Pearson
Edexcel

Examiners' Report
June 2023

Int GCSE Biology 4BI1 2BR

ResultsPlus

Introduction

The new qualification was examined for the third time in a June series. The examiners were impressed with the standard of candidate responses. Centres continue to prepare candidates well for the new style of questions and the new areas of specification content. Generally, most candidates were able to demonstrate very good levels of knowledge and understanding of the specification content. They were also able to apply their knowledge to new contexts both theoretical and practical. There was little evidence of candidates running out of time on the paper and most candidates attempted all questions.

Candidates continue to improve on those items requiring an evaluation response. These were the items which used the command word comment. Candidates also did well on applying their knowledge to novel scenarios including those describing practical experiments. Candidates also did well on the questions based on the printed passage. Most candidates did well on the items examining the mathematical skills outlined in the appendix at the end of the specification. In the calculations, most candidates showed their working, so that even if they did not get the final answer, they were able to gain some credit.

Question 1 (a)

Q01 gave candidates a passage on tissue culture and plants. In Q01(a) they were asked to state what is meant by in vitro. Most responses were able to gain a mark by stating in glass or in a petri dish or test tube.

Scientists are also using cell suspension culture systems from which products can be extracted. A suspension culture is developed by transferring a portion of the callus into liquid media. The media are maintained under suitable conditions of agitation, light and temperature. This system can provide a continuous, reliable source of natural products independent of climate and soil conditions. The first commercial application of large-scale suspension cultivation of plant cells was carried out to produce shikonin. Shikonin is used in traditional Chinese medicine and is a potential anti-cancer treatment.

(a) State what is meant by the term ***in vitro***. (line 1)

(1)

in glass

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Examiner Comments

This response gains the mark.

Scientists are also using cell suspension culture systems from which products can be extracted. A suspension culture is developed by transferring a portion of the callus into liquid media. The media are maintained under suitable conditions of agitation, light and temperature. This system can provide a continuous, reliable source of natural products independent of climate and soil conditions. The first commercial application of large-scale suspension cultivation of plant cells was carried out to produce shikonin. Shikonin is used in traditional Chinese medicine and is a potential anti-cancer treatment.

(a) State what is meant by the term ***in vitro***. (line 1)

(1)

In a laboratory (outside of regular, non natural location.

ResultsPlus
Examiner Comments

This response also gains the mark.

Scientists are also using cell suspension culture systems from which products can be extracted. A suspension culture is developed by transferring a portion of the callus into liquid media. The media are maintained under suitable conditions of agitation,
25 light and temperature. This system can provide a continuous, reliable source of natural products independent of climate and soil conditions. The first commercial application of large-scale suspension cultivation of plant cells was carried out to produce shikonin. Shikonin is used in traditional Chinese medicine and is a potential anti-cancer treatment.

(a) State what is meant by the term ***in vitro***. (line 1)

(1)

in a lab

ResultsPlus
Examiner Comments

This response also gains the mark.

Question 1 (b)

In Q01(b) candidates were asked to explain how plant cells differ from human cells in their ability to differentiate and specialise. Most responses gained at least one mark, with many candidates scoring both marks for explaining that all plant cells can differentiate into all types of cells throughout the plant's life and can regenerate a whole plant. Some responses also explained that most human cells cannot differentiate or that only embryonic stem cells can become different types of cell.

(b) Explain how plant cells differ from human cells in their ability to differentiate and specialise. (lines 2 and 3)

(2)

Any plant cell can differentiate and become specialised cells, while in humans only stem cells can differentiate to become specialized. Plant cells when ~~differentiating can~~ differentiated can change their metabolism, growth and development to form a new ~~plant~~ whole plant.

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Examiner Comments

This response gains both marks for explaining that any plant cell can differentiate and become specialised but only stem cells can in humans. They also note that plant cells can form a whole new plant.

(b) Explain how plant cells differ from human cells in their ability to differentiate and specialise. (lines 2 and 3)

(2)

Human cells ~~can~~ cannot ~~be~~ differentiate and become specialised cells, on the other hand, plant cells can differentiate and become specialised cells.

ResultsPlus
Examiner Comments

This response also gains both marks.

(b) Explain how plant cells differ from human cells in their ability to differentiate and specialise. (lines 2 and 3)

(2)

Human cells can only differentiate once.* Stem cells either embryo or adult cell found in bone marrow. Plant cells retain the ability and can ~~did~~ differenciate throughout their lifetime. Human cell stem cells can differentiate and specialize into any cell. e.g nerve for spinal paralysis

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Examiner Comments

This response also gains both marks. Human stem cells, embryonic stem cells can differentiate. Plant cells can differentiate throughout their life.

Question 1 (c)

Q01(c) asked candidates to give the function of two mineral ions included in the culture media. Almost all responses gained credit with the best giving the function of nitrate as required for amino acids for protein synthesis and magnesium for chlorophyl production. Other minerals and a correct function were also credited.

(c) Give the function of two named minerals included in the culture media. (line 6)

(4)

1 Nitrate allow the plant to make protein as nitrogen is needed to ~~build~~ make amino acid.

2 Magnesium allow plant to carry out photosynthesis as it is a key component to make chloroplast.

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Examiner Comments

This response scores 4 marks. Nitrate for protein and magnesium for chloroplasts.

(c) Give the function of two named minerals included in the culture media. (line 6)

(4)

1 magnesium for chloroplast.

2 phosphate for DNA of plants

ResultsPlus
Examiner Comments

This response also gains 4 marks. Magnesium for chloroplasts and phosphate for DNA.

(c) Give the function of two named minerals included in the culture media. (line 6)

(4)

1 Vitamins are used by the plants will help the plants stay health and structure the plants. Vitamins can help the plants photosynthesise to create glucose used in respiration

2 Minerals in the culture media will be taken in by the plant and will help produce chloroplast using magnesium and help the growth of a plant (example, nitrates used for making proteins

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Examiner Comments

This response eventually gains 4 marks. On the last two lines it refers to magnesium for chloroplasts and nitrate for proteins.

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Examiner Tip

This shows that candidates need to think more about their response before starting to write. This response contains a lot of writing that does not gain any credit.

Question 1 (d)

In Q01(d) candidates were asked why the pH of the media needs to be kept constant. Most responses gained both marks for explaining that enzymes are affected by changes in pH away from the optimum as the shape of the active site could be altered and the enzyme denatured.

(d) Explain why the pH of the media needs to be kept constant. (line 7)

(2)

Because the pH of the media is important to the function of the enzyme. If the pH is too low or high the enzymes will denature and chemical reactions will slow down or stop completely in the plant which would cause the plants growth to stunt or die.

ResultsPlus
Examiner Comments

This response gains both marks. It refers to the enzyme being affected and enzyme being denatured.

(d) Explain why the pH of the media needs to be kept constant. (line 7)

(2)

As photosynthesis is an enzyme-controlled reaction meaning ~~an opt~~ a constant pH is needed to keep it at its optimum ~~for~~ pH for enzyme action.

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Examiner Comments

This response gains 1 mark for reference to keeping an optimum for enzyme action.

(d) Explain why the pH of the media needs to be kept constant. (line 7)

(2)

The pH of the media is kept constant to ensure the plant tissue grows efficiently. A pH that is not suitable for the plant can cause the plant to die as it won't grow properly

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Examiner Comments

This response does not gain any marks as it does not refer to enzyme or active site.

Question 1 (e)

Q01(e) asked candidates to describe a simple experiment you could do to show the phototropic response of plant stems to light. Most responses scored full marks for describing an experiment using two similar plants, one with light from one side and the other in the dark, leaving for a stated time and observing that the response of the plant is to grow towards the light.

(e) Auxin also controls the response of plants to light.

Describe a simple experiment you could do to show the phototropic response of plant stems to light.

(3)

One plant must be kept in dark light, an one ~~in~~ with light to one side and one with the tip of the plant cut off. Leave the plants for a week and ensure that the temperature, humidity ~~and~~, water and ~~coss~~ minerals are the same for all three plants. Record the height ~~results~~ after a week. All the plants must have the same height and must be of the same species.

ResultsPlus
Examiner Comments

This response gains 3 marks for one plant in dark and another with light to one side, similar plants.

(e) Auxin also controls the response of plants to light.

Describe a simple experiment you could do to show the phototropic response of plant stems to light.

(3)

First put the plant in a dark environment, then add a lamp in a certain direction to the plant. After several weeks, observe the direction change of the stem of plant, which is facing towards the light. Therefore, the stem is positive phototropism and repeat the experiment ~~at to~~.

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Examiner Comments

This response scores 3 marks for reference to a lamp in one direction, for a stated time and the plant growing to the light.

Question 1 (f)

Q01(f) asked candidates to explain why scientists want to conserve endangered plant species and varieties. Most responses gained full marks for explaining that this would prevent extinction, maintain biodiversity and keep species for future use.

(f) Explain why scientists want to conserve endangered plant species and varieties. (lines 13 and 14)

(2)

This is to ensure that the ecosystems of ~~a~~ the environment the plant is in won't be disrupted, and to prevent the extinction of plant ~~sp~~ species that could be used to produce medicines and more.

ResultsPlus Examiner Comments

This response gains both marks for prevents extinction and use for medicines.

(f) Explain why scientists want to conserve endangered plant species and varieties. (lines 13 and 14)

(2)

To prevent extinction and to maintain biodiversity

ResultsPlus Examiner Comments

This response also gains both marks for prevent extinction and maintains biodiversity.

(f) Explain why scientists want to conserve endangered plant species and varieties. (lines 13 and 14)

(2)

So they don't go ~~extinct~~ extinct and can't be produced anymore in medicine. If it was a helpful plant it would no longer have use since it doesn't exist anymore and medicine will stop production.

ResultsPlus
Examiner Comments

This response also gains both marks.

Question 1 (g)

In Q01(g) candidates were asked to explain why plant cell suspension media are maintained under suitable conditions of agitation, light and temperature. Most responses recognised the link to the specification point on industrial fermenters and some candidates could describe the role of agitation in providing the cells with carbon dioxide. Most responses referred to light for photosynthesis and a suitable temperature for enzyme action.

(g) Explain why plant cell suspension culture media are maintained under suitable conditions of agitation, light and temperature. (lines 24 and 25)

(3)

Having enough light allow plants to conduct photosynthesis efficiently, and to grow. Under suitable temperature will result in the highest working rate of enzymes, and plants can grow faster. ~~and~~ Under to suitable condition of agitation allows plants to absorb more minerals ~~minerals~~ and nutrients for growth.

ResultsPlus
Examiner Comments

This response scores full marks for light for photosynthesis, temperature for enzyme action and agitation to provide minerals.

(g) Explain why plant cell suspension culture media are maintained under suitable conditions of agitation, light and temperature. (lines 24 and 25)

(3)

Light is required for photosynthesis to produce glucose which the plant can use for respiration for energy.

Temperature is ~~needed~~ maintained under suitable condition to increase ~~effect~~ an enzyme activity for respiration to allow more ~~energy~~ ATP to be produced for energy.

The level of agitation is also kept the same to ensure growth of the plant.

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Examiner Comments

This response gains 2 marks for light for photosynthesis and temperature for increased enzyme action.

ResultsPlus
Examiner Tip

The reference to agitation improving growth needs to include how growth is improved, such as providing carbon dioxide or minerals for the plant cells.

(g) Explain why plant cell suspension culture media are maintained under suitable conditions of agitation, light and temperature. (lines 24 and 25)

(3)

light is needed for photosynthesis to produce glucose for respiration to produce energy for growth. Temperature is needed to provide kinetic energy for enzyme reactions.

ResultsPlus
Examiner Comments

This response also gains 2 marks for light for photosynthesis and temperature for increased enzyme reactions.

Question 2 (b)

In Q02(b) candidates had to determine the magnification of the diagram. Most responses gained some marks with many candidates gaining full marks for correctly measuring the line P Q and converting mm to µm and dividing this by 80. Those candidates who did not calculate the correct magnification often picked up marks for working.

(b) The actual length of the root cell from P to Q is 80 µm.

Determine the magnification of the diagram.

[1000 µm = 1 mm]

P → Q = 38 mm

(3)

$\frac{80}{1000} = 0.08$

~~0.08 × 38 =~~

$\frac{38}{0.08} = 475$

magnification = × 475

ResultsPlus
Examiner Comments

This scores full marks.

(b) The actual length of the root cell from P to Q is 80 µm.

Determine the magnification of the diagram.

[1000 µm = 1 mm]

(3)

P↔Q = 3.9cm = 390mm = 390000µm

$\frac{390000}{80} = 4875$

magnification = × 4875

ResultsPlus Examiner Comments

This scores 2 marks for measuring PQ correctly and dividing by 80.

ResultsPlus Examiner Tip

The error here is converting cm to mm but the response gains two marks for working.

(b) The actual length of the root cell from P to Q is 80 µm.

Determine the magnification of the diagram.

[1000 µm = 1 mm]

(3)

Magnification = $\frac{\text{image size}}{\text{actual size}} \times 100$.

$= \frac{107}{80} \times 100$.

magnification = ×

ResultsPlus Examiner Comments

This scores 1 mark for dividing by 80.

Question 2 (c)

Q02(c) asked candidates to explain how root hair cells are adapted for their functions. This was answered well by candidates, with many scoring full marks for explaining how the long cell penetrates into the soil increasing the surface area for absorption of water by osmosis and of mineral ions by diffusion or active transport.

(c) Root hair cells are specialised cells adapted for their functions.

Explain how root hair cells are adapted for their functions in the plant.

(4)

Root hair cells have a very large surface area for absorption of water from soil by osmosis. It has many mitochondria which produce energy / ATP by aerobic respiration for the active transport of mineral ions from the soil into the cell, using protein carriers against a concentration gradient. Mineral ions are in small quantities / low concentration in the soil. It has a higher concentration of dissolved sugars, minerals* and other solutes in its cytoplasm to provide it with a low water potential / more negative / steeper concentration gradient, to increase the rate of osmosis. A vacuole filled with cell sap helps turgor and produces an internal pressure for absorption of water. Osmosis is the net movement of water molecules from a more concentrated to a more dilute solution. The water then passes out of the root hair cell and enters the root cortex via osmosis.

(Total for Question 2 = 9 marks)

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Examiner Comments

This response scores full marks. It explains that the root hair cell has a large surface area, to absorb water by osmosis. It uses active transport to absorb mineral ions.

(c) Root hair cells are specialised cells adapted for their functions.

Explain how root hair cells are adapted for their functions in the plant.

(4)

Root hair cells have to absorb and take in water and minerals from the soil which is carried away by the phloem and xylem. In order to carry out osmosis, it has a partially permiable membrane to let water in. Root hair cells are geotropic so they grow towards the earth to find the water and mineral ions in the soil. They also have long 'tails' to have a larger surface area for osmosis and active transport. Therefore it has a negative concentration gradient

ResultsPlus
Examiner Comments

This response also scores full marks. It explains that the cells absorb water and mineral ions. It refers to osmosis, active transport and the large surface area.

(c) Root hair cells are specialised cells adapted for their functions.

Explain how root hair cells are adapted for their functions in the plant.

(4)

Root hair cells have large surface area to volume ratio. which increases ~~so that~~ diffusion rate.

They have mitochondria to provide energy for active transport. to absorb minerals.

They have large vacuoles to store water.

~~They have partt~~ one cell ~~think~~ thick to ~~f~~ increase the diffusion rate.

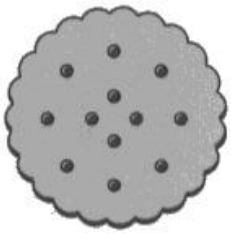
ResultsPlus
Examiner Comments

This response also gains full marks. It explains that root hair cells have a large surface area increasing diffusion and active transport of mineral ions.

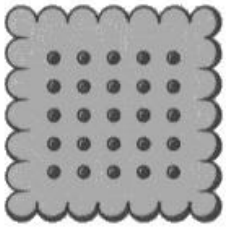
Question 3 (a)

Question 3 presented a table showing nutritional information about two biscuits. In Q03(a) candidates had to calculate the percentage of the total carbohydrate present in biscuit A that is starch. Most responses were able to gain full marks for this calculation.

3 The picture shows two biscuits, A and B.



Biscuit A



Biscuit B

The table shows some nutritional information supplied by the manufacturers of the two biscuits.

Biscuit	Energy in kJ per 100 g	Lipid in g per 100 g	Carbohydrates in g per 100 g			Protein in g per 100 g	Salt in g per 100 g
			starch	sugars	total		
A	1860	13.6	66.5	1.5	68.0	10.0	1.2
B	1653	3.7	75.8	1.2	77.0	10.5	0.9

(a) Calculate the percentage of the total carbohydrate in biscuit A that is starch.

(2)

Percentage of starch in Biscuit A = starch in grams over total carbohydrates in grams multiplys by 100

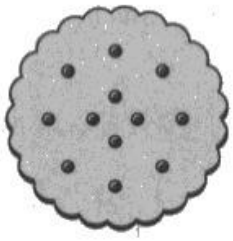
Biscuit A = (66.5 / 68.10) x 100

percentage = 97.79 %

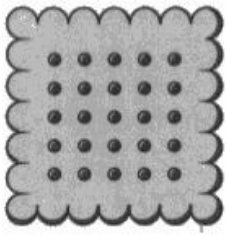
ResultsPlus
Examiner Comments

This response scores both marks.

3 The picture shows two biscuits, A and B.



Biscuit A



Biscuit B

The table shows some nutritional information supplied by the manufacturers of the two biscuits.

Biscuit	Energy in kJ per 100 g	Lipid in g per 100 g	Carbohydrates in g per 100 g			Protein in g per 100 g	Salt in g per 100 g
			starch	sugars	total		
A	1860	13.6	66.5	1.5	68.0	10.0	1.2
B	1653	3.7	75.8	1.2	77.0	10.5	0.9

(a) Calculate the percentage of the total carbohydrate in biscuit A that is starch.

(2)

$\frac{66.5}{68.0} \times 100 = 97.794\ \%$

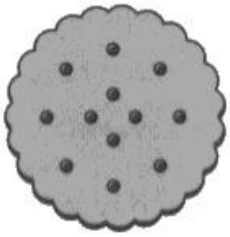
$= 98\ \%$

percentage = 98 %

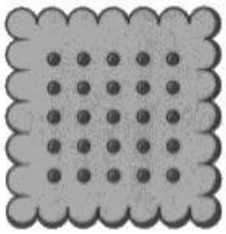
ResultsPlus
Examiner Comments

This gains full marks for the correct answer.

3 The picture shows two biscuits, A and B.



Biscuit A



Biscuit B

The table shows some nutritional information supplied by the manufacturers of the two biscuits.

Biscuit	Energy in kJ per 100 g	Lipid in g per 100 g	Carbohydrates in g per 100 g			Protein in g per 100 g	Salt in g per 100 g
			starch	sugars	total		
A	1860	13.6	66.5	1.5	68.0	10.0	1.2
B	1653	3.7	75.8	1.2	77.0	10.5	0.9

(a) Calculate the percentage of the total carbohydrate in biscuit A that is starch.

(2)

$$\frac{68.0 - 66.5}{68.0} \times 100 = 2.2$$

percentage = 2.2 %

ResultsPlus
Examiner Comments

The answer given is incorrect but the response gains one working mark for dividing by 68.

Question 3 (b)

In Q03(b) candidates were asked to comment on which biscuit would be most suitable for a person, who had been told by their doctor, to maintain a healthy diet but lose some weight. Almost all responses gained at least one mark. However, only the best responses linked the differences between the nutritional contents with their effect on the person. The best responses gained full marks for commenting that biscuit B is most suitable as it has less energy so less energy would be stored as fat / it has less lipid, so less lipid stored under the skin / it has less sugar, so less risk of diabetes / it has less salt which can increase blood pressure and that it has more protein which is required for tissue repair.

(b) A doctor has advised a person to lose weight.

Comment on which biscuit, A or B, would be most suitable for the person to maintain a healthy diet and to lose weight.

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

(4)

~~B~~ Biscuit B is more suitable. First, It has less energy. If excess energy is consumed, it will be stored as fat. Also, B contains less lipid. Excess lipid will lead to obesity. It will be stored it the body as fat. However, total carbohydrate of B is slighter higher than A. Yet, sugar content in B is less than A. Consuming B has less risk of diabetes. The protein in B is higher than A. This promotes growth and helps repairs cells.

other than biscuits other food needed to be healthy

ResultsPlus
Examiner Comments

This response scores full marks. It comments that B has less energy so less fat stored, less lipid so less fat stored, less sugar so less risk of diabetes and more protein for repairing cells.

(b) A doctor has advised a person to lose weight.

Comment on which biscuit, A or B, would be most suitable for the person to maintain a healthy diet and to lose weight.

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

(4)

Biscuit A has slightly less total carbohydrates at 68g per 100g compared to 77, and slightly less protien. However, it has nearly 4 times the lipids, at 13.6g per 100g compared to 3.7g, which can cause obesity and increase cholesterol levels. A also has more energy per 100g at 860g compared to 653g for biscuit B. A also has slighty more sugar at 2.2% of its total per 100g compared to 1.558% for B. Excessive sugar can lead to diabetes. Biscuit A also has 0.3 grams more salt per 100g, which can increase the risk of high blood pressure.

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Examiner Comments

This response scores 3 marks. It comments upon B has less fat so less cholesterol, less sugar so less risk of diabetes and less salt so less risk of higher blood pressure.

(b) A doctor has advised a person to lose weight.

Comment on which biscuit, A or B, would be most suitable for the person to maintain a healthy diet and to lose weight.

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

(4)

Biscuit A ~~has~~ contains more lipids so it increases chances of obesity when consumed.
Biscuit B contains more carbohydrates which primarily provides more energy than Biscuit A.
The amount of protein in both busicuits are roughly the same. ~~Biscuit A has slight~~ They also have roughly the same salt content.
Busicuit B is more suitable because it contains much less fats(267.6% less fat).

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Examiner Comments

This scores one mark for A containing more lipid so increasing the risk of obesity as an equivalent to gaining more weight.

Question 3 (c)(i)

In Q03(c)(i) candidates were asked to describe the method for an experiment to compare the energy values of the two biscuits. Most responses gained marks, with many candidates gaining full credit for describing the practical 2.33B from the specification.

(c) A teacher tells some students to carry out an experiment to compare the energy values of biscuit A and biscuit B.

(i) Describe a suitable method the students could use for their experiment.

(4)

Pour same volume of water into two test tube. Measure the original temperature of water using a thermometer. ~~Fix~~ Measure weight of biscuit A and biscuit B using a balance. Fix each of them on a mounted needle. Ignite biscuit A and biscuit B. Move them ~~to~~ under the test tube to heat water immediately. ~~After~~ Record the final temperature of water ~~as~~ after ~~con~~ ~~but~~ combustion is complete. Energy released = 4.2x water volume x ~~=~~ increase of temperature. ~~Divided by~~ Calculate energy value, by using total energy released divided by mass of biscuit. Repeat the experiment and ~~tak~~ calculate the average.

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Examiner Comments

This scores full marks. It refers to using the same volume of water, measuring the mass of the biscuits, measuring the change in temperature and heating the water using the burning biscuits. It also gives the equation for calculating energy released.

(c) A teacher tells some students to carry out an experiment to compare the energy values of biscuit A and biscuit B.

(i) Describe a suitable method the students could use for their experiment.

(4)

- set up apparatus of burning biscuit A with torch, continuously relighting until it stops relighting under a beaker of 30 cm^3 of cold water
- use formula $Q = mc\Delta T$ where Q is energy, m is mass of water in g, c is 4.2 ~~(specific)~~ (specific heat capacity of water) and T is temperature change of water ~~at start~~ at end subtracted by start (final – initial) in °C
- divide energy by mass of ~~biscuit~~ biscuit in g
- measure mass of water and biscuit with electronic balance ~~in~~ in g., measure temperature change with thermometer
- repeat with biscuit B
- use one mass of biscuits
- ~~use same type of biscuits with~~ repeat whole experiment 5 times, find mean to increase reliability and spot anomalies

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Examiner Comments

This response also gains full marks. It refers to using 30cm^3 of water, using the equation, temperature change of the water and mass of biscuit. It also notes that the biscuit should be relit if it goes out.

(c) A teacher tells some students to carry out an experiment to compare the energy values of biscuit A and biscuit B.

(i) Describe a suitable method the students could use for their experiment.

(4)

Take a 10g sample of each biscuit. Take an insulated beaker of water and measure the initial temperature. Hold the sample of biscuit A on a stick and light it on fire and hold the flame under the beaker until the sample has completely turned black and cannot burn or relight anymore. Measure the new water temperature with a thermometer and calculate the change in temperature. Use the equation energy value = mass x 4.2 x change in temperature to calculate the energy value of A. Repeat this with the 1g sample of B keeping the room temperature, water volume, and water temperature constant. Repeat 3 times with each biscuit and find the mean energy value.

ResultsPlus
Examiner Comments

This also gains full marks. It mentions mass of biscuit, burning biscuit under tube until completely burnt, measure increase in temperature of water. It also quoted the equation.

Question 3 (c)(ii)

In Q03(c)(ii) candidates were asked to give two reasons why the energy value the students determined in their experiment was much lower than the energy values supplied by the manufacturers. Most responses gained at least one mark, with the best stating that energy is lost from the students test tube or that the biscuits were not fully burnt.

(ii) The energy values the students determined for the biscuits were much lower than the energy values supplied by the manufacturers.

Give two reasons why this is the case.

(2)

1 Some heat energy from the ~~the~~ burning of biscuit ~~it~~ is lost to the surroundings

2 The biscuit was not fully ~~combusted~~ burned

ResultsPlus Examiner Comments

This scores both marks. It states energy lost to the surroundings and not completely burnt.

(ii) The energy values the students determined for the biscuits were much lower than the energy values supplied by the manufacturers.

Give two reasons why this is the case.

(2)

1 There was no insulation so some heat energy was lost to the surroundings as the transfer wasn't fully efficient.

2 The food sample wasn't fully combusted / burnt

ResultsPlus
Examiner Comments

This also gains both marks.

(ii) The energy values the students determined for the biscuits were much lower than the energy values supplied by the manufacturers.

Give two reasons why this is the case.

(2)

1 Not all the heat produced was transferred to the water, and some of it was lost to the environment

2 Human error in measurements and reading equipment.

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Examiner Comments

This scores one mark for not all energy transferred.

Question 4 (b)(i)

Q04(b)(i) asked candidates to describe how pollution by fertilisers can affect aquatic ecosystems. Those candidates who knew and understood this part of the specification were able to score well with many candidates gaining full marks.

(b) Farmers sometimes add chemical fertiliser to the soil.

(i) Describe how pollution by fertiliser can affect aquatic ecosystems.

(5)

Fertilisers includes of nitrates and useful minerals that is used by algae to feed on. This causes an algal bloom resulting in light needed for photosynthesis by aquatic plants not being able to penetrate well causing in the death of the said aquatic plants. As they die, decomposers feed on them to survive while taking up oxygen needed for respiration. As plants, a source of food for other aquatic organisms die, the said aquatic organisms die as well due to the lack of food and oxygen taken up by decomposers. This is the process of eutrophication.

ResultsPlus
Examiner Comments

This response gains all 5 marks. It describes nitrates causing an algal bloom blocking light. Aquatic plants die and decomposers using up oxygen. Other organisms die. Finally it refers to eutrophication.

(b) Farmers sometimes add chemical fertiliser to the soil.

(i) Describe how pollution by fertiliser can affect aquatic ecosystems.

(5)

The fertiliser reach into the ground ~~by~~ in the process called leaching. The substance in fertiliser such as nitrate ~~a~~ are induced the the rapid growth of algae and causes algae blooming The ~~gla~~ huge amount of algae block the sunlight so, there will be less light for photosynthesis for other aquatic plants. Then, the decomposers use oxygen for their respiration to break down algae. Thus, there will be less oxygen for other ~~aq~~ aquatic animals such as fish. ~~and which leads to die~~ And, the aquatic animals and plants would be died.

ResultsPlus
Examiner Comments

This response also gains 5 marks. It refers to nitrates, algal growth, less light, decomposers using oxygen for respiration, aquatic animals die.

(b) Farmers sometimes add chemical fertiliser to the soil.

(i) Describe how pollution by fertiliser can affect aquatic ecosystems.

(5)

fertilisers run off due to rain into ponds and rivers ~~which causes algae grow~~ which causes algae to grow on the surface of the water. The algae spreads out across the surface and intercepts the sunlight from reaching the bed of the pond and the plants at the bottom. as they can't photosynthesise This causes the plants to die so the fish have nothing left to eat and die too. once the fertiliser has run out, the algae dies too. Bacteria and other decomposers feed off of the decaying plants and use up oxygen in the water ~~to do so through~~ due to respiration. once all oxygen has been used up, the water turns anoxic and the bacteria die and so do the other organisms in the water. ** fertilisers cause aquatic ecosystems to die

ResultsPlus
Examiner Comments

This response also gains full marks. It describes algal growth, blocking light, plants die, bacteria use up oxygen, other organisms die.

Question 4 (b)(ii)

In Q04(b)(ii) candidates were asked to give an alternative to chemical fertilisers that a farmer could use. Many responses gained the mark for giving manure of animal faeces. A few candidates gave biological controls, confusing fertiliser with pesticide.

(ii) Give an alternative to chemical fertiliser that a farmer could use.

(1)

Use manure as fertiliser ~~tha~~ because they are less soluble in water.

ResultsPlus
Examiner Comments

This scores the mark for manure.

(ii) Give an alternative to chemical fertiliser that a farmer could use.

(1)

biological herbicides and biological pesticides

ResultsPlus
Examiner Comments

No credit for herbicide or pesticide.

Question 5 (a)(i)

Q05(a)(i) gave part of a DNA molecule and asked candidates to write the letters of the correct bases for strand 2. Many responses gained both marks for the correct series of bases.

5 (a) Diagram 1 shows part of a DNA molecule.

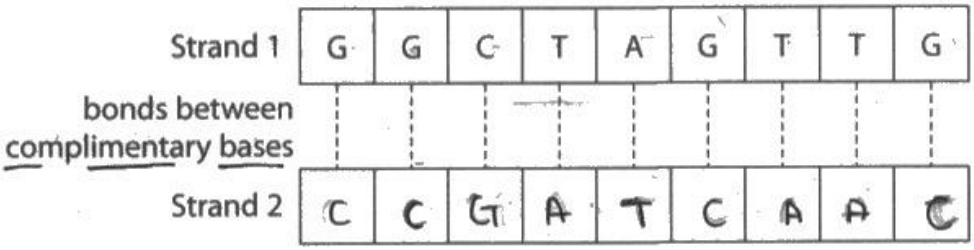


Diagram 1

(i) Complete Diagram 1 by writing the letters of the missing bases in the empty boxes for strand 2.

ResultsPlus
Examiner Comments

This scores both marks for a correct sequence of bases.

5 (a) Diagram 1 shows part of a DNA molecule.

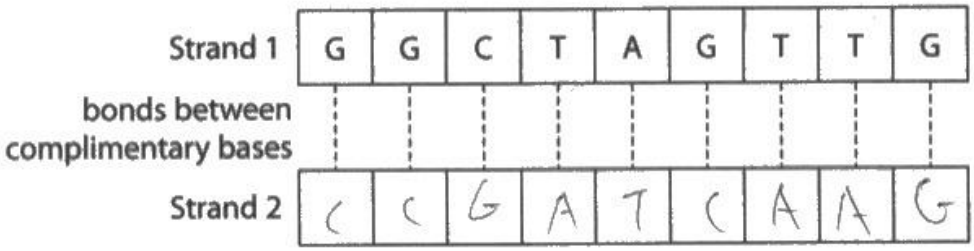


Diagram 1

(i) Complete Diagram 1 by writing the letters of the missing bases in the empty boxes for strand 2.

ResultsPlus
Examiner Comments

This scores 1 mark for a sequence with one error.

Question 5 (a)(ii)

Most responses could give the maximum number of amino acids coded by this strand as 3.

Question 5 (a)(iii)

In Q05(a)(iii) candidates had to complete the empty boxes to show the mRNA coded for by this DNA strand. Again most candidate responses could give the appropriate bases.

(iii) The original DNA strand is used to produce mRNA.

Complete the empty boxes in Diagram 2 to show the mRNA coded for by this DNA strand.

(2)

DNA	G	G	C	T	A	G	T	T	G
mRNA	C	C	G	A	U	C	A	A	C

Diagram 2

ResultsPlus
Examiner Comments

This gains both marks for the correct bases.

(iii) The original DNA strand is used to produce mRNA.

Complete the empty boxes in Diagram 2 to show the mRNA coded for by this DNA strand.

(2)

DNA	G	G	C	T	A	G	T	T	G
mRNA	C	C	G	A	U	G	A	A	C

Diagram 2

ResultsPlus
Examiner Comments

This response scores one mark as it makes an error in one of the bases.

Question 5 (b)

In Q05(b) candidates were given information about a length of DNA containing 25 000 base pairs and 50 000 bases. They were told that 30% of the bases were adenine. They were asked to determine the number of thymine, cytosine and guanine bases in the length of DNA. Many candidates gained full marks.

(b) A length of DNA consists of 25 000 base pairs.

This makes a total of 50 000 bases.

In this length of DNA, 30% of the bases are adenine (A).

Determine the number of thymine (T) bases, cytosine (C) bases, and guanine (G) bases in this length of DNA.

(3)

$50000 \times 30\% = 15000$

b

$50000 \times (1 - 30\% - 30\%) = 20000$

$\frac{20000}{2} = 10000$

number of thymine bases (T) = 15000

number of cytosine bases (C) = 10000

number of guanine bases (G) = 10000

ResultsPlus
Examiner Comments

This response gains full marks for the correct number of T, C and G.

(b) A length of DNA consists of 25 000 base pairs.

This makes a total of 50 000 bases.

In this length of DNA, 30% of the bases are adenine (A).

Determine the number of thymine (T) bases, cytosine (C) bases, and guanine (G) bases in this length of DNA.

(3)

30% also thymine

100 - 30 - 30 = 40

40 ÷ 2 = 20

20% C

20% G

number of thymine bases (T) = 30%

number of cytosine bases (C) = 20%

number of guanine bases (G) = 20%

ResultsPlus
Examiner Comments

This response gains 2 marks for correctly stating the percentage of each base.

(b) A length of DNA consists of 25 000 base pairs.

This makes a total of 50 000 bases.

In this length of DNA, 30% of the bases are adenine (A).

Determine the number of thymine (T) bases, cytosine (C) bases, and guanine (G) bases in this length of DNA.

(3)

30 %. C 30%. × 50000 = 15,000

100%. - 60%. = 40%.

20%. T 20%. × 50000 = 10,000

20%. G

number of thymine bases (T) = 10,000

number of cytosine bases (C) = 15,000

number of guanine bases (G) = 10,000

ResultsPlus
Examiner Comments

This response scores 1 mark for the number of G bases being 10 000.

Question 5 (c)

Q05(c) required candidates to describe the differences between the process of transcription and the process of translation. Again many responses scored full marks for describing the location, starting substance and product of each as well as the role of tRNA. The quality of responses showed the candidates knowledge and understanding of protein synthesis.

(c) Describe the differences between the process of transcription and the process of translation.

(4)

Transcription occurs inside the nucleus whereas translation occurs in the cytoplasm and ribosome. Transcription involves DNA and mRNA however, translation involves mRNA and tRNA. Transcription involves the copying of DNA onto an mRNA molecule however, translation involves codons binding to anti-codons as they are complementary. Translation involves the forming of amino acid chains / polypeptide but transcription does not.

ResultsPlus
Examiner Comments

This response scores all four marks for the location, starting molecule, product and the role of tRNA in translation.

(c) Describe the differences between the process of transcription and the process of translation.

(4)

Transcription creates mRNA in the nucleus. DNA 'unzips' and mRNA is formed with complementary bases.

Translation creates proteins in the ribosomes. mRNA attaches to the ribosome. tRNA brings attached amino acids. Anti-codons from tRNA attach to codons in mRNA. Amino acids form a polypeptide chain (protein).

ResultsPlus
Examiner Comments

This response also scores all four marks for the location, starting molecule, product and the role of tRNA in translation.

(c) Describe the differences between the process of transcription and the process of translation.

(4)

Translation occurs in the ribosome in the cytoplasm, while transcription occurs in the nucleus. ~~Translation~~ tRNA is involved in translation whereas only mRNA is involved in transcription. There is complimentary base pairing between codons and anticodons in translation. The DNA is unzipped into a template strand during transcription. There is a start and stop codon in translation.

ResultsPlus
Examiner Comments

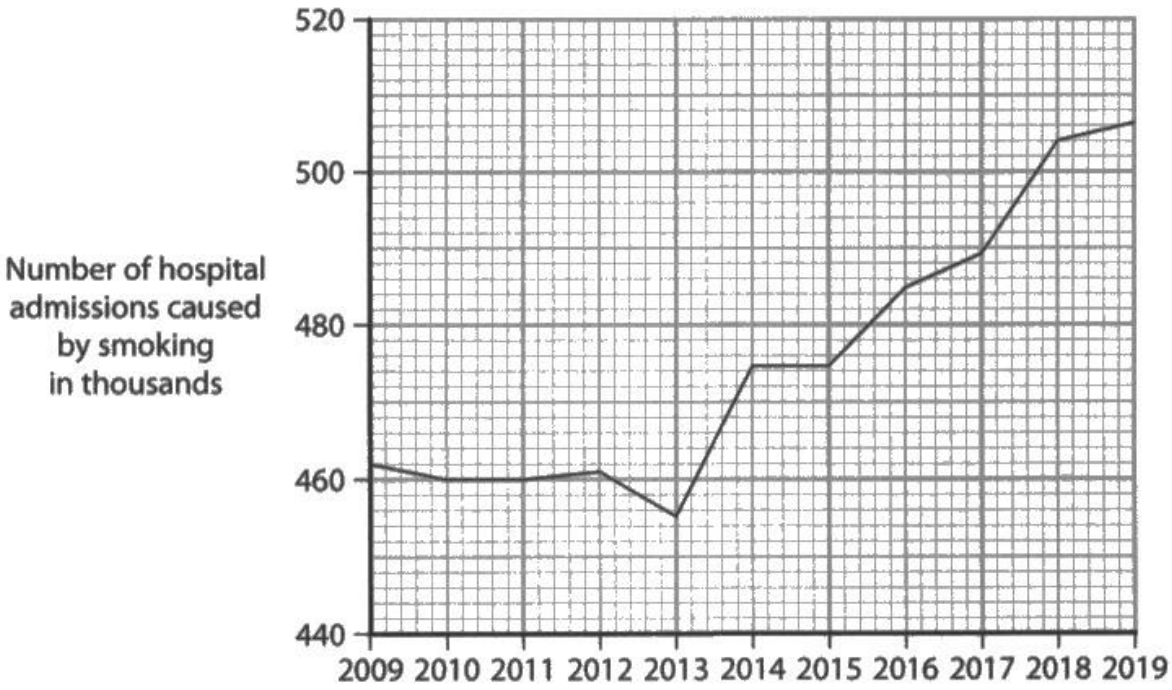
This response scores 3 marks for the location, starting molecule and the role of tRNA in translation.

Question 6 (a)

In Q06(a) candidates were given a graph showing the change on the number of hospital admissions caused by smoking from 2009 to 2019. They were asked to calculate the percentage increase in numbers from 2009 to 2019. Most responses were able to read the values of the graph and calculate the increase.

6 Smoking cigarettes has harmful effects on the body.

Graph 1 shows the number of hospital admissions in thousands due to conditions caused by smoking each year from 2009 to 2019.



Graph 1

(a) Using information from Graph 1, calculate the percentage increase in the number of hospital admissions caused by smoking in 2019 compared with 2009.

(2)

$\frac{506000 - 462000}{462000} = 9.523...\%$

$\approx 9.52\%$ (3 s.f.)

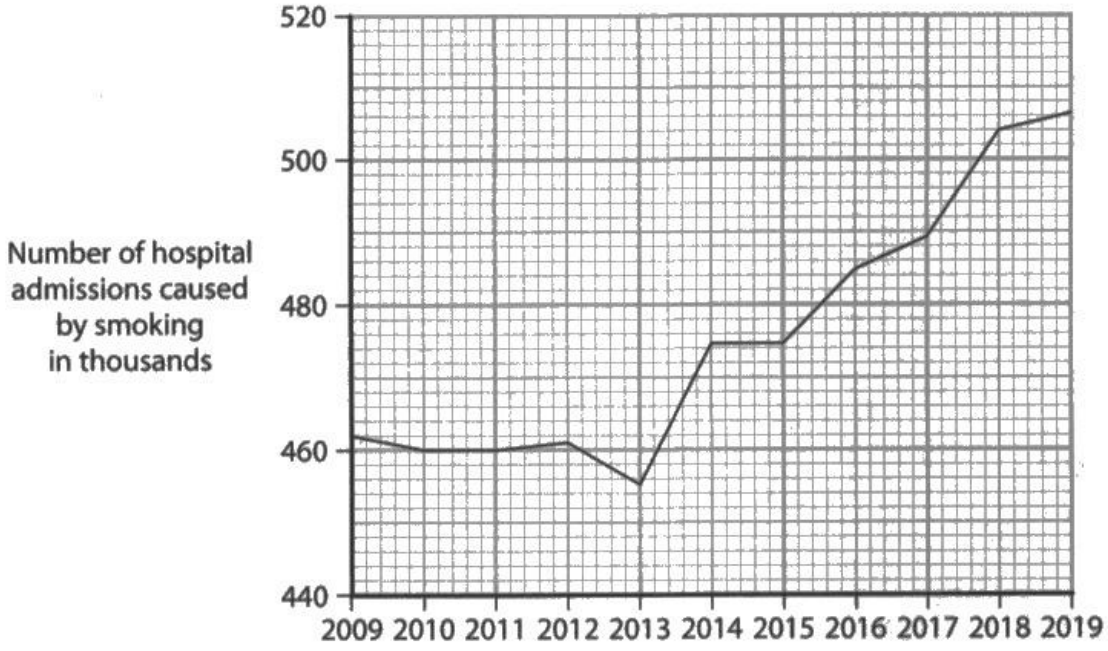
percentage increase = 9.52 %

ResultsPlus
Examiner Comments

This response scores both marks for 9.52%.

6 Smoking cigarettes has harmful effects on the body.

Graph 1 shows the number of hospital admissions in thousands due to conditions caused by smoking each year from 2009 to 2019.



Graph 1

(a) Using information from Graph 1, calculate the percentage increase in the number of hospital admissions caused by smoking in 2019 compared with 2009.

(2)

~~5~~6 · 506 − 462 = 44.

44 ÷ 506 = 0.087

0.087 × 100 = 8.7%

percentage increase = 8.7 %

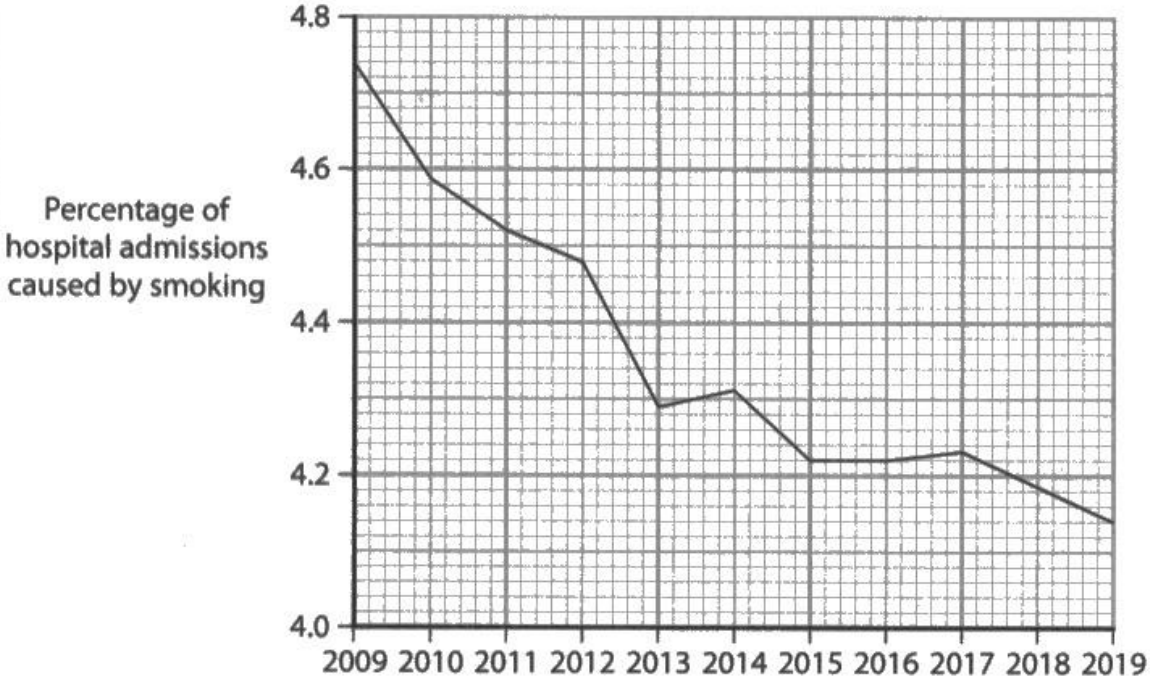
ResultsPlus
Examiner Comments

This response does not give the correct answer but gains 1 mark for subtracting 462 from 506 and getting 44.

Question 6 (b)

Q06(b) asked candidates to comment on the changes in the number and the percentage of all hospital admissions caused by smoking. Most responses were able to score 3 or 4 marks for noting numbers being constant from 2009 to 2012, then decreasing slightly in 2013 but overall that there was an increase in number of admissions from 2009 to 2019 and that the percentage of admissions fell from 2009 to 2019. The best candidates explained that other conditions increased or that the population increased.

(b) Graph 2 shows the percentage of all hospital admissions that were due to conditions caused by smoking each year from 2009 to 2019.



Graph 2

Comment on the changes in the number of hospital admissions caused by smoking and the percentage of all hospital admissions that were caused by smoking.

Use data from graph 1 and graph 2 in your answer.

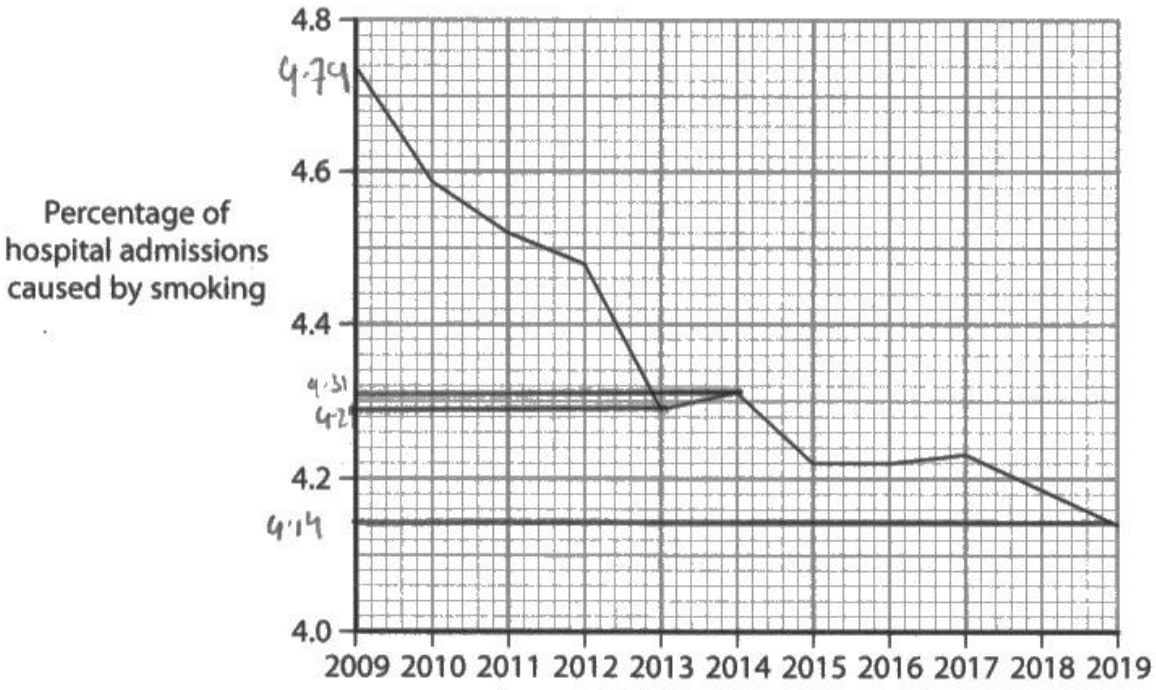
(4)

The number of hospital admissions ~~in~~ caused ~~by~~ smoking increased over time, however there was a steep reduction in 2013 and a steep increase in 2014. The ~~to~~ highest number was in 2019 with 506 admissions. ~~For~~ ~~peop~~ However, the percentage of hospital admissions caused by smoking decreased over time, with a steep reduction in 2013 and the lowest being at 2019, while the highest was in 2009. This suggests that ~~only~~ while more people are going to the hospital on smoking related issues, ~~this is a~~ a smaller percentage of the total population smoke. The graphs do not show where the research took place or ~~how many~~ the other reasons for hospital admissions. There may have been an increase in other conditions, causing the percentage to drop. Not everyone who smokes goes to the hospital.

ResultsPlus
Examiner Comments

This response gains full marks. It comments that numbers increased over time, that there was a drop in 2013, that the percentage of admissions due to smoking declined, that the percentage of the population who smoke may be declining and that there are other reasons for hospital admissions.

(b) Graph 2 shows the percentage of all hospital admissions that were due to conditions caused by smoking each year from 2009 to 2019.



Graph 2

Comment on the changes in the number of hospital admissions caused by smoking and the percentage of all hospital admissions that were caused by smoking.

Use data from graph 1 and graph 2 in your answer.

(4)

The number of hospital admissions stayed roughly the same at 460 from 2009 to 2012 but then decreased to 455 in 2013. By 2019 it increased by 9·3%. The percentage of hospital admissions decreased by 0·6% from 2009 to 2019. It had a rapid decrease from 2009 to 2013 but had a small increase of 0·02% in 2014. Overall, the number of hospital admissions increased however the percentage of hospital admissions decreased. ~~This could be because~~

* From 2014 to 2015 number of hospital admissions stayed the same
* From 2015 to 2017 percentage of hospital admissions stayed roughly the same

This also scores 4 marks. It comments that the number of admissions stayed the same from 2009 to 2102, then decreased in 2013, the numbers overall increased and the percentage of admissions decreased.

Question 6 (c)

In the last item, Q06(c), candidates were asked to describe the consequences of smoking for the functioning of the lungs. Most candidates gained some credit, with the best describing how cilia are damaged, leading to a build-up of mucus causing bacterial infection, that alveoli are damaged leading to a loss of surface area or emphysema and that airways may become inflamed or narrow and that COPD and lung cancer develops.

(c) Smoking causes harmful effects on the lungs.

Describe the consequences of smoking cigarettes for the functioning of the lungs.

(5)

~~smo~~ Cigarettes ~~Smoking~~ contains nicotine which is highly addictive. They also contain carcinogens which increases the risk of ~~a~~ lung cancer. Smoking cigarettes contains ~~con~~ tar which builds up and blocks the movement of cilia. The mucus builds up and creates infections like pneumonia. Smoking breaks down ~~causes the~~ the walls of the alveoli. The alveoli heals but become smoother and rounder. The alveoli now ~~start to~~ have smaller surface area to volume ratio causing less diffusion to occur. So the lungs doesn't have enough oxygen and can't dispose of carbon dioxide. These causes emphysema. Smoking in general increases the risk of lung cancer.

ResultsPlus
Examiner Comments

This response gains all 5 marks. It describes the risk of cancer, cilia no longer working, mucus build up and infection. It also describes damage to alveoli.

(c) Smoking causes harmful effects on the lungs.

Describe the consequences of smoking cigarettes for the functioning of the lungs.

(5)

Harmful particles from smoking can irritate the airways of the lungs, causing increased mucus production and cilia damage. This can cause bronchitis and other infections. Carcinogens can increase the risk of cell mutations and cause lung cancer. And smoking can damage alveoli, causing them to fuse. This can lead to emphysema.

ResultsPlus
Examiner Comments

This response also gains 5 marks. It describes inflamed airways, mucus production and cilia damage, bronchitis and lung infection. It also refers to lung cancer and alveoli being damaged.

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 and explain items.
- Make sure you have practised calculations and that you understand and know how to apply formulae and always include all your working.
- Write in detail and use correct and precise biological terminology.
- Revise practical work to help in questions about required practicals but also to help in unfamiliar or novel practical procedures.
- Make sure you know and understand all of the terms in the specification.
- Always read through your responses and ensure that what you have written makes sense and answers the question fully.