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Examiners' Report
June 2025

Int GCSE Biology 4BI1 1BR

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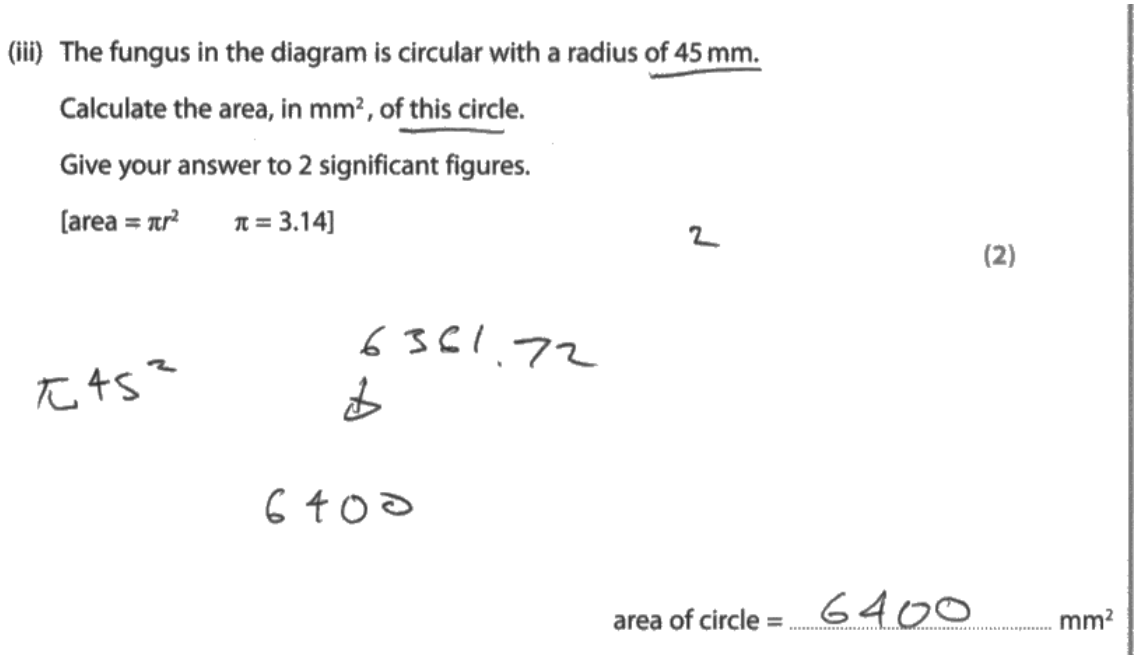
Introduction

The examiners were very impressed with the high standard of many of the scripts seen. It is clear that candidates and centres work very hard to prepare for these examinations. Many candidates demonstrated excellent, detailed and accurate understanding of all areas of the specification and wrote answers that were clear and carefully addressed the questions. Graph skills were excellent, with most correctly presenting carefully drawn graphs that had linear scales and all axes labelled. Mathematical skills were strong and many demonstrated a clear understanding of how to calculate ratios and use the correct numbers of significant figures. A few candidates confused significant figures with decimal places. Practical skills were generally very strong - AO3 is focused on practical work and it was clear that many candidates had completed the core practicals and had a strong understanding of generic practical skills. The six-mark practical planning question was well answered by most candidates and it was pleasing to see that the majority wrote full experimental details and gave excellent descriptions of valid, reliable and well controlled experiments. A few candidates find the meaning of the different command words challenging -candidates should have a full understanding of the requirements of each of the command words listed in the specification - a common error was to confuse 'describe' and 'explain'. The longer evaluative style questions were very well answered and most candidates appreciated that they needed to look closely at data, use the data to support their answer and also comment on experimental designs where appropriate. A small number of candidates underestimated the depth required to gain maximal credit for answers, for example, it is good practice when referring to osmosis to state how water moves from a higher water potential to a lower water potential. Most candidates were able to present correct genetic diagrams and many excellent, well set out diagrams were seen that clearly showed parental genotypes, gametes and offspring.

Question 1(a)iii

This question was well answered by most candidates. The question required candidates to substitute numbers into the formula and then give the final answer to the correct number of significant figures. A few candidates incorrectly gave their answer to two decimal places rather than two significant figures.



(iii) The fungus in the diagram is circular with a radius of 45 mm.

Calculate the area, in mm², of this circle.

Give your answer to 2 significant figures.

[area = πr^2 $\pi = 3.14$]

(2)

$\pi 45^2$ 6361.72

6400

area of circle = 6400 mm²

ResultsPlus
Examiner Comments

This answer is a correct answer that gained both marks.

ResultsPlus
Examiner Tip

Make sure that you know the difference between significant figures and decimal places.

(iii) The fungus in the diagram is circular with a radius of 45 mm.

Calculate the area, in mm^2, of this circle.

Give your answer to 2 significant figures.

[area = πr^2 $\pi = 3.14$]

(2)

Area = πr^2
= 3,14 . 45^2
= 3,14 . 2025
= 6350,5

area of circle = 6350,5 mm^2

ResultsPlus
Examiner Comments

This answer gained one mark. The calculation is correct but the final answer is not given to two significant figures.

Question 1(b)i

This question asked candidates to give two differences between sexual and asexual reproduction. Common correct answers included the production of genetic variation, the roles of mitosis and meiosis, and the need for fusion of haploid gametes in sexual reproduction. A common error was to refer to the need for two parents in sexual reproduction - candidates should refer to the two parent cells.

(b) *Mucor* can reproduce using asexual or sexual reproduction.

(i) State two differences between asexual and sexual reproduction.

(2)

1 asexual reproduction requires only one parent while sexual reproduction requires two (male and female)

2 asexual reproduction produces genetically identical ~~one~~ clones.

ResultsPlus
Examiner Comments

This answer gained one mark for the reference to asexual reproduction producing genetically identical offspring. Two parents was insufficient as two parent cells was required for the mark.

(b) *Mucor* can reproduce using asexual or sexual reproduction.

(i) State two differences between asexual and sexual reproduction.

(2)

1 Asexual reproduction only need one parent and is ~~a~~ completely identical to the parent.

2 Sexual reproduction needs two gametes in order to form an offspring.

ResultsPlus
Examiner Comments

This answer gained one mark for the reference to the need for gametes in sexual reproduction.

(b) *Mucor* can reproduce using asexual or sexual reproduction.

(i) State two differences between asexual and sexual reproduction.

(2)

1 asexual doesn't involve gametes, no fertilisation while sexual requires fertilisation between gametes

2 asexual involves only one parent cell while sexual involves two parent cells

ResultsPlus
Examiner Comments

This excellent answer gained two marks for correctly referring to the need for two parent cells in sexual reproduction and the need for gametes and fertilisation in sexual reproduction.

ResultsPlus
Examiner Tip

Always be clear in answers about what you are referring to. Try not to say 'it' or 'they'.

Question 1(b)ii

This question required candidates to explain why sexual reproduction is beneficial. Strong answers referred to the generation of variation and went on to explain that this means that organisms are more adaptable to changes in the environment or that some may survive if an environment change occurs.

(ii) Explain why it is an advantage for *Mucor* to be able to reproduce using sexual reproduction.

(2)

When using sexual reproduction, the two gametes need to combin and produce the offspring. The offsprings have a genetic variation and can adapt the changing enviroments' situations.

ResultsPlus
Examiner Comments

This excellent answer gained both marks. The candidate clearly states that sexual reproduction generates variation and goes on to explain that this means that the offspring can adapt to environmental changes.

(ii) Explain why it is an advantage for *Mucor* to be able to reproduce using sexual reproduction.

(2)

When Mucor reproduce using sexual production, they can have variation so they have better adaptation skill and ~~can s~~ they have more chance to survive.

ResultsPlus
Examiner Comments

This excellent answer gained two marks for correctly stating that sexual reproduction generates variation and this means that offspring may be adapted so that they can survive better.

(ii) Explain why it is an advantage for *Mucor* to be able to reproduce using sexual reproduction.

(2)

Sexual reproduction fuses gametes with different genetic material which results in variation within the population.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea that sexual reproduction generates variation. The candidate does not give any further explanation however, to give a full explanation.

ResultsPlus
Examiner Tip

Look at the number of marks allocated - if there are two marks, it usually means that two things will be needed.

Question 2(a)ii

This short question required candidates to state why a lung is classed as an organ. Most candidates understood that organs are composed of several tissues. A few candidates confused organs with tissues.

(ii) State why a lung is described as an organ.

(1)

it is made up of tissues that are working together

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that an organ is made of tissues.

(ii) State why a lung is described as an organ.

(1)

It is different tissues that ~~do~~ perform a specific function

ResultsPlus
Examiner Comments

This strong answer correctly states that an organ is made of different tissues.

ResultsPlus
Examiner Tip

Make sure that you know definitions of all key terms listed in the specification.

Question 2(a)iii

This question required candidates to give an explanation of why contraction of the diaphragm causes air to move into the lungs. Strong answers referred to the flattening of the diaphragm, the increase in volume of the thorax, and the lower pressure within the thorax. Candidates should refer to the increase in volume of the thorax rather than the volume of the lungs. Some candidates referred to exhalation rather than inhalation and a few candidates incorrectly referred to an increase in pressure when the thorax volume increases.

(iii) Explain how contraction of the diaphragm causes air to move into the lungs.

(3)

The diaphragm contracts and moves downwards allowing space for the lungs to expand to allow air to enter the alveolis.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea that the diaphragm moves down. Increased space is not the same as inversed volume of the thorax.

ResultsPlus
Examiner Tip

Always use accurate scientific vocabulary.

(iii) Explain how contraction of the diaphragm causes air to move into the lungs.

(3)

As diaphragm contracts, it moves downwards and flattens increasing volume of air and reducing pressure inside.

ResultsPlus
Examiner Comments

This answer gained all three marks. The candidate correctly stated that the diaphragm moves down, the volume (of the thorax) increases and the pressure decreases.

(iii) Explain how contraction of the diaphragm causes air to move into the lungs.

(3)

Contraction of diaphragm means decrease in pressure in the thorax cavity and increase in volume. intercostal muscles contract and diaphragm flattens, ~~causing~~ air

ResultsPlus
Examiner Comments

This strong answer gained all three marks for correctly stating that the diaphragm flattens, the volume of the thorax increases and the pressure decreases.

Question 2(b)i

This answer required candidates to multiply 35 by the body mass of 70 (kg) and by the time of 30 (minutes). Most candidates gained at least one mark with many going on to get both marks.

(b) A scientist compared the rate at which oxygen is used during exercise by a person who is a non-smoker with a person who is a smoker.

The rate is measured in cm^3 per minute for each kilogram of body mass.

The table shows the scientist's results.

Human	Rate of oxygen use during exercise in cm^3 per minute for each kilogram of body mass
non-smoker	35
smoker	27

(i) Calculate the volume of oxygen used in 30 minutes by a non-smoker with a mass of 70 kg.

(2)

cm^3/m for each kg $\frac{cm^3}{\frac{m}{kg}} = 35$ $\frac{x}{\frac{30}{70}} = 35$

= 35 cm^3 73500

$\frac{cm^3}{1} \times \frac{kg}{m}$ =

$\frac{35 \times 70}{30} = 81.666667$

73,500

volume = ... cm^3

ResultsPlus Examiner Comments

This answer gained both marks. The candidate clearly shows their working.

ResultsPlus Examiner Tip

Always show working - it may gain some credit even if the final answer is incorrect.

(b) A scientist compared the rate at which oxygen is used during exercise by a person who is a non-smoker with a person who is a smoker.

The rate is measured in cm^3 per minute for each kilogram of body mass.

The table shows the scientist's results.

Human	Rate of oxygen use during exercise in cm^3 per minute for each kilogram of body mass
non-smoker	35
smoker	27

cm^3/min

(i) Calculate the volume of oxygen used in 30 minutes by a non-smoker with a mass of 70 kg.

(2)

35 cm^3/min for 70kg

35 x 30 = 1050

= 1050 cm^3 in 30 ~~minutes~~

~~1050 ÷ 70 = 15~~

volume = 1050 cm^3

ResultsPlus
Examiner Comments

This answer gained one mark for a multiplication but did not get the final correct answer.

(b) A scientist compared the rate at which oxygen is used during exercise by a person who is a non-smoker with a person who is a smoker.

The rate is measured in cm^3 per minute for each kilogram of body mass.

The table shows the scientist's results.

Human	Rate of oxygen use during exercise in cm^3 per minute for each kilogram of body mass
non-smoker	35
smoker	27

(i) Calculate the volume of oxygen used in 30 minutes by a non-smoker with a mass of 70 kg.

$35 \times 70 = 2450$

$2450 \times 30 = 73500$

(2)

volume = 73500 cm^3

ResultsPlus
Examiner Comments

This answer gained both marks and the candidate shows their working clearly.

Question 2(b)ii

This question required candidates to look at data for the rate of oxygen used by smokers and non-smokers and give explanations for the difference. Most candidates gained at least one mark. Strong answers started their answers with a description of how the rate is lower for smokers and then went on to suggest reasons for this, such as loss of alveolar surface area, reduced diffusion of oxygen into the blood and the damage caused by tar. Many candidates gave excellent answers that explained how carbon monoxide would bind to haemoglobin to reduce oxygen uptake. Weaker answers tended to describe the data without going on to give any explanations. Candidates should look to give accurate detail in their answers.

(ii) Explain the effect of cigarette smoking on the rate at which oxygen is used.

(3)

The carbon monoxide in the smoke, when in the alveoli in the lungs, ~~can~~ can diffuse into the blood and bind to the haemoglobin in red blood cells. This forms carboxyhaemoglobin and reduces the amount of oxygen carried in the blood by haemoglobin so less oxygen is used up.

ResultsPlus
Examiner Comments

This answer gained two marks for the effect of carbon monoxide on haemoglobin and the reduced use of oxygen.

(ii) Explain the effect of cigarette smoking on the rate at which oxygen is used.

(3)

Smoking a cigarette will lead to certain diseases that will affect the amount of oxygen taken in by the body. Ex: Emphysema - which will reduce the surface area of the alveoli present in the lungs, which will reduce the amount of oxygen taken in by the body, as a result the rate at which oxygen is used will be reduced.

ResultsPlus
Examiner Comments

This answer gained three marks for correctly referring to emphysema, the reduced surface area of alveoli, and the reduced rate of oxygen usage.

(ii) Explain the effect of cigarette smoking on the rate at which oxygen is used.

(3)

~~Smoker~~ effect on cigarette smoking on the rate at which oxygen is used is lesser than the non-smoker due to damaged lungs

ResultsPlus
Examiner Comments

This answer gained one mark for correctly describing the lower rate of oxygen use by smokers. The candidate did not go on to give any explanation for the difference.

ResultsPlus
Examiner Tip

Make sure that you know the difference between describe and explain and use your knowledge when giving explanations.

(ii) Explain the effect of cigarette smoking on the rate at which oxygen is used.

(3)

The rate decreases when smoking because the alvioli are damaged so they can't expand for a larger surface ~~area~~ area. This means less gas exchange & oxygen being absorbed.

ResultsPlus
Examiner Comments

This good answer gained all three marks. The candidate clearly states that the alveoli are damaged, there is less surface area and that less oxygen is absorbed.

(ii) Explain the effect of cigarette smoking on the rate at which oxygen is used.

(3)

– The rate of oxygen use during exercise for a smoker is relatively lower than non-smoker.
– Cigarette smoking may cause damages of alveolus as cigarette has tar which is a ~~carcinagine~~ ~~carnigine~~ carcinogine
– Tars and many other toxic chemicals go into the lungs, affecting the function of alveolus.
– Some alveolus may fuse together, decreasing the efficiency of gas exchange.

ResultsPlus
Examiner Comments

This answer gained three marks. The candidate correctly describes the lower rate of oxygen use, the role of tar, and the damage to alveoli.

Question 3(b)i

This question was very well answered by many candidates. Candidates had to use the data in the table to calculate the volume of a sperm cell and use this to determine the ratio of the volume of a villus cell to the volume of a sperm cell. Many candidates gained at least one mark for calculating the volume with many going on to gain all three. The main error was not recognising that the number of mitochondria per volume was per 10 μm3 of cell.

(b) The table shows information about the number of mitochondria in different types of human cell.

Type of human cell	Number of mitochondria in one cell	Number of mitochondria in 10 μm^3 of cell	Volume of cell in μm^3
skin	510	3	1700
villus	2000	8	2500
sperm	75	12	62.5

(i) The volume of a villus cell is 2500 μm^3.

Calculate the ratio of the volume of a villus cell to the volume of a sperm cell.

Give your answer in the form n : 1

(3)

$\frac{75}{12} \times 10 = 62.5$

ratio = 0.025 : 1

ResultsPlus
Examiner Comments

This answer gained one mark for correctly calculating the volume of the sperm cell as 62.5.

(b) The table shows information about the number of mitochondria in different types of human cell.

Type of human cell	Number of mitochondria in one cell	Number of mitochondria in 10 μm³ of cell	Volume of cell in μm³
skin	510	3	1700
villus	2000	8	2500
sperm	75	12	62.5

(i) The volume of a villus cell is 2500 μm³.

Calculate the ratio of the volume of a villus cell to the volume of a sperm cell.

Give your answer in the form n : 1

(3)

$\frac{75}{12} = 6.25 \times 10 = 62.5$

2500 : 62.5

40 : 1

ratio = 40 : 1

ResultsPlus
Examiner Comments

This answer gained all three marks. The candidate clearly shows the working - an example of good practice.

(b) The table shows information about the number of mitochondria in different types of human cell.

Type of human cell	Number of mitochondria in one cell	Number of mitochondria in 10 μm³ of cell	Volume of cell in μm³
skin	510	3	1700
villus	2000	8	2500
sperm	75	12	625

(i) The volume of a villus cell is 2500 μm³.

75 / 0.12 = 625

Calculate the ratio of the volume of a villus cell to the volume of a sperm cell.

Give your answer in the form n : 1

(3)

2500 : 625

4 : 1

ratio = 4 : 1

ResultsPlus
Examiner Comments

This answer gained two marks. The candidate has calculated the ratio but has got the scale factor wrong to reach an answer of 4:1.

Question 3(b)ii

This question required candidates to comment on the data in the table. 'Comment on' requires candidates to identify patterns from a number of variables and go on to make judgements. Strong answers described how villus cells have the highest number of mitochondria per cell but that sperm have the highest number per 10 μm3 of cell. Strong answers then went on to give explanations for the different densities of mitochondria such as the need for sperm cells to have ATP for swimming and the need for villus cells to carry out active transport. Some answers correctly referred to the role of villus cells in absorption but did not go on to mention active transport.

(ii) Using the information in the table, comment on the importance of mitochondria to the activities of different cell types.

(4)

- mitochondria is the site of aerobic respiration and provides energy to the cell. ~~in the cell and~~
It is the powerhouse of the cell. Sperm has the most number of mitochondria in it's cell compared to it's size.
- this is because lots of energy is required for the sperm to propel and find an egg cell to fertilise.
- The villus cell has the second most amount in relation to it's size and this is because ~~although~~ energy is required for ~~the~~ diffusion and active transport (especially as it's against concentration gradient)
- skin has the least but ~~it is~~ energy is still required ~~needed~~ for activities such as thermoregulation.

(Total for Question 3 = 9 marks)

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Examiner Comments

This is a good answer that gained three marks. The candidate identifies mitochondria as the site of respiration and then explains that sperm need energy for movement and villus cells need energy for active transport. Note that 'powerhouse of the cell' is insufficient as a function of mitochondria.

ResultsPlus
Examiner Tip

Make sure that the language used is of a GCSE standard. Phrases such as 'powerhouse of the cell' is not sufficient.

(ii) Using the information in the table, comment on the importance of mitochondria to the activities of different cell types.

(4)

Mitochondria is the site of respiration to produce energy ATP from glucose and oxygen. Mitochondria in the sperm cell releases energy for the flagellum so that it can swim. Mitochondria present in the villi allow for efficient active transport as it requires energy

ResultsPlus
Examiner Comments

This answer also gained three marks for describing the function of mitochondria and the roles of energy in sperm cells and villus cells.

(ii) Using the information in the table, comment on the importance of mitochondria to the activities of different cell types.

(4)

Mitochondria provides energy, or ATP, to cells so they can carry out their functions efficiently.

ResultsPlus
Examiner Comments

This answer only gained one mark for the function of ATP in sperm cells. At least four points would be expected for a four mark question.

(ii) Using the information in the table, comment on the importance of mitochondria to the activities of different cell types.

(4)

Mitochondria is important because respiration occurs in it and provides energy for the cell. Villus with the most amount of mitochondria ~~with high surface area~~ which means it requires the most energy, however the sperm has the most mitochondria in 10 μm^3 of cell as it need energy to swim, so it is the most important for sperm. For skin, mitochondria is not that important because both number in a cell and in 10 μm^3 is very low, so not ~~ha~~ that important for skin cell.

ResultsPlus
Examiner Comments

This answer gained four marks. The candidate gives the role of mitochondria, states that villus cells have the most per cell and the sperm cells have the most per 10 µm 3 of cell. The candidate also gives the role of energy in sperm movement.

(ii) Using the information in the table, comment on the importance of mitochondria to the activities of different cell types. (4)

skin cells require moderate mitochondria in one cell to undergo aerobic respiration to generate ATP / energy for cells to grow. villus in ileum needed the highest number of mitochondria for respiration to provide energy for active transport to absorb nutrients like amino acids and glucose or sugar into the blood as active transport required energy for molecules to travel from a low concentration to a high concentration against concentration gradient. sperm has ~~highest~~ lowest number of mitochondria in one cell ✓, it need mitochondria to respire and generate energy for movement in semen to travel to the egg cell.

(Total for Question 3 = 9 marks)

ResultsPlus
Examiner Comments

This strong answer gained four marks. The candidate gives the function of mitochondria, states that villus cells have the most mitochondria (per cell) and gives roles of energy in villus cells and sperm cells.

Question 4(a)i

This question required candidates to give a component of a balanced diet that was not present in the table. Most candidates were able to gain one mark but a few incorrectly referred to carbohydrates which were already listed in the table or vitamins and minerals that were stated in the question stem.

4 Fruit juice drinks contain a range of nutrients.

The table shows some of the nutrients in a fruit juice drink and the percentage of the recommended daily allowance (RDA) of these nutrients for a 16 year old.

Nutrient	Mass of nutrient in 400 cm^3 of drink in g	Percentage of RDA in 400 cm^3 of drink
starch	2.8	2
sugar	6.4	4
fat	7.0	10
fibre	9.2	35

(a) (i) Vitamins and minerals are not listed in the table.

Name one other component of a balanced diet that is not listed in the table.

(1)

Vitamin B

ResultsPlus
Examiner Comments

This answer did not gain the mark. The candidate refers to vitamin B which is already given in the question stem.

4 Fruit juice drinks contain a range of nutrients.

The table shows some of the nutrients in a fruit juice drink and the percentage of the recommended daily allowance (RDA) of these nutrients for a 16 year old.

Nutrient	Mass of nutrient in 400 cm^3 of drink in g	Percentage of RDA in 400 cm^3 of drink
starch	2.8	2
sugar	6.4	4
fat	7.0	10
fibre	9.2	35

(a) (i) Vitamins and minerals are not listed in the table.

Name one other component of a balanced diet that is not listed in the table.

(1)

Protein, Amino acids

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating protein as a component of a balanced diet.

4 Fruit juice drinks contain a range of nutrients.

The table shows some of the nutrients in a fruit juice drink and the percentage of the recommended daily allowance (RDA) of these nutrients for a 16 year old.

Nutrient	Mass of nutrient in 400 cm^3 of drink in g	Percentage of RDA in 400 cm^3 of drink
starch	2.8	2
sugar	6.4	4
fat	7.0	10
fibre	9.2	35

(a) (i) Vitamins and minerals are not listed in the table.

Name one other component of a balanced diet that is not listed in the table.

(1)

water

ResultsPlus
Examiner Comments

This answered gained one mark for correctly stating that water is another component of a balanced diet.

Question 4(a)ii

This challenging calculation required candidates to use the information to determine the RDA for fibre of a 16 year old. A significant number of candidates multiplied 35 by 9.2. Strong answers demonstrated clear working and gave their answers to the nearest whole number.

(ii) Calculate the RDA of fibre for a 16 year old.

Give your answer in grams and to the nearest whole number.

(2)

$\frac{9.2}{0.35} = 26.28$

$= 26$ g

RDA of fibre = 26 g

ResultsPlus
Examiner Comments

This answer gained both marks as the final answer is correct. The candidate shows the working clearly and gives the final answer to the nearest whole number.

(ii) Calculate the RDA of fibre for a 16 year old.

Give your answer in grams and to the nearest whole number.

(2)

$\frac{9.2}{35} = 0.26285...$

$= 1\%$

0.26285×100

$= 26.28$

≈ 26

RDA of fibre = 26 g

ResultsPlus
Examiner Comments

This answer also gained two marks. The candidate shows their working clearly and it is clear how they correctly rounded their answer to the nearest whole number.

(ii) Calculate the RDA of fibre for a 16 year old.

Give your answer in grams and to the nearest whole number.

(2)

$\frac{35}{400} \times 9.2$

$= 0.805$

RDA of fibre = 1 g

ResultsPlus
Examiner Comments

This answer gained no marks and was a common error whereby the candidate multiplied 35 by 9.2.

ResultsPlus
Examiner Tip

Always double check if calculated answers make sense.

Question 4(a)iii

This question required candidates to state the function of fibre in the human diet. Most candidates were able to correctly state that fibre is important to facilitate egestion of faeces, move food through the gut, or prevent constipation. A common incorrect answer was to state the fibre helps digestion and some candidates incorrectly stated that fibre helps excretion. Candidates should give very precise, accurate answers.

(iii) State the function of fibre in the human diet.

(1)

it is to help with the digestion

ResultsPlus
Examiner Comments

This answer did not gain the mark. Stating that fibre helps digestion is too vague.

(iii) State the function of fibre in the human diet.

(1)

Fibre helps in peristalsis process in digestion

ResultsPlus
Examiner Comments

This excellent answer that correctly states that fibre helps peristalsis gained the mark.

ResultsPlus
Examiner Tip

Make sure that you use accurate, precise terminology.

(iii) State the function of fibre in the human diet.

(1)

Fibre can prevent constipation

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Examiner Comments

This answer also gained the mark for correctly stating that fibre prevents constipation.

Question 4(b)

This answer generated answers with a wide range of quality. Strong answers correctly stated that amylase digests starch, gave a correct location such as the mouth or duodenum, stated that amylase breaks down starch into maltose, and went on to state that maltase breaks down maltose into glucose. Common errors included: stating that amylase breaks down starch into glucose, that the digestion occurs in the stomach, and confused the spellings of maltose and maltase. This is an AO1, factual recall question, that tests candidates' knowledge of the roles of enzymes in carbohydrate digestion.

(b) Describe how starch is digested into glucose in the human alimentary canal.

(3)

- starch is digested by amylase in the bile
- which then breaks ~~it~~ it down into smaller molecules
- which is glucose

ResultsPlus Examiner Comments

This answer gained one mark for correctly identifying amylase as the enzyme that digests starch. The incorrect reference to bile was ignored and the candidate incorrectly states that amylase breaks down starch into glucose rather than maltose.

(b) Describe how starch is digested into glucose in the human alimentary canal.

(3)

Starch is a polysaccharide and is insoluble. Hence, it needs to broken down into glucose molecules. Amylase is secreted in the mouth and small intestine to do this. The enzyme break the polymer into glucose molecules, which are soluble and can be absorbed.

ResultsPlus Examiner Comments

This answer gained two marks for correctly referring to amylase and the location of the digestion.

(b) Describe how starch is digested into glucose in the human alimentary canal.

(3)

Amylase produced by the pancreas and salivary glands ~~digest starch~~ break down starch into maltose in the mouth and duodenum. Maltose ~~then~~ is also released into the small intestine by the pancreas to break down the maltose into glucose.

ResultsPlus
Examiner Comments

This excellent answer gained all three marks. The candidate correctly refers to amylase, the location of the glands that produce amylase, maltose as the product and the role of maltase.

(b) Describe how starch is digested into glucose in the human alimentary canal.

(3)

Mechanical digestion ~~By~~ by teeth which increase surface area. Amylase in saliva break down part of the glucose into maltose. Amylase produced by the pancreas is ~~trans~~ transfer into the small intestine to break down remainder starch that is not turned into maltose. ~~And~~. Maltase ~~in the~~ in the small intestine would break down Maltose into glucose which will then be absorbed by the villi.

ResultsPlus
Examiner Comments

This excellent answer gained all three marks. The candidate clearly states that amylase digests starch, identifies the locations, states that maltose is produced and then explains the role of maltase.

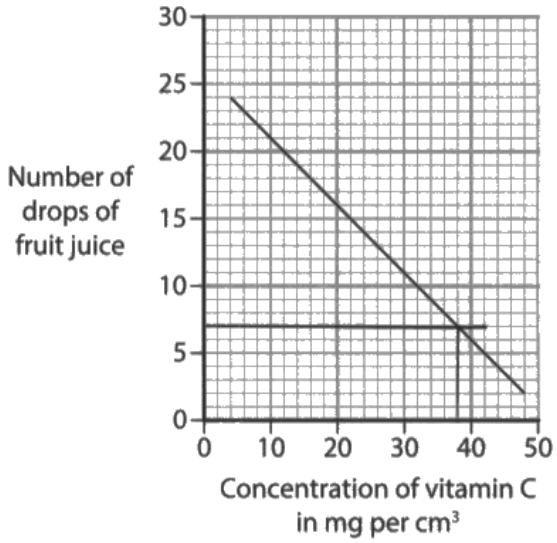
Question 4(c)i

This question assessed candidates' graphical skills by requiring them to use a calibration curve to determine the concentration of vitamin C. Most candidates correctly identified 38. A few candidates incorrectly read the scale and referred to 39 - candidates should take time to determine the value of increments on graph scales.

The table shows the student's results.

Fruit juice	Number of drops of fruit juice needed to turn DCPIP solution to colourless
apple	18
grape	22
lemon	4
lime	7
orange	3

(i) The graph shows the effect of concentration of vitamin C on the number of drops needed to change DCPIP solution to colourless.



Determine the concentration of vitamin C in lime juice.

(1)

concentration of vitamin C = 38 mg per cm³

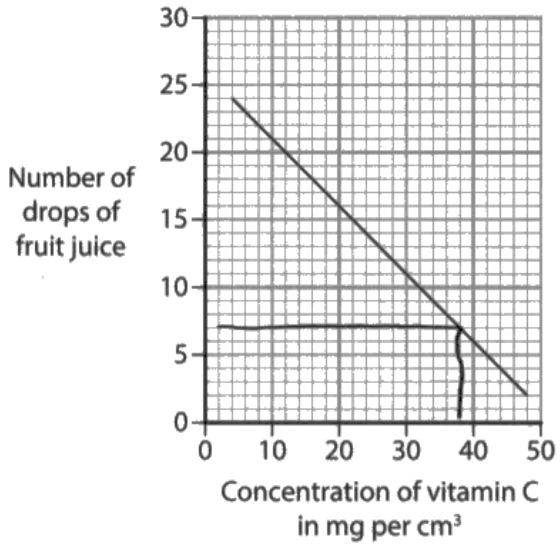
ResultsPlus
Examiner Comments

This is an example of a correct answer that gained one mark.

The table shows the student's results.

Fruit juice	Number of drops of fruit juice needed to turn DCPIP solution to colourless
apple	18
grape	22
lemon	4
lime	7
orange	3

(i) The graph shows the effect of concentration of vitamin C on the number of drops needed to change DCPIP solution to colourless.



Determine the concentration of vitamin C in lime juice.

(1)

concentration of vitamin C = 38 mg per cm³

ResultsPlus
Examiner Comments

This answer also gained the mark. The candidate shows how they derived their answer from the graph - an example of good practice.

Question 4(c)ii

This question required candidates to look at the data and determine the relative concentrations of vitamin C in different fruit juices and rank them in order. Most candidates ranked the juices correctly and gained the mark. A small number of candidates incorrectly thought that if more drops of fruit juice were required, the vitamin C concentration would be high.

(ii) Give the fruit juices in order of increasing concentration of vitamin C.

One has been done for you.

(1)

highest concentration — Orange

Lemon

lime

Apple

lowest concentration — Orange grape

ResultsPlus
Examiner Comments

This correct answer gained one mark.

(ii) Give the fruit juices in order of increasing concentration of vitamin C.

One has been done for you.

(1)

highest concentration — grape

apple

lime

lemon

lowest concentration — orange

ResultsPlus
Examiner Comments

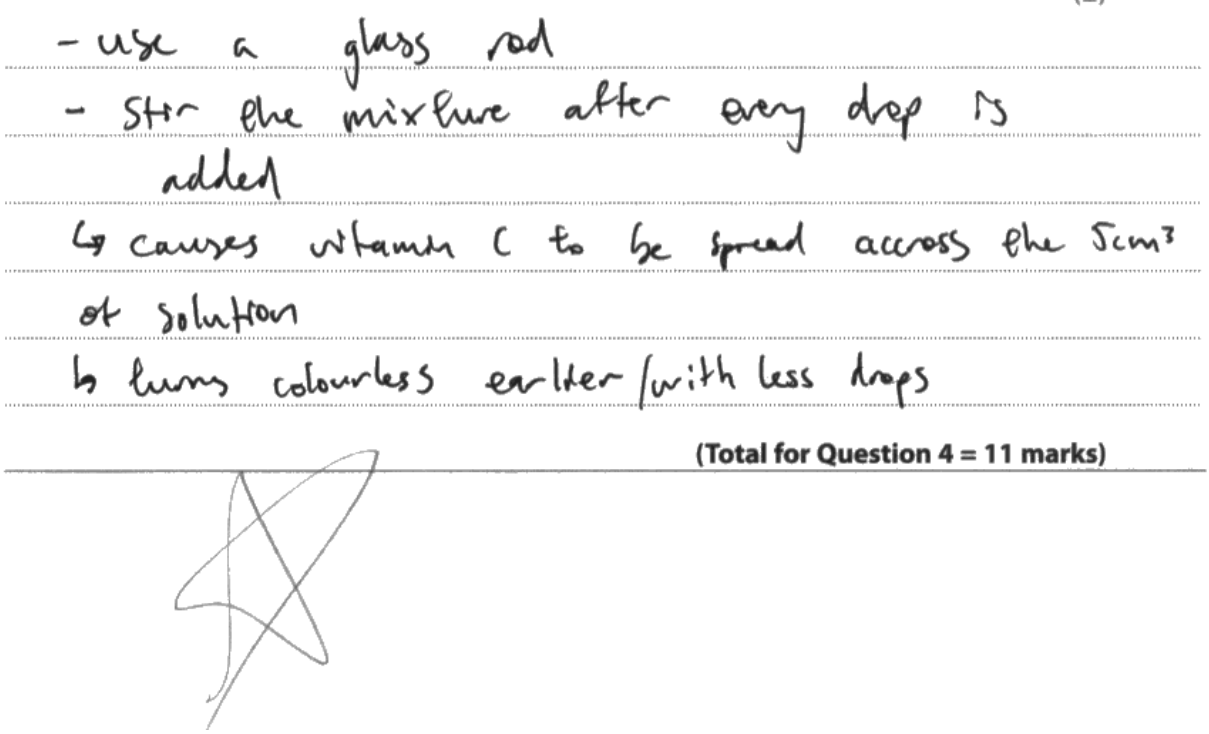
This answer did not gain the mark. The candidate has placed the fruit juices in the reverse order.

Question 4(c)iii

This question assessed candidates' understanding of how to improve accuracy of a practical method. Strong answers correctly referred to the fact that measuring volume of the fruit juice would be more accurate and went on to give a method, such as using a syringe. The question asked for an explanation so candidates should have attempted to give a reason as to why volume would be a better measure such as the idea that drops could be different volumes. Many candidates confused the term 'accuracy', with 'reliability' and suggested carrying about replicates. Candidates should be fully aware of the differences between practical terms such as accuracy and reliability.

(iii) Explain how the student could modify the experiment to give a more accurate measure of the concentrations of vitamin C in the fruit juices.

(2)



(Total for Question 4 = 11 marks)

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that stirring the mixture after each drop would make the result more accurate.

ResultsPlus
Examiner Tip

Make sure that you know the difference between practical terms such as accurate and reliable.

(iii) Explain how the student could modify the experiment to give a more accurate measure of the concentrations of vitamin C in the fruit juices.

(2)

Measure the volume ~~add~~ of the fruit juice added with cm^3 or m ml

ResultsPlus
Examiner Comments

This answer gained one mark for stating that volume should be measured but did not go on to give a method or explanation.

(iii) Explain how the student could modify the experiment to give a more accurate measure of the concentrations of vitamin C in the fruit juices.

(2)

Instead of adding juices using amount of drops, measure volume needed to change color of indicator, this would allow more precise reading as drops can be different sizes and won't make a trustworthy experiment.

ResultsPlus
Examiner Comments

This excellent answer gained both marks. The candidate correctly suggests measuring volumes and explains that drops would have different sizes.

(iii) Explain how the student could modify the experiment to give a more accurate measure of the concentrations of vitamin C in the fruit juices.

(2)

smaller number intervals of drops, use an burette to drip down fruit juice since drops (and) could be in different volumns ✓

ResultsPlus
Examiner Comments

This answer gained both marks for correctly stating that the sizes of drops would vary and that a burette could be used to measure volume.

Question 5(a)ii

This question asked candidates to explain the role of progesterone. Strong answers correctly stated that progesterone maintains the uterus lining and went on to state that this would enable an embryo to implant. Some candidates incorrectly stated that progesterone repairs the uterus lining and others incorrectly referred to the implantation of eggs - candidates should be careful to use terminology accurately. Some candidates also incorrectly stated that progesterone is released in the first half of the menstrual cycle.

(ii) Explain the importance of progesterone in the menstrual cycle.

(2)

It maintains the uterus lining for ~~an~~ a fertilised ~~egg cell to~~ embryo to implant.

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that progesterone maintains the uterus lining and that it prepares the lining for implantation of an embryo.

(ii) Explain the importance of progesterone in the menstrual cycle.

(2)

It maintains lining of uterus walls otherwise ~~it~~ ~~menstruation~~ menstruation (period) ~~cycle~~ doesn't stop. It also inhibits LH and FSH from being produced. so ovulation doesn't occur for some days.

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that progesterone maintains the uterus lining and inhibits release of LH.

(ii) Explain the importance of progesterone in the menstrual cycle.

(2)

Progesteronl maintains ~~meto~~ ~~netrns~~ ~~lining~~ utrns lining during menstrual cycle.

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that progesterone maintains the uterus lining.

(ii) Explain the importance of progesterone in the menstrual cycle.

(2)

Progesterone maintains the utherus lining thickness for implantation

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that progesterone maintains the uterus lining for implantation.

Question 5(a)iii

This question required candidates to explain how the placenta enables the transfer of nutrients. Strong answers referred to the presence of villi, the idea of it having a large surface area, the closeness of the maternal and foetal blood meaning that there is a short diffusion path, the role of blood in maintaining a gradient, and the role of diffusion or active transport. Some candidates simply gave descriptions rather than explaining how the structure of the placenta ensures transfer of substances. Candidates should always refer to process such as diffusion and active transport where appropriate rather than simply referring to transfer.

(iii) Explain how the placenta enables a developing embryo to obtain nutrients.

(3)

It provides nutrients such as vitamin and minerals to the embryo, Allow embryo to have water.

ResultsPlus Examiner Comments

This answer gained no marks as the candidate has simply stated the function of the placenta.

(iii) Explain how the placenta enables a developing embryo to obtain nutrients.

(3)

placenta enables ~~di~~ exchange of materials between the embryo and the mother through diffusion. Nutrients like protein, carbohydrates, lipids diffuse from the mother's blood to the embryo across the placenta since a ~~large~~ steep concentration gradient is ~~for~~ formed in the placenta by the dense network of blood capillaries.

ResultsPlus Examiner Comments

This good answer gained two marks for correctly referring to diffusion and explaining how

the blood maintains a diffusion gradient.

(iii) Explain how the placenta enables a developing embryo to obtain nutrients.

(3)

Placenta enables the ~~exchange~~ exchange $ of waste and CO_2 from the foetus to the blood. It also enables the diffusion of oxygen and nutrients to the foetus.

ResultsPlus
Examiner Comments

This answer gained one mark for the use of diffusion even though the context refers to gas exchange rather than nutrients.

(iii) Explain how the placenta enables a developing embryo to obtain nutrients.

(3)

There are many villi that provides large surface area for exchange of materials. The blood capillaries maintain a steep diffusion gradient for diffusion of nutrients, oxygen and glucose. The mother's blood is close to fetal blood for short diffusion distance of materials.

ResultsPlus
Examiner Comments

This excellent answer gained all three marks. The candidate correctly refers to the role of villi, diffusion, the role of the blood vessels in maintaining a gradient and the short diffusion pathway.

(iii) Explain how the placenta enables a developing embryo to obtain nutrients.

(3)

Placenta has many ~~ville~~ villi which provide a large surface area for diffusion and absorption of nutrients. Placenta has cells that are one cell thick which provides a short diffusion distance. Placenta is well supplied with a dense capillary for a steep concentration gradient for diffusion of nutrients

ResultsPlus
Examiner Comments

This excellent answer gained three marks. The candidate refers to the villi, the large surface area, and the short diffusion path.

Question 5(b)ii

This longer, evaluative style question required candidates to analyse data about the impact of a new drug on sperm motility and concentration in mice and whether it should be used in humans. Many excellent answers were seen that correctly recognised that the drug had no impact on sperm concentration but reduced movement (often correctly stating that increasing the dose from 0.4 to 0.8 has no further effect). Many candidates also went on to explain that if sperm could not move, they would not be able to reach the oviducts to fertilise egg cells. Strong answers also referred to the experimental design, often stating that the drug had not been tested on humans and could have different effects, that it would still be possible for sperm to fertilise eggs as some could still move and that the experiment had a low sample size. Weaker answers tended to gain one or two marks for simply stating that the drug had no effect on concentration/did reduce mobility. With longer, evaluative questions, candidates should explore data as fully as possible and also comment on the experimental design.

The scientists conclude that the drug could be used as a contraceptive to reduce fertility in humans.

Discuss the scientists' conclusion.

Use information in the graphs and your own knowledge to support your answer.

(5)

Drugs can be used as a contraceptive as the concentration of drug increase, the percentage of sperm that can move decreases. Percentage of sperm that can move levels off at 0.4 to 0.8 concentration of drug. This may not be fair as it has never tested on humans. The diet, age, mass of mice are unknown, may not be reliable. They have repeated with 25 mice, so they can deduce anomaly result. There are still 5% of sperms that can move at 0.8 concentration of drug, is not defined that is can prevent all sperm into the vigina. Concentration of drug and sperm concentration varies. At 0.2 concentration of drug, sperm concentration decreases to the least. At 0.2 concentration of drug, sperm concentration goes up and the same as no drug. Concentration of drug at 0.4 decrease to sperm concentration of 6. Concentration of drug of 0.8 rises back up in sperm concentration. Meaning that sperm number can increase after using drug. The light stemperature is not mentioned in the test, it may affect result. The percentage of sperm halfs as the concentration of drug goes from 0 to 1.

ResultsPlus
Examiner Comments

This excellent answer gained all five marks. The candidate correctly states that the drug reduces movement and that the effect levels off from 0.4 to 0.8. The answer also states that mice would be different to humans and that there is no mention of their health status. The candidate also states that because 5% of sperm can still move there is still a chance of fertilisation and that concentration of sperm was not affected.

The scientists conclude that the drug could be used as a contraceptive to reduce fertility in humans.

Discuss the scientists' conclusion.

Use information in the graphs and your own knowledge to support your answer.

(5)

From the graph1, as concentration of drug at 0.0, 0.2, the concentration of sperm stay same. This may cause as at 0.1, the ~~sperm~~ drug ~~has been~~ concentration is ~~too~~ ~~too~~ for enough sperm concentration to ~~maintain~~ reduce ~~maintain~~, 0.2 is the ~~optical~~ optumium convention for ~~reducing fertility~~ sperm. ~~As~~ At 0.4, 0.8 drugs go ~~too~~ high concentration and sperm start reduce the most in 0.4 and go back up in 0.8.

For graph 2, as drug concentration go up, sperm activity go low this ~~may~~ is because of the drug sucessfully reduce ~~the am~~ ~~convert~~ fertility.

ResultsPlus
Examiner Comments

This answer gained two marks for describing that the sperm concentration fluctuates and that movement is reduced.

The scientists conclude that the drug could be used as a contraceptive to reduce fertility in humans.

Discuss the scientists' conclusion.

Use information in the graphs and your own knowledge to support your answer.

(5)

On one hand, the drug decreases the percentage of sperm that can move as the concentration of drug increases, while the sperm concentration only decreasing slightly. The sperm that can't move are not capable of swimming to fertilize with the ovum, thus reducing the changes of fertility. Yet, the experiement is not conducted on humans but mice, making to conclusion hard to apply to humans without further research. The sample size is also too small and no details of the mice's age, diet and species are mentioned.

ResultsPlus
Examiner Comments

This excellent answer gained five marks. The candidate correctly refers to a small effect on concentration and the reduction of movement. The candidate also correctly stated that if sperm cannot move, fertilisation would not occur. The candidate also considers the experimental design by stating that humans may be different, that the sample size is small.

The scientists conclude that the drug could be used as a contraceptive to reduce fertility in humans.

Discuss the scientists' conclusion.

Use information in the graphs and your own knowledge to support your answer.

(5)

1) Less sperms present that can move.
2) So less sperms fertilise with egg.
3) Because Less sperms can swim.
4) Less fertilisation so less fertility.
5) Conclusion is "correct"

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that fewer sperm can move so there would be less fertilisation.

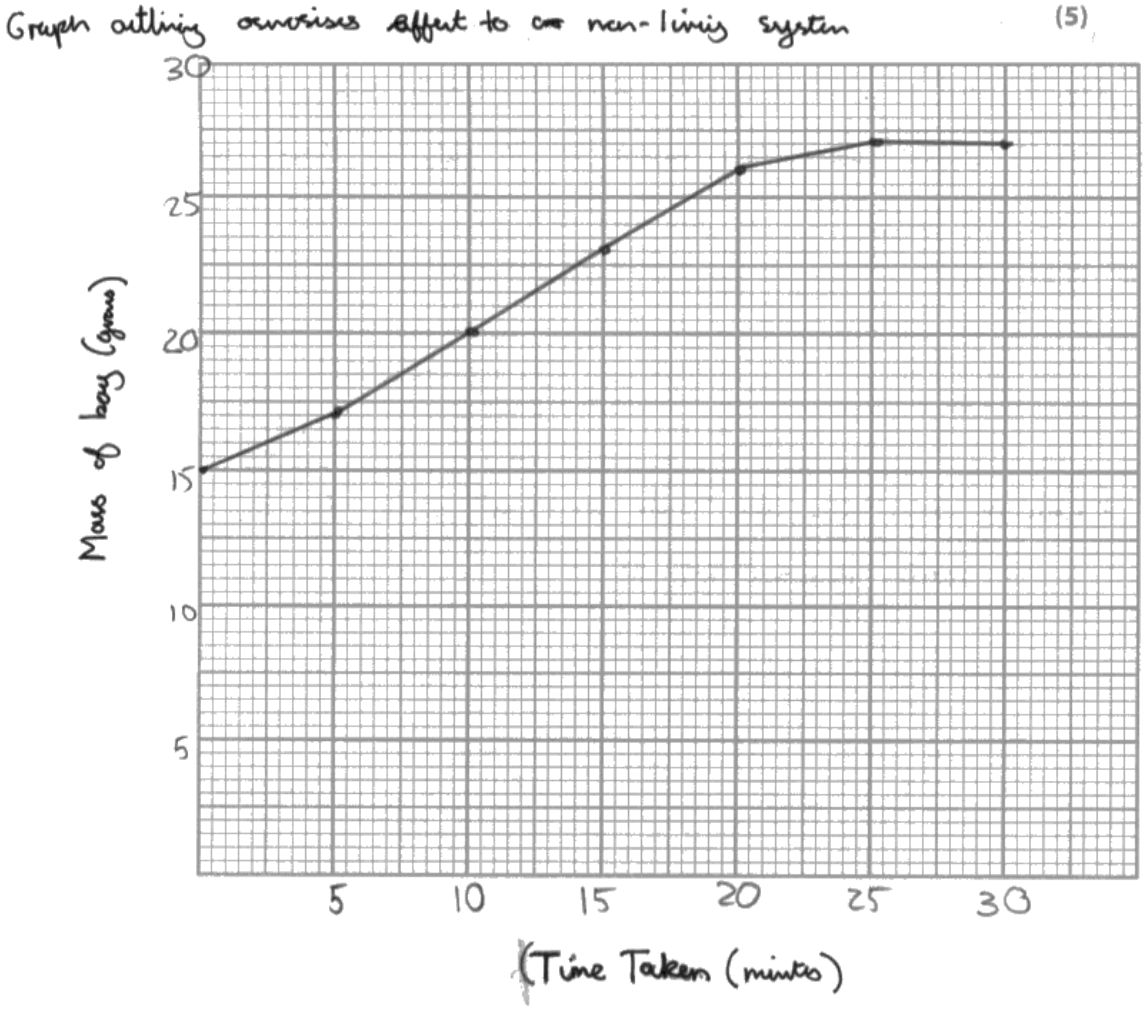
Question 6(a)i

This graph question was well answered by most candidates and it is clear that candidates and centres work hard to develop candidates' graphical skills. Most candidates selected sensible, linear scales and labelled axes correctly. Most went on to plot points accurately and join the points with ruled, straight lines. A few candidates incorrectly drew bar charts and a few placed the independent variable on the y axis rather than the x axis.

(a) (i) Draw a line graph to show the student's results.

Join your points with straight lines.

(5)



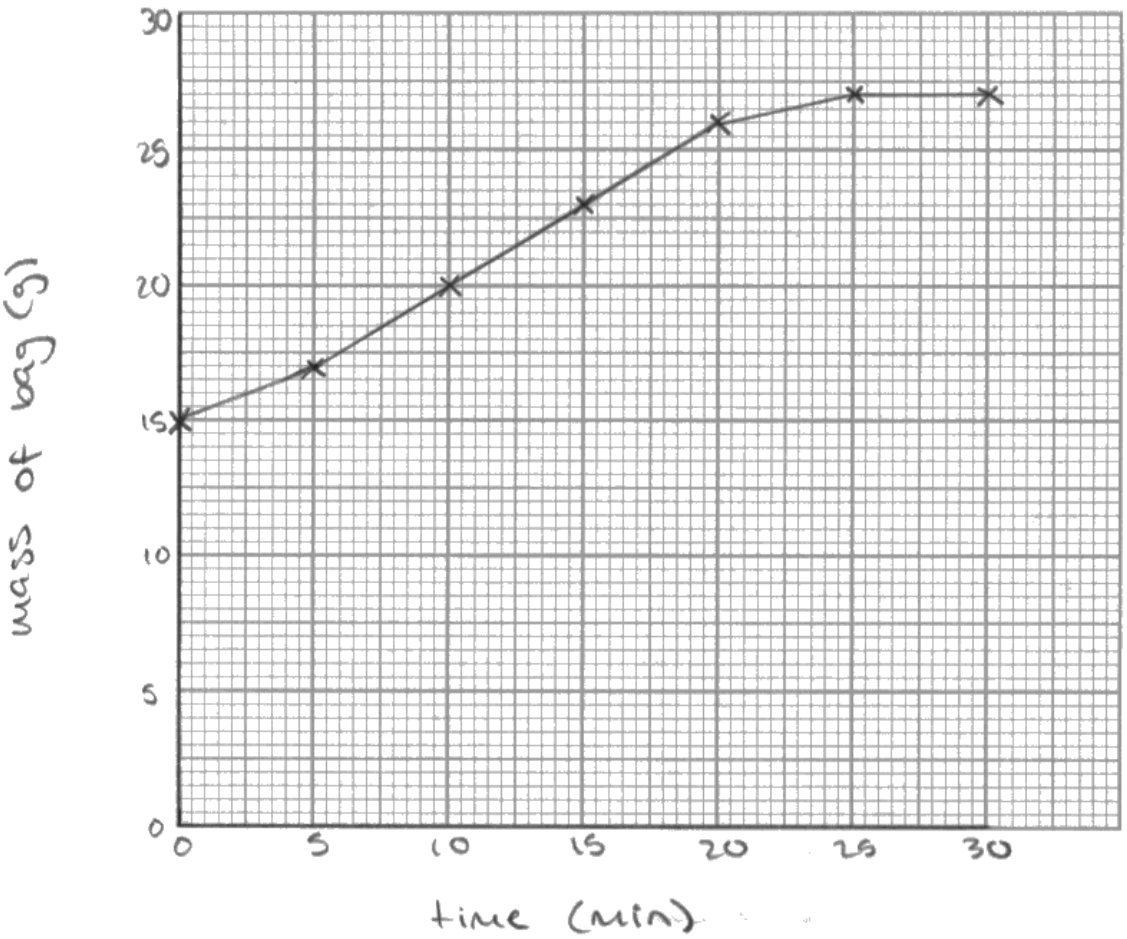
ResultsPlus
Examiner Comments

This answer gained all five marks. The scales are linear and make good use of the whole grid. The axes are the correct way round and are labelled. The points are correct and are joined with straight lines.

(a) (i) Draw a line graph to show the student's results.

Join your points with straight lines.

(5)



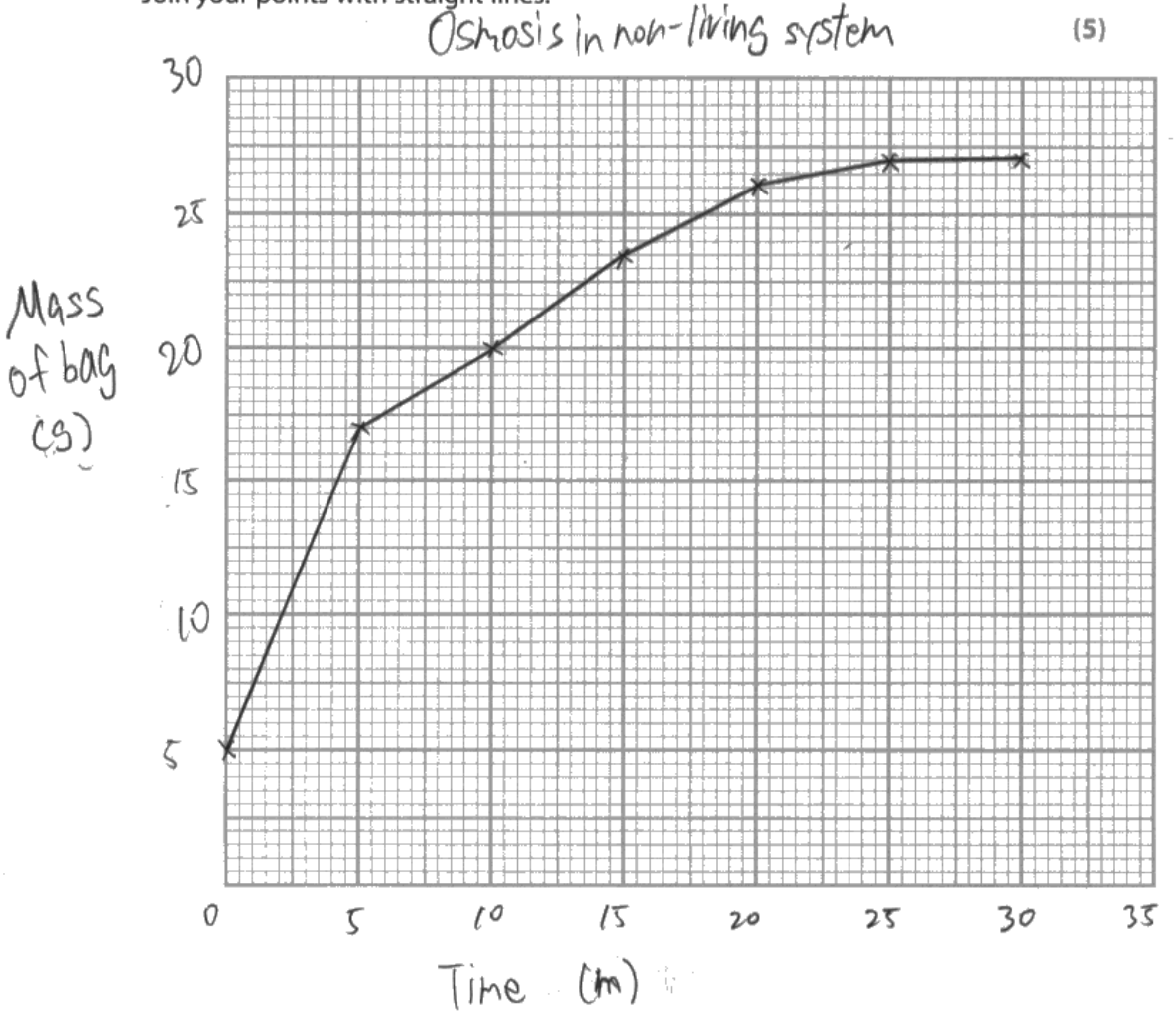
ResultsPlus
Examiner Comments

This graph also gained all five marks and is well presented.

(a) (i) Draw a line graph to show the student's results.

Join your points with straight lines.

(5)



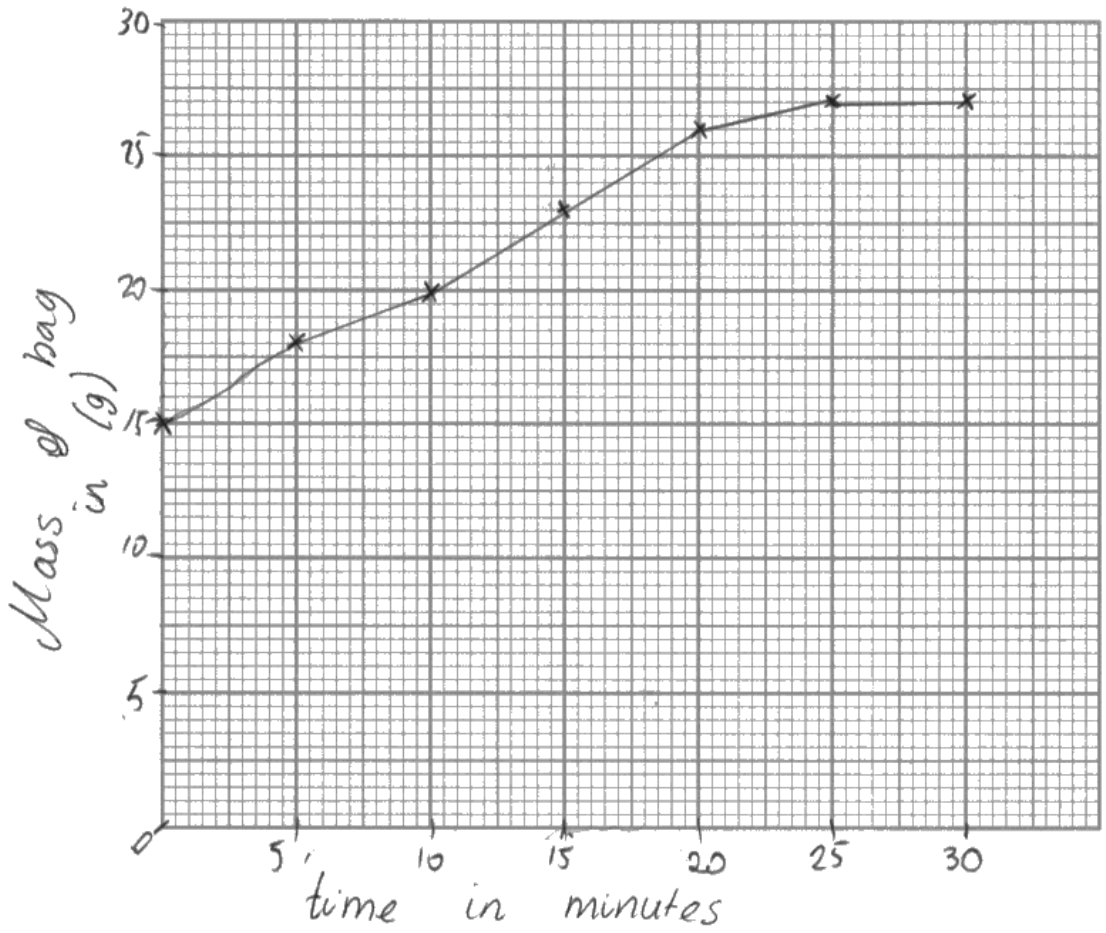
ResultsPlus
Examiner Comments

This answer gained three marks. The x axis label has an incorrect unit and the first plot is not plotted accurately.

(a) (i) Draw a line graph to show the student's results.

Join your points with straight lines.

(5)



ResultsPlus
Examiner Comments

This graph gained four marks. A mark was lost as one plot was inaccurate.

ResultsPlus
Examiner Tip

Always make sure that the independent variable is on the x axis and that you make full use of the grid.

Question 6(a)ii

This question asked candidates to describe the change in mass of the bag over the 30 minute period. Most candidates correctly stated that the mass increased but few went on to state that the mass levelled off after 25 minutes. If questions asking for descriptions of data have more than one mark allocated, more detail would be expected in answers - candidates could look for turning points and identify them in their answers. Some candidates confused 'describe' with 'explain' and referred to how osmosis was taking place.

(ii) Describe the change in mass of the bag during the 30 minutes.

(2)

As the ~~mass of bag~~ time increases, the weight of the bag ~~is~~ increases, this shows ~~that~~ osmosis is occuring during the investigation.
~~during the investigation as water molecules are moving from a high water potential to low water potential through a partially permeable membrane~~

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that there is an increase.

(ii) Describe the change in mass of the bag during the 30 minutes.

(2)

the mass of the bag steadily increased as osmosis occured and water travelled ~~into~~ through the semi-permeable membrane before plateauing at 27g

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that there is an increase and identifying that the mass levels off at 27g.

(ii) Describe the change in mass of the bag during the 30 minutes.

(2)

At first, the mass of the bag continues to increase until 25 minutes. After 25 minutes, the mass levels off and remains at 27 g for the last 5 minutes.

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that there is an increase and that the mass levels off at 25 minutes.

(ii) Describe the change in mass of the bag during the 30 minutes.

(2)

The change in mass remained constant during 30 minutes as the concentration of ~~more~~ water moved from an area of high concentration to an area of low concentration which is from the ~~te~~ test tube to the bag. This is known as osmosis.

ResultsPlus
Examiner Comments

This answer gained no marks. There is no mention of an increase and the reference to a constant mass is at the wrong time. The candidate has given an explanation rather than a description.

Question 6(a)iii

This question required candidates to explain the change in mass of the bag over the 30 minute period. Strong answers referred to the movement of water into the bag from a higher water potential to a lower water potential. The very strongest answers also explained that the mass levelled off as turgor pressure increased inside the bag. Candidates need to be careful when referring to the gradients involved with osmosis. When referring to concentrations, candidates should be clear if they are referring to solutes or water. It is better to refer to the movement of water from a higher water potential to a lower water potential so there is no confusion about concentrations.

(iii) Explain the change in mass of the bag during the 30 minutes.

(2)

because the water potential of inside is lower than outside, water starts to get in by osmosis, as the water potential gets closer, the osmosis starts decreasing. Finally, the water potential is the same, then no water is coming in or going out.

ResultsPlus
Examiner Comments

This answer gained both marks for correctly stating that water moves into the bag from a high water potential to a lower water potential.

(iii) Explain the change in mass of the bag during the 30 minutes.

(2)

The change in mass of bag increases because pure water enters the bag by osmosis from high to low concentration gradient through the permeable tubing. There is a low concentration gradient in the bag, so water enters the bag. The change in mass then stays the same because the concentration gradient in and out of the bag is balanced and is the same.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea of water moving into the bag. The candidate has incorrectly stated that the concentration gradient inside the bag is low.

ResultsPlus
Examiner Tip

Make sure you use clear, accurate terminology when writing about osmosis. Referring to water potentials is better than water concentrations.

(iii) Explain the change in mass of the bag during the 30 minutes.

(2)

Solute concentration from inside tubing is bigger than outside so water moves in by osmosis through partially permeable wall. It then reaches maximum volume of water for the bag so there's no more changes. Also might be because solute concentration is balanced, so no water movement.

ResultsPlus
Examiner Comments

This answer gained both marks for correctly stating that water moves into the bag to where the solute concentration is higher.

Question 6(b)i

This question assessed generic practical skills which are a feature of AO3 in the specification. Candidates needed to describe how the experiment could be carried out safely at a higher temperature. Strong answers referred to the use of a water bath and gave a safety feature. The best answers also described how a water bath would be maintained at the same temperature with either a thermostat or the use of a Bunsen and thermometer.

(b) The student decides to investigate how increasing the temperature would affect the results.

(i) Describe how the student could repeat the experiment safely at a higher temperature.

(2)

The student can use a water bath and heat the test tube

ResultsPlus
Examiner Comments

This answer gained one mark for the use of a water bath. The candidate has not extended their answer to give a safety feature or explained how the temperature would be maintained.

(b) The student decides to investigate how increasing the temperature would affect the results.

(i) Describe how the student could repeat the experiment safely at a higher temperature.

(2)

- put the test tube into water bath and heat it until the set temperature, wearing gloves and goggles
- put the test tube in a beaker with water and heat it up using bunsen burner to the set temperature, wearing gloves and goggles

ResultsPlus
Examiner Comments

This answer gained two marks for the use of a water bath and a relevant safety feature.

(b) The student decides to investigate how increasing the temperature would affect the results.

(i) Describe how the student could repeat the experiment safely at a higher temperature.

(2)

Cover the test tube with a lid to prevent ~~both~~ high temperature water splashing. Student could wear safety google to prevent water splashing to eye. Do experiment in water bath.

ResultsPlus
Examiner Comments

This answer also gains two marks for the use of a water bath and a relevant safety feature.

(b) The student decides to investigate how increasing the temperature would affect the results.

(i) Describe how the student could repeat the experiment safely at a higher temperature.

(2)

The student should wear goggles to protect ~~the~~ their eyes in case the tubing bursts and use a bunsen burner with a thermometer to gradually increase the temperature.

ResultsPlus
Examiner Comments

This answer gained two marks for a relevant safety feature and the use of a Bunsen and thermometer to maintain the temperature.

Question 6(b)ii

This question assessed candidates' understanding of the effect of temperature on osmosis and required an explanation as to what would happen if the temperature were increased. Strong answers gave full explanations that the bag would fill faster as water particles would have more kinetic energy, move faster and so osmosis would be quicker. Some candidates gave descriptions rather than explanations and others confused the effect of temperature on osmosis with the effect of temperature on enzymes. Candidates should be careful to read command words when tackling questions.

(ii) Explain how repeating the experiment at a higher temperature would affect the results.

(3)

Higher temperature makes the water particles move faster because they have higher kinetic energy. More collision will happen so the rate of osmosis increases. Mass of bag will increase faster.

ResultsPlus
Examiner Comments

This excellent answer gained all three marks. The candidate correctly states that the particles move faster due to having more kinetic energy and goes on to state that the bag will fill faster.

(ii) Explain how repeating the experiment at a higher temperature would affect the results.

(3)

The constant mass would be achieved faster. This is because the higher temperature gives the particles of water a higher kinetic energy. This increases their speed so they are able to permeate through the membrane faster.

ResultsPlus
Examiner Comments

This strong answer also gained all three marks. The candidate correctly states that the bag would fill faster, and the water particles have higher temperature and so will move faster.

(ii) Explain how repeating the experiment at a higher temperature would affect the results.

(3)

· osmosis could take place quicker

· glucose in sugar could be denatured = less to ososmosise

This answer gained one mark for the idea that osmosis would be faster. The candidate has confused the effect of temperature on osmosis with the effect of temperature on enzymes.

Question 7(a)ii

This question required candidates to give a definition of the term 'population'. There are several words listed in the specification that candidates need to be able to define - candidates should ensure that they have learned definitions prior to the examinations. Strong answers correctly stated that a population is the number of a single species in an area. A common error was to refer to organisms rather than species or confuse population with community and suggest that a population is all of the organisms.

(ii) State what is meant by the term **population**.

(1)

a group of the same species living in a habitate with the species being able to ~~inter~~ reproduce ~~within the~~

ResultsPlus Examiner Comments

This answer gained one mark for correctly stating that a population is the group of one species in an area.

(ii) State what is meant by the term **population**.

(1)

Population is the number of individuals of a species in a or organisms in a ~~area~~ single area.

ResultsPlus Examiner Comments

This is an excellent answer that correctly states that a population is all the individuals of a single species in an area.

(ii) State what is meant by the term **population**.

(1)

The number of a species in a habitat

ResultsPlus Examiner Comments

This answer did not gain the mark as the candidate states the number of species in an area which is not the same as the number of a single species. Unfortunately, the candidate initially gave a correct answer and then deleted the 'a'.

Question 7(a)iii

This question assessed candidates' understanding of how energy is lost along food chains. Many excellent answers were seen that gained all three marks. Many candidates correctly stated that energy is lost through respiration, heat loss, movement, indigestible material, and inedible material. A few candidates incorrectly suggested that energy is lost due to growth and reproduction.

(iii) Explain why only 1% of the energy in the algae is transferred to the starfish.

(3)

Energy might be loss through respiration, excretion, heat loss. Some food might not be eaten or might have decomposed.

ResultsPlus
Examiner Comments

This excellent answer gained all three marks. The candidate correctly states that energy is lost through respiration, excretion, things that are not consumed and losses to decomposers.

(iii) Explain why only 1% of the energy in the algae is transferred to the starfish.

(3)

Some algae are not eaten by limpets. There are also energy cost from respiration and from movement. Some algae may not be digested so it is excreted. Some algae may also have died.

ResultsPlus
Examiner Comments

This excellent answer also gained all three marks. The candidate states that energy is lost through respiration, movement, not being digested and excretion.

(iii) Explain why only 1% of the energy in the algae is transferred to the starfish.

(3)

The energy waste during transformation along the food chain. Only 10% of energy of a species can be passed on to the one who eat them. 10% energy of algae is transfered to limpets when being eaten, 1% energy of algae (10% x 10%) stored in limpets can be transfered to starfish.

ResultsPlus
Examiner Comments

This answer did not gain any marks. The candidate simply restates the question stem and has not given explanations for the energy loss.

Question 7(b)i

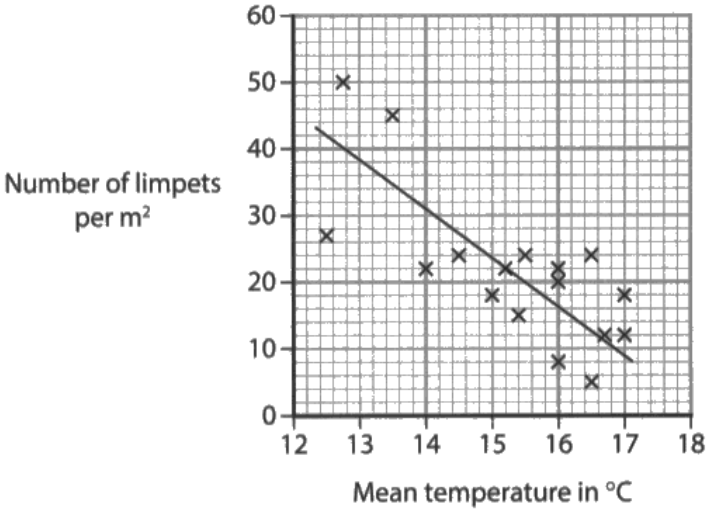
This question assessed knowledge of a core practical - the use of quadrats to determine populations. Strong answers referred to the use of quadrats, the use of random coordinates, repeats, counting the limpets within the quadrat and scaling the answer up to the whole area. Candidates should be careful to refer to quadrats rather than quadra*n*ts. It is important for candidates to have full knowledge of all the core practicals listed in the specification as they are assessed as part of AO3.

(b) Some scientists think that food webs on rocky shores are at risk from an increase in greenhouse gases.

The scientists record these two factors during August every year for 17 years.

- the number of limpets per m^2 on a rocky shore
- the mean temperature at the same rocky shore

The graph shows the scientists' results.



(i) Describe how the scientists could determine the number of limpets on the rocky shore.

(3)

They could use quadrats. They take a 1m x 1m square and use a random number generator and place the quadrat based on what that number is generated as coordinates. Then count the limpets on that quadrat repeat a few times and calculate the mean per $1 m^2$.

ResultsPlus
Examiner Comments

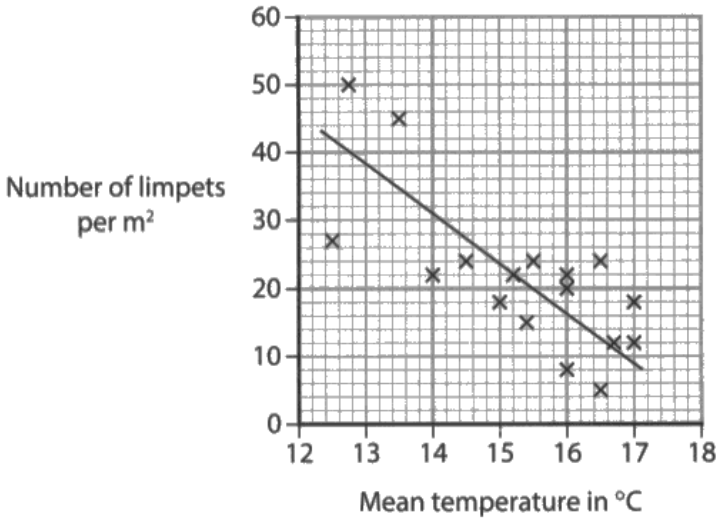
This excellent answer gained all three marks for the use of quadrats, repeats and random coordinates.

(b) Some scientists think that food webs on rocky shores are at risk from an increase in greenhouse gases.

The scientists record these two factors during August every year for 17 years.

- the number of limpets per m^2 on a rocky shore
- the mean temperature at the same rocky shore

The graph shows the scientists' results.



(i) Describe how the scientists could determine the number of limpets on the rocky shore.

(3)

- The scientist could use quadrats and random sampling to determine the number of limpets per m^2
- They can find the mean from their results
- They can multiply this by the total area of the rocky shore
- They can do this by measuring the area of the rocky shore

ResultsPlus
Examiner Comments

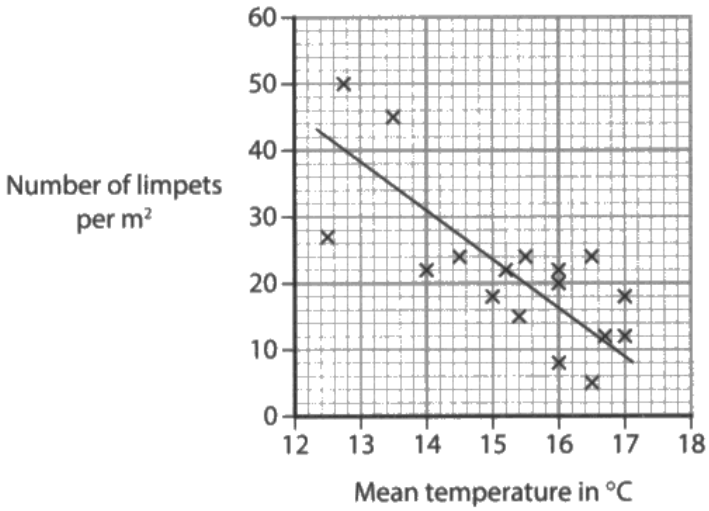
This excellent answer gained all three marks for correctly stating the use of quadrats, repeats, random sampling and scaling the answer up to the whole area.

(b) Some scientists think that food webs on rocky shores are at risk from an increase in greenhouse gases.

The scientists record these two factors during August every year for 17 years.

- the number of limpets per m^2 on a rocky shore
- the mean temperature at the same rocky shore

The graph shows the scientists' results.



(i) Describe how the scientists could determine the number of limpets on the rocky shore.

(3)

As the temperature ~~into~~ increases, the rock becomes hot. When the rock becomes hot ~~the~~ limpets are unable to rest on it. ~~&~~ Therefore, as the temperature rises the population of limpets on rocky shores decreases.

ResultsPlus
Examiner Comments

This answer gained no marks - the candidate has misread the requirements of the question. Candidates should be careful to read questions and plan their answer before writing it down.

ResultsPlus
Examiner Tip

Always read questions carefully. Identify the command word, then plan your answer before putting pen to paper.

Question 7(b)ii

This question assessed generic AO3 skills by asking candidates to suggest a control variable for an unfamiliar investigation. Candidates should be aware of the terms independent, dependent, and control variables and be to apply this knowledge to unfamiliar contexts. Many excellent answers were given that correctly stated that the location, time of day, and species of limpet should be controlled. A few candidates incorrectly referred to the independent and dependent variables.

(ii) Give one factor the scientists should control when comparing the number of limpets per m^2 each year.

(1)

Same time of day during ~~August~~. August.

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that time of day should be controlled.

(ii) Give one factor the scientists should control when comparing the number of limpets per m^2 each year.

(1)

The mean number of predators like starfish stays constant.

ResultsPlus
Examiner Comments

This answer did not gain a mark as it would not be possible to control predator numbers.

(ii) Give one factor the scientists should control when comparing the number of limpets per m^2 each year.

(1)

The exact time (such as 5p.m/1a.m)

ResultsPlus
Examiner Comments

This answer gained a mark for correctly stating that the time would be controlled.

(ii) Give one factor the scientists should control when comparing the number of limpets per m^2 each year.

(1)

The species of limpets

This answer gained a mark for correctly stating that the species of limpet should be controlled.

Question 7(b)iii

This longer evaluative question required candidates to look at the data about limpet numbers and temperature, the food web and use this to consider whether fossil fuel use would affect the food web. Many outstanding answers were seen and the examiners were very impressed with how well many candidates approached the question. Strong answers referred to the production of carbon dioxide from fossil fuel combustion, and the possible effect of carbon dioxide on global temperatures. Many went on to point out that the data shows that limpets decrease with higher temperatures and that this would affect predators and algal populations. Many also stated that the data was only for one month, commented on the length of time the investigation had occurred and stated that other factors could be affecting the limpets. Few noticed that there were data points that lay away from the line of best fit. It is pleasing to see how well centres and candidates have progressed with these evaluative style questions.

(iii) The scientists conclude that the combustion of fossil fuels is a risk to the food web.

Discuss the scientists' conclusion.

Use the information in the graph and your own knowledge to support your answer.

(5)

When the temperature is less there is more number limpets, as the temperature is increasing the ~~no~~ number of limpets is reduced compared to at starting.

ResultsPlus
Examiner Comments

This answer just gained one mark for stating that limpet numbers decrease as temperatures rise.

on daylight.

(iii) The scientists conclude that the combustion of fossil fuels is a risk to the food web.

Discuss the scientists' conclusion.

Use the information in the graph and your own knowledge to support your answer.

(5)

When fossil fuels are burned, greenhouse gases such as carbondioxide, sulfur, nitrogen are released. The sulfur and nitrogen would mix with oxygen and water vapour to form sulfuric acid and nitric acid and would fall down to the Earth as acid rain. This will falls on organisms and kill them. More greenhouse gas means more temperature increase. As seen from graph, when temperature increase, number of limpet decreases. When star fish and dog whelks can't get limpet, their food consuption decrease which may result in their death. If these die herring gull's food will also decrease, resulting in decrease in population of herring gull.

ResultsPlus
Examiner Comments

This excellent answer gained five marks. The candidate correctly states that carbon dioxide is released, this may increase temperatures and then links this to the reduction in limpet numbers. The candidate goes on to say that there would be less food for the gulls, reducing their population and mentions other factors that could influence the food web.

(iii) The scientists conclude that the combustion of fossil fuels is a risk to the food web.

Discuss the scientists' conclusion.

Use the information in the graph and your own knowledge to support your answer.

(5)

As ~~the~~ there are more combustion of fossil fuels for electricity ~~increase~~, more carbon dioxide and other greenhouse gases are released and being ~~thrapp~~ trapped by IR. The temperature increases as time increases, the number of limpets also decreases. The decrease in the number of limpets will lead to less food provided for starfish and dog whelks, ~~and~~ the ~~po~~ number of starfish and dog whelks will decrease. as well.

ResultsPlus
Examiner Comments

This excellent answer gained all five marks. The candidate correctly refers to the release of carbon dioxide, the idea of greenhouse effect, the impact on limpets and the impact of fewer limpets on the food web.

(iii) The scientists conclude that the combustion of fossil fuels is a risk to the food web.

Discuss the scientists' conclusion.

Use the information in the graph and your own knowledge to support your answer.

(5)

Combustion of fossil fuels release greenhouse gases like carbon dioxide to the atmosphere. These greenhouse gases causes global warming that ~~reduces~~ increases the temperature of earth. As temperature increase, the number of limpets per m^2 decreases, so less food ~~is~~ available to starfish and dogwhelks and their population will drop, causing further disruption to the food web. However, combustion of fossil fuel is ~~not~~ not the only factor that contribute to the release of greenhouse gases, human activities of using ~~the~~ fridge releases CFC, and cattle ~~give~~ releases methane that also cause global warming and temperature increase.

fossil fuels combustion also causes release of sulphur dioxides that result in acid rain, aside from increase of temperature. increase in acid rain may also reduces number of organisms in a food web.

ResultsPlus
Examiner Comments

This is another excellent answer that gained all five marks. The candidate clearly refers to carbon dioxide release, greenhouse effect, the impact on limpet populations and other species in the food web and other factors that would affect the food web.

(iii) The scientists conclude that the combustion of fossil fuels is a risk to the food web.

Discuss the scientists' conclusion.

Use the information in the graph and your own knowledge to support your answer.

(5)

At higher mean temperature, the number of limpets are decreasing. At the highest temperature, the number of limpets drop to 8 per m^3 but at the lowest temperature, ~~4~~ 43 per m^3. Combustion of fossil ~~fuels~~ fuels can lead to increase of greenhouse gases and more and release more CO_2 extreme weather and cause the temperature to be higher in each year however, the graph ~~is~~ is a long term study, reliable data but no mentioning which country, only one country has investigating.

ResultsPlus
Examiner Comments

This answer gained four marks. The candidate refers to carbon dioxide release, greenhouse effect, and decrease in limpets. The candidate also comments on the length of the investigation for the fourth mark.

Question 8(a)i

This question required candidates to give the name of an organism that has a gene from a different species, ie, transgenic. Many candidates gave the correct answer but some referred to 'genetically modified' organisms which was in the question stem. The term 'transgenic' is defined in the specification - candidates should know all the terms that are defined in the specification.

8 Golden rice is an example of a genetically modified plant.

Golden rice has been given a gene to make a substance called carotene.

This gene was taken from daffodil plants.

(a) (i) State the term for a genetically modified organism that has been given a gene from a different species.

(1)

~~is the the~~ recombinant ~~plasmid~~ bacterium plasmid

ResultsPlus
Examiner Comments

This answer did not state 'transgenic' so did not gain the mark.

8 Golden rice is an example of a genetically modified plant.

Golden rice has been given a gene to make a substance called carotene.

This gene was taken from daffodil plants.

(a) (i) State the term for a genetically modified organism that has been given a gene from a different species.

(1)

transgenic animals/organism.

ResultsPlus
Examiner Comments

This is the correct answer so gains one mark.

Question 8(a)ii

This question assessed candidates' understanding of how to use enzymes to genetically modify organisms. Restriction enzymes and ligase are the two enzymes referred to in the specification - candidates should have a full understanding of their use and the role of plasmid vectors. Strong answers referred to the cutting of DNA with restriction enzymes, the attachment of DNA using ligase and the use of plasmids. Some candidates incorrectly referred to restrictive enzymes and/or lipase enzymes - candidates should make sure that key, technical terms are spelt accurately.

(ii) Describe how named enzymes are used to transfer a gene from one species to another species.

(3)

restriction enzyme cuts gene from one species? allowing transfer of gene to occur

ResultsPlus
Examiner Comments

This answer gained one mark for the use of restriction enzymes to cut genes.

(ii) Describe how named enzymes are used to transfer a gene from one species to another species.

(3)

The gene from golden rice and daffodil plants are cut using restriction enzymes. Then glued together using ligase. The new genetically modified thing is put into the golden rice.

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating the roles of restriction enzymes and ligase. There is no mention of plasmids so three marks was not awarded.

(ii) Describe how named enzymes are used to transfer a gene from one species to another species.

(3)

Enzymes are used to transfer one gene from one specie, to another species by taking a part of dna from one organism and binding it together with another gene using enzymes.

ResultsPlus
Examiner Comments

This answer gained no marks. The candidate simply refers to the transfer of genes and does not mention specific enzymes.

(ii) Describe how named enzymes are used to transfer a gene from one species to another species.

(3)

Restriction enzymes cut open the ~~desire~~ plasmid and the same restriction enzyme cuts out the ~~desire~~ gene for the desired trait, from the first species and ligase is used to stick and glue the DNA back together to be inserted into another organism.

ResultsPlus
Examiner Comments

This answer gained all three marks. The candidate correctly states the function of restriction enzymes, ligase and plasmids.

(ii) Describe how named enzymes are used to transfer a gene from one species to another species.

(3)

- A restriction enzyme is used to cut out the gene from DNA
- The same restriction enzyme cuts open a plasmid
- Ligase enzymes join together the gene and the plasmid.

ResultsPlus
Examiner Comments

This excellent answer gained all three marks for correctly giving the functions of restriction enzymes, ligase, and plasmids.

Question 8(b)i

This challenging question required candidates to analyse the information given to them in the text about the function of golden rice in producing carotene and link this to the loss of vitamin A deficiency. Strong answers explained that the rice would reduce eye problems such as night blindness and that rice is a common, cheap food so would be easy to introduce into diets. Few stated that having healthy people would reduce health care costs. Many candidates simply restated the question stem by suggesting that the golden rice would reduce vitamin A deficiency without explaining what a lack of vitamin A causes.

(b) Carotene is converted into vitamin A after being consumed by humans. Non-genetically modified rice does not usually contain carotene.

(i) Vitamin A deficiency is common in some countries.

Explain why growing golden rice may benefit people in these countries.

(2)

More Golden rice will be produced. So more people can eat the golden rice containing Carotene. It will be converted into vitamin A. So the people will have sufficent vitamin A ~~they~~ we. This will prevent night blindness.

ResultsPlus
Examiner Comments

This answer gained one mark as the candidate explains that the rice would reduce the incidence of night blindness.

(b) Carotene is converted into vitamin A after being consumed by humans. Non-genetically modified rice does not usually contain carotene.

(i) Vitamin A deficiency is common in some countries.

Explain why growing golden rice may benefit people in these countries.

(2)

gloden rice contains carotene which can be converted to vitamin A preventing ~~et~~ night blindness. It is also the staple food in some countries therefore can be easily eaten.

ResultsPlus
Examiner Comments

This excellent answer gained both marks. The candidate correctly states that the rice would reduce night blindness and that rice is a staple food for many people.

(b) Carotene is converted into vitamin A after being consumed by humans.
Non-genetically modified rice does not usually contain carotene.

(i) Vitamin A deficiency is common in some countries.

Explain why growing golden rice may benefit people in these countries.

(2)

Golden rice provides vitamin A to the people which will secrete visual pigment and prevent night blindness. Providing a more balanced diet. So no vitamin A deficiency.

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that the rice would reduce night blindness.

(b) Carotene is converted into vitamin A after being consumed by humans.
Non-genetically modified rice does not usually contain carotene.

(i) Vitamin A deficiency is common in some countries.

Explain why growing golden rice may benefit people in these countries.

(2)

Contains carotene, which will be converted into vitamin A when consumed. Vitamin A is supplied, so people will not have the deficiency disease for vitamin A.

ResultsPlus
Examiner Comments

This answer gained no marks. The candidate has restated that question stem that the rice would reduce vitamin A deficiency but does not extend the answer any further.

(b) Carotene is converted into vitamin A after being consumed by humans.
Non-genetically modified rice does not usually contain carotene.

(i) Vitamin A deficiency is common in some countries.

Explain why growing golden rice may benefit people in these countries.

(2)

Because countries with scarcity in vitamin A rich foods can consume rice to increase their consumption improving their eyesight. Also the rice might be cheaper than Vitamin A rich foods.

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that vitamin A is needed for eyesight and that rice is a cheap food.

Question 8(b)ii

This challenging question required candidates to suggest why some people may object to growing genetically modified crops such as golden rice. 'Suggest' questions require candidates to use their knowledge in unfamiliar contexts and many candidates find this type of question challenging. Strong answers explained that GM crops could cross-pollinate with wild plants and so introduce different genes into populations that could affect food webs and compete with wild plants. Some candidates also correctly stated that some people may object to GM crops as they may feel that the crops could be harmful if consumed. A few candidates also correctly stated that it may be better to ensure that people's diets naturally have enough vitamin A.

(ii) Suggest why some people may not agree with growing genetically modified crops such as golden rice.

(2)

It may allow genes to be passed onto unwanted organisms, affecting the food chain.

ResultsPlus
Examiner Comments

This strong answer gained two marks for correctly stating that the genes could pass into other organisms and then affect food webs.

(ii) Suggest why some people may not agree with growing genetically modified crops such as golden rice.

(2)

It may ~~effe~~ affect the food web.
Because normal rice doesn't contain carotene.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea of the GM rice affecting food webs.

(ii) Suggest why some people may not agree with growing genetically modified crops such as golden rice.

(2)

The growing genetically modified crops may affect local ecosystem.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea of the crops affecting ecosystems but does not extend the answer any further.

(ii) Suggest why some people may not agree with growing genetically modified crops such as golden rice.

(2)

This is because the gene for ~~#~~ carotene may be transferred to another species and lead to more competition between golden rice and other spedes.

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that the GM crop could transfer into other species and affect competition between species.

(ii) Suggest why some people may not agree with growing genetically modified crops such as golden rice.

(2)

As can can have possible sideffects ~~that~~ that may not be tested before. It could be unethical to the plants and animals involved.

ResultsPlus
Examiner Comments

This answer correctly states that some people may be concerned about potential side effects of eating the rice and so gained one mark.

Question 8(c)i

This question assessed candidates understanding of the use of pesticides to control pests. The answer asked candidates to 'comment on' the information given in the table about the effect of a pesticide on populations of insect pests, carnivorous beetles, and lizards. 'Comment on' requires candidates to identify and describe all patterns in the data and then make judgements. Strong answers correctly stated that populations of all three groups decreased and went on to identify the exact points at which the insects and beetles began to increase and/or state that the lizards did not recover. Candidates should be careful to accurately state where turning points in data series are as some answers gave the wrong months. Very strong answers went on to give some explanations, such as the pesticide being washed off, the insects becoming resistant and/or predator/prey relationships. Most candidates gained at least one mark with many going on to gain at least three.

These are the scientists' results.

Time in months	Number of each type of organism		
	insect pests	carnivorous beetles	lizards
0 (before spraying)	490	310	26
3	25	175	12
6	30	45	6
9	175	20	2
12	280	25	2

43% ~~57%~~ ~~43%~~ ~~43%~~ 92 % 92%

(i) Comment on the effects on the numbers of different organisms of spraying pesticides in a rice field.

(4)

Spraying pesticides reduced different
~~The effect on number of di~~ the number of ~~di~~ organisms.
The pesticide had the least effect on insect pests, which only had a 43% decrease. While the pesticide has similar effects on the carnivorous beetles and lizards, both experiencing a 92% decrease in numbers. This means that pesticide may be most effective on carnivorous beetles and lizard, but less effective in killing insect pests.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea that all three types of organism reduce.

These are the scientists' results.

Time in months	Number of each type of organism		
	insect pests	carnivorous beetles	lizards
0 (before spraying)	490	310	26
3	25	175	12
6	30	45	6
9	175	20	2
12	280	25	2

(i) Comment on the effects on the numbers of different organisms of spraying pesticides in a rice field.

(4)

~~Decreases~~, the number of insect pests decreases drastically over 6 months, compared to before spraying. The number of carnivous beetles and lizards also decreased nearly half. However after 6 months the ~~one~~ number of insect pests increases while carnivoous beetles sees a slight increase after 9 months and none for lizard. This can be explained by the food web as the insects pests were the main consumer for the carnivoous beetles while beetles for lizards. Hence the lost of insect pests meant the drastic decrease in all organism until the insect pests started to reproduce. This shows that chemical pesticides drastically decreases the number of different organisms, but ~~it~~ doesn't have a long term impact.

ResultsPlus
Examiner Comments

This strong answer gained all four marks. The candidate correctly states that all three types of organism reduce and then goes on to give the times that the insects and beetles begin to increase. The candidate also explains the population changes in terms of predator-prey relationships.

These are the scientists' results.

Time in months	Number of each type of organism		
	insect pests	carnivorous beetles	lizards
0 (before spraying)	490	310	26
3	25	175	12
6	30	45	6
9	175	20	2
12	280	25	2

(i) Comment on the effects on the numbers of different organisms of spraying pesticides in a rice field.

(4)

The number of insect pests decreased after 3 months as the pesticide killed most of the population, but became resistant to the pesticide and numbers increased again after 9 months. As insect pests decreased in population, carnivorous beetles had less food, decreasing their population. Lizards had less food as beetles were decreasing in population as well.

ResultsPlus
Examiner Comments

This answer gained three marks. The candidate correctly states that all three groups decrease. The candidate, unfortunately, has chosen the incorrect month for when the insects increase. The candidate also gained a mark for the idea of resistance and the predator-prey relationship.

These are the scientists' results.

Time in months	Number of each type of organism		
	insect pests	carnivorous beetles	lizards
0 (before spraying)	490	310	26
3	25	175	12
6	30	45	6
9	175	20	2
12	280	25	2

(i) Comment on the effects on the numbers of different organisms of spraying pesticides in a rice field.

(4)

After spraying the pesticides ~~most organisms~~ the number of different organisms decreased.
The lizards went from 26 to (12 months later) two lizards.
The carnivorous beetles also decreased significantly over 12 moths, going from 310 to 25.
The insect pests decreased significantly the first 6 months but they increased again after 9 months.
It didn't affect the insect pests as much but it affected the other organisms like the carnivorous beetles and the lizards.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea of all three groups decreasing. The candidate gave the wrong month for the increase in insect pests.

These are the scientists' results.

Time in months	Number of each type of organism		
	insect pests	carnivorous beetles	lizards
0 (before spraying)	490	310	26
3	25	175	12
6	30	45	6
9	175	20	2
12	280	25	2

(i) Comment on the effects on the numbers of different organisms of spraying pesticides in a rice field.

(4)

- in the first 3 months, number of ~~all~~ the organism decrease drastically, showing that the pesticides spray is effective
- insect pest number are ~~increasing~~ decreasing but it slowly increase. this show that insect pest have undergo a mutation, that make them resistance to the pesticides.
- carnivorous beetles number also decreasing but at ~~the end of the year~~ month 12) it start to increase, this show that carnivorous beetles are also might undergo a genetic mutation that make them resistance towards the pesticides.
- pesticides are very effective on lizards as the number keep on going down.

ResultsPlus
Examiner Comments

This excellent answer gained all four marks. The candidate correctly states that all three types of organism decrease and goes on to state that the insects become resistant, identifies when the beetles increase and states that the lizards do not increase.

These are the scientists' results.

Time in months	Number of each type of organism		
	insect pests	carnivorous beetles	lizards
0 (before spraying)	490	310	26
3	25	175	12
6	30	45	6
9	175	20	2
12	280	25	2

(i) Comment on the effects on the numbers of different organisms of spraying pesticides in a rice field.

(4)

At 3 months after spraying, the populations of all three organisms had decreased considerably (almost half or more than half). At 6 months, ~~they~~ beetles and lizards continued decreasing, but the population of insect pests had risen from 25 to 30. The numbers of insect pests continued increasing greatly, ending at 280 at 12 months. The number of carnivorous beetles decreased from 6 to 9 months but increased to 25 at 12 months. The population of lizards decreased to 2 and stayed at 2 from 7 to 12 months. It can be seen that the effects of pesticides are not permanent here.

ResultsPlus
Examiner Comments

This answer gained all four marks. The candidate correctly states that all three groups increase and correctly identifies the months when insects and beetles increase and states that the lizards do not increase.

Question 8(c)ii

This assessed candidates' understanding of the benefits of biological control. Strong answers referred to the specificity, the fact that pests do not become resistant, the lack of need to reapply, and the fact that bioaccumulation does not occur. A few candidates misread the question and gave benefits of pesticide use. Most candidates gained at least one mark with many going on to gain both.

(ii) State two reasons why using biological control is better for the environment than using chemical pesticide.

(2)

1 No disadvantage for plants.

2 Doesn't make pets evolution. to make more pets have antibodie of the pesticide.

ResultsPlus
Examiner Comments

This answer gained no marks. 'Disadvantages for plants' is too vague and the candidate has incorrectly referred to immunity rather than resistance.

ResultsPlus
Examiner Tip

Do not confuse resistance with immunity.

(ii) State two reasons why using biological control is better for the environment than using chemical pesticide.

(2)

1 Chemical pesticide may ~~damage~~ kill other organisms and damage the food web.

2 Chemical pesticide may stay on crops and soil. ~~and be eaten by~~ human

ResultsPlus
Examiner Comments

This answer gained two marks for the idea that biological control is specific and that it does not leave a residue on the crops. This is an example of the converse answer that was credited (disadvantage of chemical use).

(ii) State two reasons why using biological control is better for the environment than using chemical pesticide.

(2)

1 No chemicals are used so it doesn't pollute water

2 It doesn't have to be reapplied ~~many times~~ like chemical pesticides, so ~~they~~ the you don't have to keep buying them or continue putting harsh chemicals

ResultsPlus
Examiner Comments

This answer gained one mark for the idea of no need to keep adding. The reference to lack of pollution is too vague for a mark.

(ii) State two reasons why using biological control is better for the environment than using chemical pesticide.

(2)

1 Chemical pesticide is not specific to only pests but can also kill other organisms.

2 ~~The the chemical pesticide~~ Chemical pesticide has to be consistently sprayed.

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that chemical pesticides are non-specific and that they need to keep being sprayed.

(ii) State two reasons why using biological control is better for the environment than using chemical pesticide.

(2)

1 Chemical pesticides can cause pests resistance, causing environment issues as pests are harder to kill.

2 ~~Pesticides~~ Overly relying on pesticides can cause crops to become dependent on it, reducing its ability to survive in wild.

(Total for Question 8 = 14 marks)

ResultsPlus
Examiner Comments

This answer gained one mark for the idea that pests become resistant to pesticides.

Question 9(a)

This question assessed candidates' understanding of what recessive alleles are. The specification lists several genetic terms that candidates should be familiar with. Strong answers referred to the fact that recessive alleles are only expressed when homozygous - candidates should be encouraged to use technical terms confidently. Weaker answers referred to recessive alleles being less frequent, less powerful, or being overpowered by dominant alleles.

9 The ability of humans to taste a chemical called PTC is controlled by a single gene.

The ability to taste PTC is coded for by a dominant allele, **T**.

Not being able to taste PTC is coded for by a recessive allele, **t**.

(a) State what is meant by the term **recessive allele**.

(1)

Need to be homozygous recessive to present the trait. It is an example. They need two of the same allele to present their characteristics.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea that recessive alleles are only expressed when homozygous.

ResultsPlus
Examiner Tip

Make sure that you know what terms such as 'recessive', 'dominant', 'heterozygous', and 'homozygous' mean and use them in answers.

9 The ability of humans to taste a chemical called PTC is controlled by a single gene.

The ability to taste PTC is coded for by a dominant allele, **T**.

Not being able to taste PTC is coded for by a recessive allele, **t**.

(a) State what is meant by the term **recessive allele**.

(1)

when the characteristic is less likely to be shown when the dominant is present

ResultsPlus
Examiner Comments

This is an example of an answer that was too vague to gain the mark. If the candidate had stated that the allele is not expressed when heterozygous, or with a dominant allele, the mark would have been awarded.

9 The ability of humans to taste a chemical called PTC is controlled by a single gene.

The ability to taste PTC is coded for by a dominant allele, **T**.

Not being able to taste PTC is coded for by a recessive allele, **t**.

(a) State what is meant by the term **recessive allele**.

(1)

An allele that is not always expressed unless ~~homozygous recessive~~ homozygous recessive

ResultsPlus
Examiner Comments

This answer gains the mark for stating that the allele is only expressed when homozygous.

9 The ability of humans to taste a chemical called PTC is controlled by a single gene.

The ability to taste PTC is coded for by a dominant allele, **T**.

Not being able to taste PTC is coded for by a recessive allele, **t**.

(a) State what is meant by the term **recessive allele**.

(1)

~~ree~~ Rececsive allele heed two to be expressed ~~wan~~ in phenotype. wont be expressed if there is Dominant allele

ResultsPlus
Examiner Comments

This answer gained a mark for correctly stating that recessive alleles are not expressed with a dominant allele.

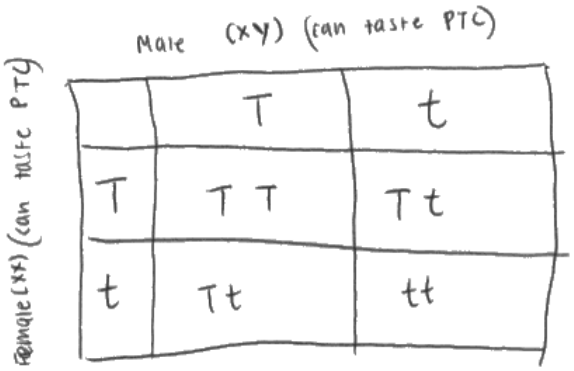
Question 9(b)ii

This question assessed candidates' understanding of how to determine genotypes of individuals from pedigree diagrams and construct a genetic diagram. Many excellent answers were seen that correctly identified the parental genotypes from the diagram, set out the genetic diagram correctly and calculated the probability correctly. Common errors included calculating the probability of the offspring tasting PTC correctly as 0.75 but then not multiplying it by 0.5 to give the probability of a male that can taste PTC. The examiners were impressed with how well many candidates set out the genetic diagrams and it is clear that candidates and centres have worked hard to develop a strong understanding of this area of the specification.

(ii) Determine the probability of individuals 3 and 4 having another child that can taste PTC and is male.

Use a genetic diagram to show your working.

(4)



Gametes of parents: T t T t

Genotypes of offspring: T T, T t, T t, t t

Phenotypes of offspring: T T = can taste PTC
T t = can taste PTC
t t = can't taste PTC

can taste PTC = $\frac{3}{4}$

Male = $\frac{1}{2}$

Male can taste = $\frac{3}{4} \times \frac{1}{2}$

$= \frac{3}{8}$

$= 0.375$

probability 0.375

ResultsPlus
Examiner Comments

This answer gained all four marks. The parental genotypes are correct, the diagram is all correct and the final probability is correct.

(ii) Determine the probability of individuals 3 and 4 having another child that can taste PTC and is male.

Use a genetic diagram to show your working.

(4)

Parent genotypes : Tt Tt

Parent gametes : T t T t

	T	t
T	TT	Tt
t	Tt	tt

TT Tt Tt tt

Offspring genotypes : TT Tt tt

Offspring phenotypes : can taste PTC | cannot taste PTC

Ratio : 3 | 1

$\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$

probability $\frac{3}{8}$

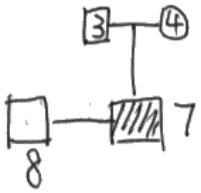
ResultsPlus
Examiner Comments

This answer also gained all four marks and the candidate has set out the diagram and all their working very clearly.

(ii) Determine the probability of individuals 3 and 4 having another child that can taste PTC and is male.

Use a genetic diagram to show your working.

(4)



	T	t
T	TT	Tt
t	Tt	tt

$\frac{3}{4} = 0.75$

probability 0.75

ResultsPlus
Examiner Comments

This answer gained three marks. The parental genotypes and diagram are correct but the final answer is not multiplied by 0.5.

(ii) Determine the probability of individuals 3 and 4 having another child that can taste PTC and is male.

Use a genetic diagram to show your working.

(4)

parent phenotype = male female

parent genotype = TT TT

gametes = T T T T

child genotype = TT

male

female	T	T
T	TT	TT
T	TT	TT

} 100%

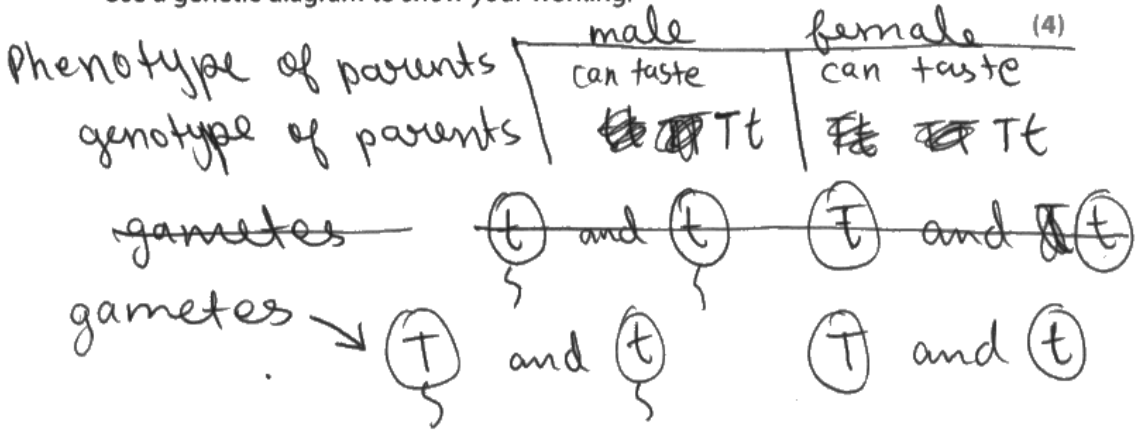
probability 100 %

ResultsPlus
Examiner Comments

This answer gained two marks. The parental genotypes are incorrect but two marks were awarded for a consequential error.

(ii) Determine the probability of individuals 3 and 4 having another child that can taste PTC and is male.

Use a genetic diagram to show your working. (4)



1 TT : 2 Tt : 1 tt

probability 3 :

T is dominant

so

→ 3 Tt : 1 tt

3 : 1

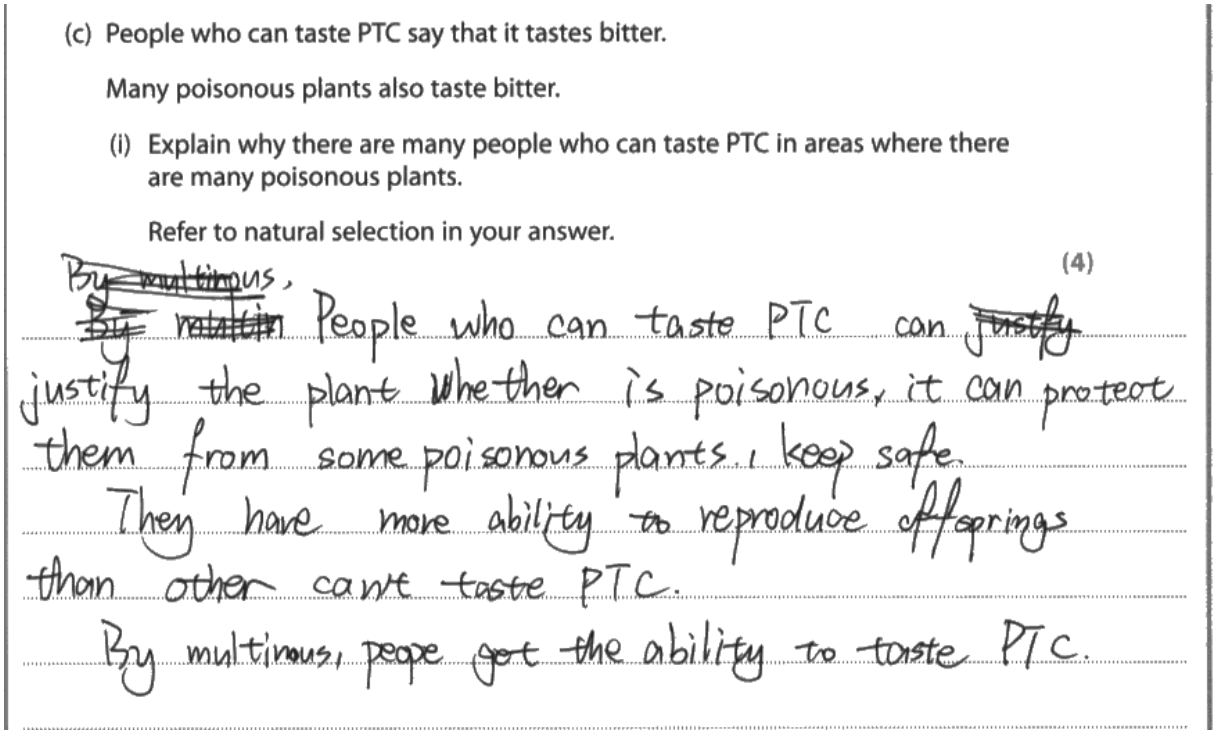
probability = 3

ResultsPlus
Examiner Comments

This answer gained three marks. The parental genotypes and the genetic diagram are correct but the candidate has given a ratio for the final answer rather than a probability.

Question 9(c)i

This question was well answered by many candidates with many gaining all four marks. The question assessed candidates' understanding of natural selection in a novel context. Many recognised that the allele for tasting PTC would have been produced by mutation, and that some individuals would be able to survive by tasting poisonous food would reproduce and pass on the allele.



(c) People who can taste PTC say that it tastes bitter.

Many poisonous plants also taste bitter.

(i) Explain why there are many people who can taste PTC in areas where there are many poisonous plants.

Refer to natural selection in your answer.

(4)

~~By multimous,~~ ~~By~~ ~~mutation~~ People who can taste PTC can ~~justify~~ justify the plant whether is poisonous, it can protect them from some poisonous plants, keep safe.

They have more ability ~~to~~ reproduce offsprings than other cant taste PTC.

By multimous, peope ~~got~~ the ability to taste PTC.

ResultsPlus
Examiner Comments

This answer gained two marks for the idea that people could identify poisonous plants and would reproduce.

(c) People who can taste PTC say that it tastes bitter.

Many poisonous plants also taste bitter.

(i) Explain why there are many people who can taste PTC in areas where there are many poisonous plants.

Refer to natural selection in your answer.

(4)

The population ~~There are~~ in the area with many poisonous plants show genetic variation, some who can taste PTC due to mutations tend to have a higher chance of survival as they can identify poisonous plants. Ones who cannot taste PTC won't be identify those plants and eat them and will die, due to natural selection therefore people who can taste PTC who survives are more likely to reproduce more and pass on their advantageous genes of tasting PTC, and more of their offsprings will survive with the ability of tasting PTC; and over many generations, there will be lots of people who can taste PTC.

ResultsPlus
Examiner Comments

This excellent answer gained all four marks. The candidate correctly states that mutation generates variation and that people who can taste the plants would survive and reproduce.

(c) People who can taste PTC say that it tastes bitter.

Many poisonous plants also taste bitter.

(i) Explain why there are many people who can taste PTC in areas where there are many poisonous plants.

Refer to natural selection in your answer.

(4)

People who can taste if a plant is bitter are more likely to survive since they know if a plant is poisonous, people that can't taste it die to their poison, so aren't able to pass on their gene, while the one's that survive pass on their gene down generations causing their offspring to also taste bitterness by reproducing. A mutation caused this gene. This is known as natural selection.

ResultsPlus
Examiner Comments

This strong answer also gained four marks. The candidate correctly states that people who can taste the PTC survive, reproduce and pass on the allele. They also state that mutation has generated the allele for tasting PTC.

(c) People who can taste PTC say that it tastes bitter.

Many poisonous plants also taste bitter.

(i) Explain why there are many people who can taste PTC in areas where there are many poisonous plants.

Refer to natural selection in your answer.

(4)

people can taste PTC ~~nature~~ reduce probability of being ~~poison~~ poison, so more survival could occur, then they got higher chance to reproduce and pass down the allele that can test PTC. which is a advantages in natural selection while in place of many poisonous dont

ResultsPlus
Examiner Comments

This answer gained three marks for stating that some survive, reproduce and pass on the allele.

Question 9(c)ii

This challenging question asked candidates to suggest why the allele for not tasting PTC still exists in populations. Strong answers stated that people who did not taste PTC would eat more plants and so gain more nutrients. Other correct answers included the idea that heterozygous individuals could still pass on a recessive allele and that some people tend to live in areas where there are no poisonous plants or have diets which focus more on meat and fish.

(ii) People who can taste PTC often find the taste of vegetables very bitter.

Suggest why the recessive allele for not tasting PTC still exists in human populations.

(2)

PTC-tasting people may avoid eating vegetables as they taste bitter to them;
This decreases their fibre consumption which makes them less healthy and therefore less likely to reproduce;
Therefore the recessive allele for inability to taste PTC passes on

ResultsPlus
Examiner Comments

This strong answer gained two marks for correctly stating that people who taste PTC may eat fewer vegetables and so lack fibre.

(ii) People who can taste PTC often find the taste of vegetables very bitter.

Suggest why the recessive allele for not tasting PTC still exists in human populations.

(2)

The recessive allele to still exists because some places do not contain lots of poisonous plants so the people have not ~~evolved~~ adapt to taste PTC.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea that some people have evolved in areas with no poisonous plants.

(ii) People who can taste PTC often find the taste of vegetables very bitter.

Suggest why the recessive allele for not tasting PTC still exists in human populations.

(2)

Because some people are carriers for not tasting PTC eventhough they don't exhibit this condition. It is possible to pass it down to their offspring.

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that some people can be carriers and still pass on an allele for not tasting PTC.

(ii) People who can taste PTC often find the taste of vegetables very bitter.

Suggest why the recessive allele for not tasting PTC still exists in human populations.

(2)

People who can't taste PTC can eat more vegetables without tasting it bitter. So they are ~~more~~ possible to survive because of a wide range of diet. Also, heterozygous genotype, Tt, can taste PTC too and survive in natural selection. When 2 Tt, Tt breed, tt forms and there's possibility he cannot taste PTC.

(Total for Question 9 = 12 marks)

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that people would eat more vegetables and the idea that heterozygotes would still carry a recessive allele.

Question 10

This final question was the six-mark experimental plan. The context of this question was the effect of light colour on the rate of movement of fly larvae. The examiners were very impressed with the high standard of many answers. Most candidates gained at least two marks with many going on to gain all six. Many candidates planned their answer using CORMS (C- change the independent variable, O- control focused on the organism, R - replicates, M - how to measure the dependent variable, S- which other variables need controlling) and it was pleasing to see that most went on to write their plan fully. When stating how to do repeats, candidates should be careful to stress that the repeats are for reliability and so in this question, there would need to be repeats with each light colour. Control variables should be ones that are relevant to the experiment.

10 Fly larvae will continuously move around the edge of a Petri dish when placed under a lamp.

The diagram shows a fly larva in a Petri dish.

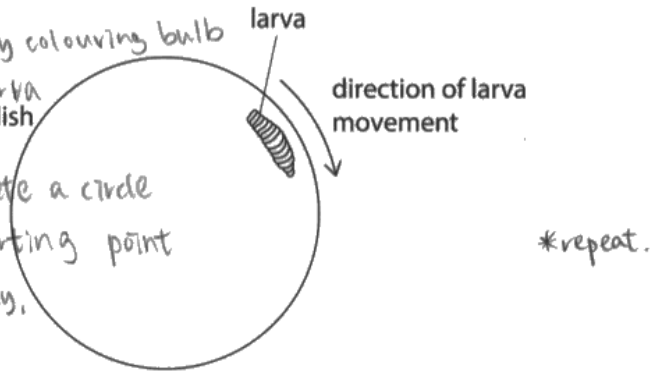
C - change colour of light by colouring bulb

O - same type, size, sex, age, of larva, activity level

M - measure the time it takes to complete a circle

M - mark a dot on the starting point

S - same brightness, humidity, oxygen, water



*repeat.

Design an investigation to find out if changing the colour of light from the lamp affects the speed that the larvae move.

Include experimental details in your answer and write in full sentences.

(6)

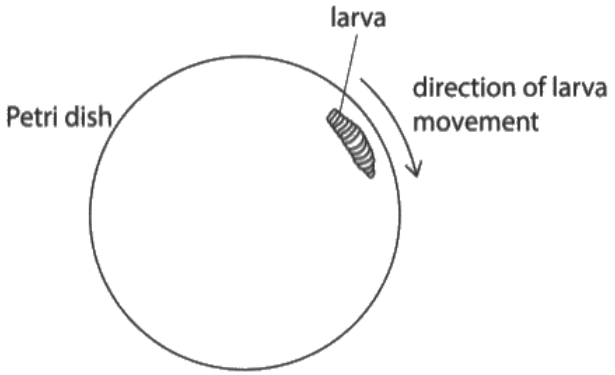
Prepare 10 lamp each with different coloured ~~tam~~ bulb. Find 10 fly larvae with the same size, species, age, sex, and mass. Prepare 10 Petri dish, ~~each~~. Place 1 fly larvae in each Petri dish and use a marker to mark the starting point before ~~as the larvae starts moving. Open Turn on the lamp and start the timer before you~~ ↑ of where the larvae is positioned before you turn on the lamp. Then, turn on the lamp and start the timer, stop the timer when the larvae returns to the starting point marked. Make sure the experiment is conducted in the same time of the day, with same humidity, oxygen level and the brightness of each lamp should be the same and the size of the Petri dish should be the same. Repeat each colour and find the average, exclude anomalies and results if larvae doesn't move around the edge of the Petri dish.

This excellent answer gained all six marks. The candidate states that different colours of light area used ©, the larvae are of the same species (O), each colour is repeated ®, the time taken for each lap (M,M) and lists controls such as humidity (S,S). The candidate has planned their answer using CORMS which is an example of excellent practice.

Plan your experiment using CORMS and then use this to write your plan in full.

10 Fly larvae will continuously move around the edge of a Petri dish when placed under a lamp.

The diagram shows a fly larva in a Petri dish.



Design an investigation to find out if changing the colour of light from the lamp affects the speed that the larvae move.

Include experimental details in your answer and write in full sentences.

(6)

1 take out ~~retrieve~~ a petri dish, a ~~to~~ live larva ~~and~~, 5 different colored ~~light~~ lamps, and a stop watch.

2 take one ~~light~~ lamp and place it above the petri dish ~~—~~ placed on the table, ~~then~~ carefully take the larva and place it on the edge of the petri dish

3 as soon as the lamp is turned on, start ~~the~~ stop watch and count the number of laps moved. when 5 laps is reached, ~~turn~~ stop the stop watch and record the result

4 change the lamp.

5 repeat step 3-4 until all lamps are used

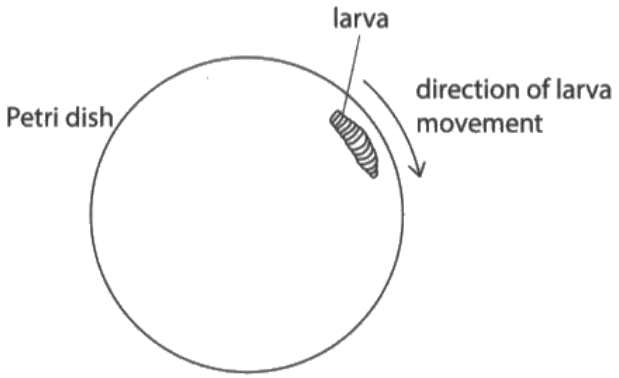
6 compare the results and find out ~~the lamp color~~ ~~lamp color with~~ whether or not color of light from a lamp ~~color~~ affects the larva's speed.

ResultsPlus
Examiner Comments

This answer gained three marks for using different light colours ©, and recording the number of laps in a set time (MM). The repeat mark was not awarded as it was for the different colours.

10 Fly larvae will continuously move around the edge of a Petri dish when placed under a lamp.

The diagram shows a fly larva in a Petri dish.



Design an investigation to find out if changing the colour of light from the lamp affects the speed that the larvae move.

Include experimental details in your answer and write in full sentences.

(6)

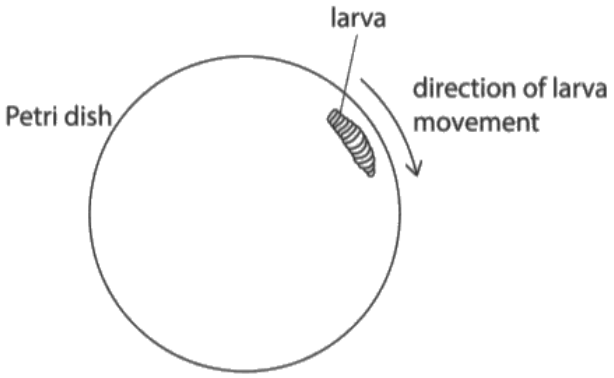
set the color of the light to red and measure the distance that the larva moves over the course of 10 minutes using a tape measure circling the edge of the petri dish. Repeat using the same larva, but changing the color each time (red → orange → yelow → green → blue → purple). Keep the amount of food the larva is provided and the temperature of the room constant. Repeat the entire experiment 3 times and average the results.

ResultsPlus
Examiner Comments

This answer gained six marks for: changing the light colour ©, measuring distance moved in 10 minutes (MM), repeating the experiment ®, and controlling the food and temperature (SS).

10 Fly larvae will continuously move around the edge of a Petri dish when placed under a lamp.

The diagram shows a fly larva in a Petri dish.



Design an investigation to find out if changing the colour of light from the lamp affects the speed that the larvae move.

Include experimental details in your answer and write in full sentences.

(6)

The independent variable is the color of the light, which would be red, blue, green, yellow, aqua, white, purple. When changing the color of the light, the same species and same age larva should be used, and for each color of light the experiment should be repeated three times and speed should be averaged. Firstly measure the diameter of the petridish to find the circumference of the dish using using a ruler $C = \pi d$, then using a stopwatch record the time taken for the larva to travel a whole circle or cycle under the light, and use speed = circumference divided by time to obtain speed that larvae moves (then repeat experiment as mentioned above). Then repeat the experiment with another color of light. The temperature, light intensity, size and diameter of petridish, oxygen concentration, humidity should be controlled throughout.

ResultsPlus
Examiner Comments

This excellent answer gained six marks. The candidate states that the light colour is changed ©, the same age of larvae are used (O), the experiment is repeated ®, the speed ie calculated using the distance and time (MM), and lists several control variables (SS) such as temperature and light intensity.

Paper Summary

In future series, candidates should:

- Have a full understanding of the requirements of all the command words listed in the specification
- Make sure that they add key terms and depth commensurate with GCSE standards
- Explore data and experimental designs thoroughly when answering longer, evaluative questions
- Focus on the number of marks allocated to a question when structuring an answer
- Understand how to design valid, controlled and reliable experimental plans.

Grade boundaries

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