbon dioxide due to photosynthesis. They also noted that the maggots produce carbon dioxide.

(b) The table shows the results of this investigation.

Tube	Contents of test tube	Light condition	Colour of indicator after two hours
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C	maggots	light	yellow
D	maggots	dark	yellow
E	empty	light	orange

Explain the relationship between the test tube contents, the light condition and the colour of the indicator after two hours.

(4)

In tube A, photosynthesis happens and the rate of CO_2 intake is higher than respiration and so CO_2 is less which changes the colour to dark red.

In tube B, there is no photosynthesis as there is no light and respiration is more so CO_2 level is also more which less to the colour being yellow.

In tube C and D, the colour is same for light and dark because they don't photosynthesis and the rate of respiration remains constant and CO_2 in the tube is high.

ResultsPlus
Examiner Comments

This response also gains full marks. It notes that in tube A the leaves carry out photosynthesis and take in carbon dioxide. In tube B respiration occurs as leaves increase the carbon dioxide level. In tubes C and D carbon dioxide levels are also high due to maggot respiration.

(b) The table shows the results of this investigation.

Tube	Contents of test tube	Light condition	Colour of indicator after two hours
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D	maggots	dark	yellow
E	empty	light	orange

Explain the relationship between the test tube contents, the light condition and the colour of the indicator after two hours.

(4)

Tube A ⟶ leaves turn dark red after two hours means that there was hydrchloric carbonate and less amount of CO_2.
Tube B, C, and D ⟶ all turned yellow means there was more amount of CO_2. But tube B had dark light. and D.
Tube E ⟶ It was empty and was in light and also ~~was~~ stayed orange this is because ~~the~~ the person that did the experiment left the tube empty as a control.

Question 4 (c)

In Q04(c) candidates were told that the teacher sets up another test tube that contains leaves and maggots. They put the test tube in the light for two hours. Candidates were required to explain why the indicator remains orange. Almost all candidates gained one or two marks with the best responses explaining that the production of carbon dioxide by respiration is balanced by the intake of carbon dioxide by photosynthesis.

(c) The teacher sets up another test tube that contains leaves and maggots. They put the test tube in the light for two hours.

The colour of the indicator after two hours remains orange.

Explain why the indicator remains orange.

(2)

In light plants photosynthesise, in the same time maggots respire, Carbondioxide level goes down and then up, so the concentration of CO_2 gets balanced out and orange stays the same. due to no change in CO_2 level.

(Total for Question 4 = 9 marks)

ResultsPlus
Examiner Comments

This response gains both marks for photosynthesis using carbon dioxide and respiration producing it.

(c) The teacher sets up another test tube that contains leaves and maggots. They put the test tube in the light for two hours.

The colour of the indicator after two hours remains orange.

Explain why the indicator remains orange.

(2)

CO₂

The ~~oxygen~~ that is produced by the maggots in respiration is absorbed and converted in oxygen by the leaves in photosynthesis. This oxygen is then inhaled by the maggots keeping the CO₂ level constant so the colour doesn't change.

(Total for Question 4 = 9 marks)

(c) The teacher sets up another test tube that contains leaves and maggots. They put the test tube in the light for two hours.

The colour of the indicator after two hours remains orange.

Explain why the indicator remains orange.

(2)

Leaves produce oxygen and use up CO_2 during respiration. Maggots need oxygen so th and release CO_2. So they balance eachother at and no colour change occurs as concentration levels remain the same.

Question 5 (a)(i)

In Q05 candidates were told about deforestation in Russia, Brazil and Canada and given some data. In Q05(a)(i) candidates were asked to use this data to determine the total tree cover loss by countries other than Russia, Brazil and Canada from 2001 to 2021. Many candidates could correctly calculate the total global loss using the data provided.

5 Loss of trees is known as deforestation.

From 2001 to 2021, Russia, Brazil and Canada had the most deforestation.

- Russia lost 76.0 Mha of tree cover. This loss was 10% of forests in Russia. The loss accounted for 17% of the total tree cover lost in the entire world.

- Brazil lost 62.8 Mha of tree cover. This loss was 12% of forests in Brazil. The loss accounted for 14% of the total tree cover loss in the entire world.

- Canada lost 49.3 Mha of tree cover. This loss was 11% of forests in Canada. This loss accounted for 11% of the total tree cover loss in the entire world.

(a) (i) Use this data to determine the total tree cover loss by countries other than Russia, Brazil and Canada from 2001 to 2021.

(2)

$$100 - 17 - 14 \ 11 = 58 \qquad 49.3 = 11\%$$
$$0.58 \times 448.18 = 259.9$$

tree cover loss = ...260...... Mha

ResultsPlus Examiner Comments

This scores full marks for the correct answer.

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- Canada lost 49.3 Mha of tree cover. This loss was 11% of forests in Canada. This loss accounted for 11% of the total tree cover loss in the entire world.

(a) (i) Use this data to determine the total tree cover loss by countries other than Russia, Brazil and Canada from 2001 to 2021.

$$\frac{76 + 62.8 + 49.3}{X} = 42\%$$

$$X = 447.857\ldots$$

$$58\% = \frac{y}{448}$$ **(2)**

$$y = 259.84$$

tree cover loss = ... 259.8 .... Mha

5 Loss of trees is known as deforestation.

From 2001 to 2021, Russia, Brazil and Canada had the most deforestation.

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(a) (i) Use this data to determine the total tree cover loss by countries other than Russia, Brazil and Canada from 2001 to 2021.

(2)

$$188.1 = 42\%$$

$$\frac{188.1}{42} \times 100 = 447.86$$

tree cover loss = ...4 47 .8 6........ Mha

ResultsPlus
Examiner Comments

This scores one mark for 447.86 in the working.

Question 5 (a)(ii)

In Q05(a)(ii) candidates were asked to calculate the loss of tree cover in Brazil per month from 2001 to 2021. They were asked to give their answer in standard form. Most responses gained one or two marks. Some responses failed to gain full credit as they rounded 2.617 to 2.61.

(ii) Calculate the loss of tree cover in Brazil per month from 2001 to 2021.

Give your answer in standard form.

(2)

tree cover loss = $\underset{0.26}{2.6 \times 10^{-1}}$ Mha per month

ResultsPlus
Examiner Comments

This scores both marks for the correct answer in standard form.

(ii) Calculate the loss of tree cover in Brazil per month from 2001 to 2021.

Give your answer in standard form.
62.8
(2)

20 × 12

62.8 ÷ 240
= 0.261666 6667

tree cover loss = 2.6167×10^{-1} Mha per month

ResultsPlus
Examiner Comments

This also scores both marks.

(ii) Calculate the loss of tree cover in Brazil per month from 2001 to 2021.

Give your answer in standard form.

(2)

20 ~~months~~ years × 12

= 240 months

$\frac{62.8}{240}$ = 0.26

tree cover loss = ...0.26......... Mha per month

ResultsPlus
Examiner Comments

This response gained one mark for the correct answer but not in standard from.

Question 5 (a)(iii)

In Q05(a)(iii) candidates were asked to explain why Russia contributed 17% of the total tree cover loss in the entire world even though the loss of tree cover in Russia was only 10%. Most candidates gained at least one mark with only the very best scoring both marks. The best responses explained that as Russia has the most forest area in the world a low percentage of Russia will make a proportionally larger contribution to the world percentage.

(iii) Explain why Russia contributed 17% of the total tree cover loss in the entire world even though the loss of tree cover in Russia was only 10%.

(2)

Because Russia is a large country and has lots of forests so its total number of tree cover loss accounts for a large Portion in the world.

ResultsPlus
Examiner Comments

This response scores both marks.

(iii) Explain why Russia contributed 17% of the total tree cover loss in the entire world even though the loss of tree cover in Russia was only 10%.

(2)

Russia has lots of ~~trees~~ land and has more trees than the rest of the world

ResultsPlus
Examiner Comments

This response gains one mark.

Question 5 (b)

Q05(b) asked candidates to describe the effects of deforestation on an ecosystem. Many candidates gained full marks on this item. These responses described how deforestation would reduce biodiversity by destroying habitats and increase the carbon dioxide level as less photosynthesis will occur. Soil will be eroded and minerals will be washed out of the soil reducing its fertility. Flooding may occur and less transpiration will result in less rainfall.

(b) Describe the effects of deforestation on an ecosystem.

(4)

- Deforestation means that less trees are available in the ecosystem.
- This means that the CO_2 isn't taken in by the trees and levels rise in the ecosystem, causing global warming
- Deforestation also results in a reduced amount of biodiversity in the area as trees are homes to many plants / animals, so they die out as well.
- Deforestation causes large amounts of mineral ions to be leeched into the rivers causing eutrophication as trees cannot take them up.
- Deforestation also upsets the water cycle as trees take up and return water to the atmosphere causing a loss of water in the ecosystem.

(Total for Question 5 = 10 marks)

ResultsPlus
Examiner Comments

This gained full marks for describing less carbon dioxide absorbed, how biodiversity is reduced, mineral ions leached out of soil and the water cycle being disturbed.

(b) Describe the effects of deforestation on an ecosystem.

(4)

deforestation cause soil erosion as roots are not here to hold the soil causing infertile land. It also causes more carbon dioxide in atmosphae as less plants so less photosynthesis. $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$. so less plants to remove CO_2. Cuising increase in CO_2 leads to enhanced greenhause effect so climate chang and global warming leeding to extreme whethers and melting of ice caps, loss of habitat for organisms causing a decrease in biodiversity and distrupting food chain. so less CO_2 produced as to less plant so less photosynthesis to produce O_2. burning of trees cause rise of CO_2.

(b) Describe the effects of deforestation on an ecosystem.

(4)

deforestation cause cutting down of trees which means that the oxygen levels will decrease and CO_2 levels will increase. Also deforestation means burnig of trees which means that CO_2 is realsed with which is a green house gas that traps IR Radiation which harms Ozone layer. Deforstation could also break some animals homes that they have built which would cause the animals to hibernate. deforistation could also cause Soil erosion. global warming and meltig of ICE caps.

Question 6 (a)

Q06(a) asked candidates to give the difference between a gene and a genome. Most candidates could give an answer but often they did not give a full definition of a gene as being a section of DNA that codes for a specific polypeptide or protein.

6 Cells use genetic information when carrying out protein synthesis.

(a) Give the difference between a gene and a genome.

(1)

A gene is a section of DNA that codes for a specific protein while the genome is all of genetic material in an organism.

ResultsPlus
Examiner Comments

This response gains the mark.

6 Cells use genetic information when carrying out protein synthesis.

(a) Give the difference between a gene and a genome.

(1)

Gene is a single section of DNA that codes for a protein. Genome is the entire human DNA.

ResultsPlus
Examiner Comments

This response also gains the mark.

6 Cells use genetic information when carrying out protein synthesis.

(a) Give the difference between a gene and a genome.

(1)

gene is a protien of DNA

Question 6 (b)

Q06(b) asked candidates to describe the process of transcription. This item produced the whole range of scores with many responses gaining full marks. These responses described how DNA unzips and is copied to produce mRNA which carries the genetic code. The mRNA leaves the nucleus and travels to the ribosome.

(b) Describe the process of transcription.

(4)

Inside the nucleus.
The DNA Polymerase unzips the double helix for the mRNA to come in and copy the specific strand of gene by copying the corosponding base pare. The mRNA After the mRNA copyies the strand it can come out of the nucleus for it to bind to ribosome. The base pair of A-T.C-G in DNA is transcripted into U-T-C-G in mRNA. After mRNA the double helix zips back.

ResultsPlus
Examiner Comments

This response gains full marks. It describes how DNA unzips in the nucleus, how the mRNA copies the base sequence and leaves the nucleus for the ribosome.

(b) Describe the process of transcription.

(4)

DNA unwinds.

~~mRNA to mRNA~~ transcription is in genetic material in nucleus of cell. MRNA copies ~~by~~ information of (base sequence) DNA. MRNA strand produced. MRNA is complementary to DNA strand at use of antisense/template strand to produce mRNA. MRNA contains uracil instead of thymine. nucleotides lined up during transcription using RNA polymerase

(b) Describe the process of transcription.

(4)

The DNA unzips and seperates its strands. A messenger RNA is formed on the template strand of the DNA and creates a copy of the code on the template strand. Then the mRNA leaves the nucleus causing the DNA to close back

Question 6 (c)

Q06(c) asked candidates to explain why a change in the sequence of bases in the DNA does not always result in a change in enzyme function. Again this item discriminated well with most candidates gaining some credit and the best gaining full marks. These responses explained that not all base changes will change the amino acid produced. So the same protein is produced that has the same active site so binds to the same substrate. The changed gene may be recessive so will not affect the phenotype or the mutation may be in non-coding DNA.

(c) Explain why a change in the sequence of bases in the DNA does not always result in a change in enzyme function.

(3)

Several different triplet combinations code for one amino acid so it may not a mutation, which is a rare, random change to the DNA base sequence, may not produce different amino acids so no change to the protein [enzyme] and no change to the active site. The mutation could have occurred in a non-coding section of DNA or a recessive allele so it is not expressed in the presence of dominant allele.

ResultsPlus
Examiner Comments

This response gains full marks. It explains that different combinations can code for the same amino acid. The protein will not change nor will is active site. It also explains that the mutation could be in the non-coding DNA or be recessive.

(c) Explain why a change in the sequence of bases in the DNA does not always result in a change in enzyme function.

(3)

Change in sequence may be in non coding sequence of bases. The change in sequence can still code for the same amino acid and same enzyme and active site leading to same. The change in sequence only affects enzyme produced and same active site. The change in sequence can be in non-coding sequence of bases. The change in sequence only affects. The change in sequence still codes for same codon. So same amino acid and same enzyme.

ResultsPlus
Examiner Comments

This also scores full marks. The same amino acid can be coded for, the same enzyme produced with the same active site.

(c) Explain why a change in the sequence of bases in the DNA does not always result in a change in enzyme function.

(3)

· gene mutation · same mRNA coded
· → same amino acid, sequence coded · same polypeptide produced
· the active site doesn't change
· substrates can still bind to enzymes.

ResultsPlus
Examiner Comments

This also scores full marks. The same amino acid sequence produced, same polypeptide produced with the same active site.

Question 6 (d)

Q06(d) asked candidates to give an example of a characteristic determined only by the genes, and an example of a characteristic determined by a combination of the genes and the environment. Most responses gained two marks and a wide range of examples were seen and credited.

(d) Some characteristics are determined only by the genes, and some are determined by a combination of the genes and the environment.

Give an example of each type of characteristic in humans.

(2)

determined only by the genes

_____ eye _____ colour _____

_____

determined by the genes and the environment

_____ height _____

ResultsPlus
Examiner Comments

Both of these examples are credited.

(d) Some characteristics are determined only by the genes, and some are determined by a combination of the genes and the environment.

Give an example of each type of characteristic in humans.

(2)

determined only by the genes

Eye color

determined by the genes and the environment

Height of the human

ResultsPlus
Examiner Comments

Both of these examples are credited.

(d) Some characteristics are determined only by the genes, and some are determined by a combination of the genes and the environment.

Give an example of each type of characteristic in humans.

(2)

determined only by the genes

Eye colour, ~~attact~~ attached or detached ear lobe.

determined by the genes and the environment

Height, weight, skin complexion

ResultsPlus
Examiner Comments
All of these examples are correct.

ResultsPlus
Examiner Tip
Usually if asked for an example it is better to just write one.

Paper Summary

Based on their performance on this paper, candidates should:

- Ensure that you read the question carefully and include sufficient points to gain full credit.
- Include as many points as there are marks available in comment or discuss items.
- Make sure you are familiar with all the core practicals listed in the specification and understand the reasons for each stage in the methods used.
- Make sure you have practised calculations especially the mathematics skills listed in the appendix of the specification and always include all your working.
- Write in detail and use correct and precise biological terminology, such as the role of arterioles in vasoconstriction.
- Make links between different parts of the specification, and when considering a question remember to use all the knowledge and understanding you have gained throughout the specification.
- Make sure you know and understand all of the terms in the specification including gene and genome.
- Be able to identify the independent variable, the dependent variable and the control variables in an investigation or experiment.
- 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:

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